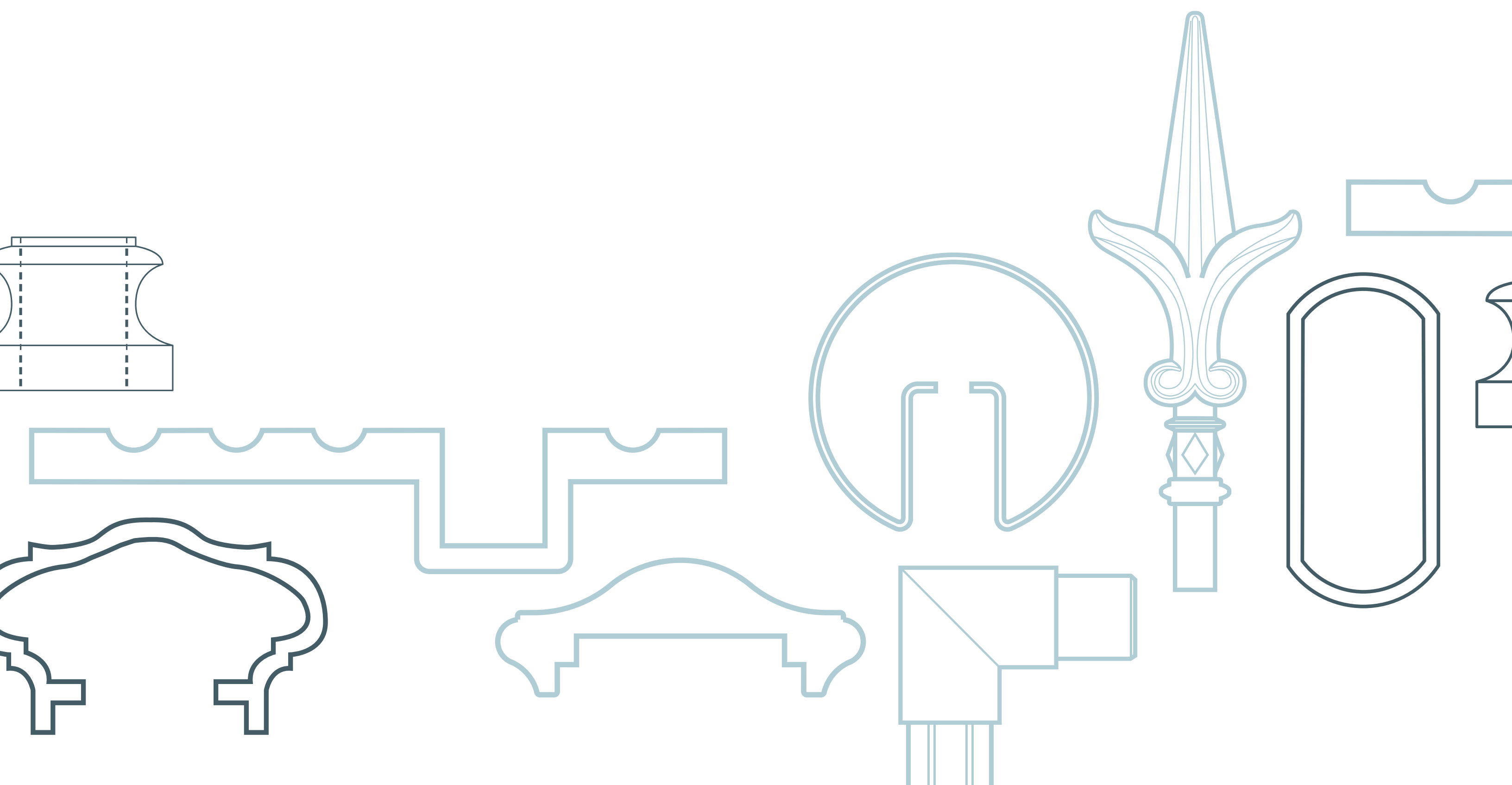
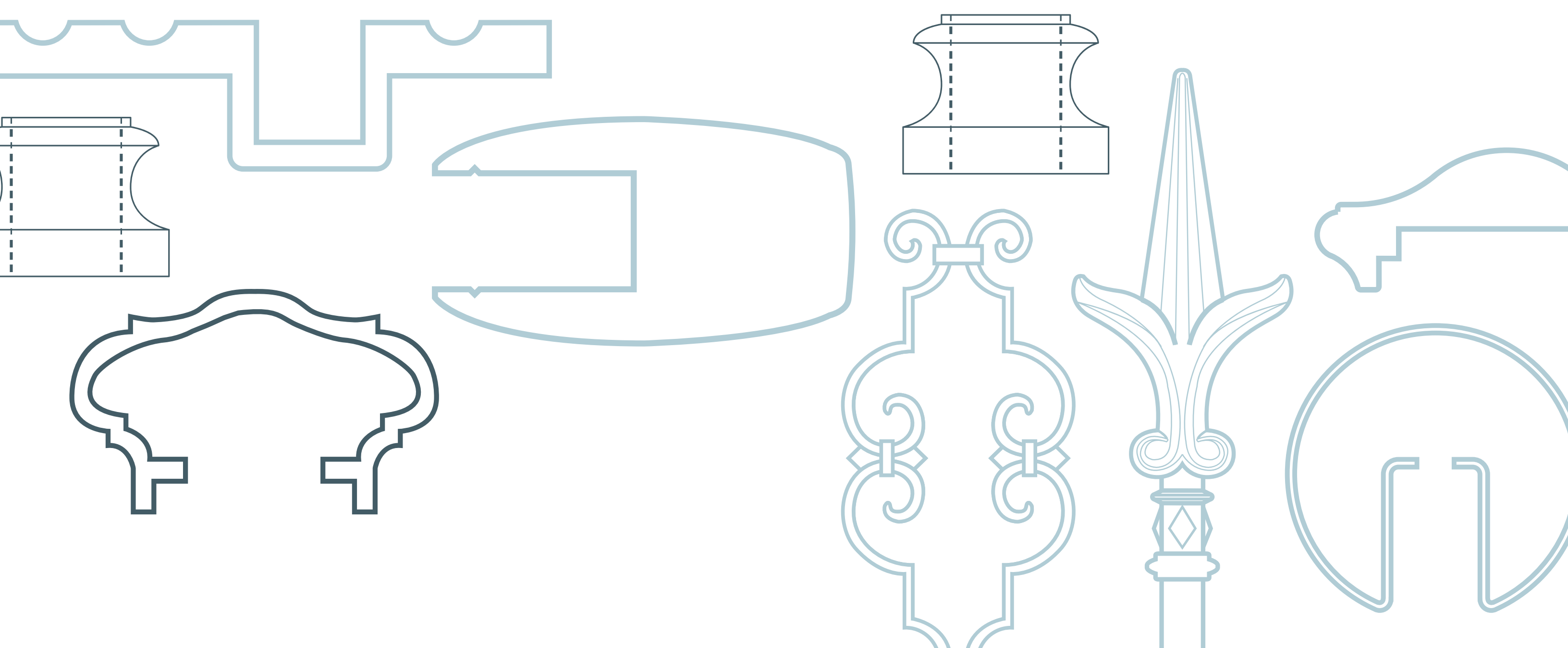
Julius Blum & Co. Inc.

SINCE 1910

P.O. BOX 816 CARLSTADT, NJ 07072 | 800.526.6293 | JULIUSBLUM.COM | BLUMINFO@JULIUSBLUM.COM



CATALOG 21

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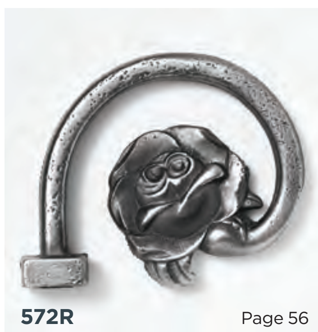
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JB® GLASS RAILING COMPONENTS

PIPE RAILINGS

TRADITIONAL RAILING COMPONENTS

TREILLAGE & ORNAMENTAL RAILINGS PANELS

CARLSTADT® RAILING SYSTEMS

HANDRAIL BRACKETS

ELEVATOR CAB COMPONENTS

TUBING, BARS AND SHAPES

JULIUS BLUM & CO., INC.

In addition to our product descriptions, our Catalog and website juliusblum.com - contain Engineering Data to aid in the design of structurally sound and code compliant railing systems. We look forward to hearing from you and welcome 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 every item shown in our Catalog. We take pride in our prompt service and generally ship within a day or two of receiving an order.

QUALITY CONTROL

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

FABRICATION

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 some help in finding a local fabricator, we are always glad to suggest firms in your area who are familiar with our products.

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 and/or by the metal fabricator. 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) for additional information on this subject.

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

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 in color.
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" to .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. As mentioned above, 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 the stainless 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 serve to avoid the problem. It is important to note that roll-formed stainless steel handrail shapes require special attention at the joints to assure proper alignment.

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. Chemical composition is 47.7% copper, 40.9% zinc, 7.4% nickel, 2% manganese and 2% lead. Samples are available upon request.

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 operation. By using old newspapers as packing material, re-using 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.

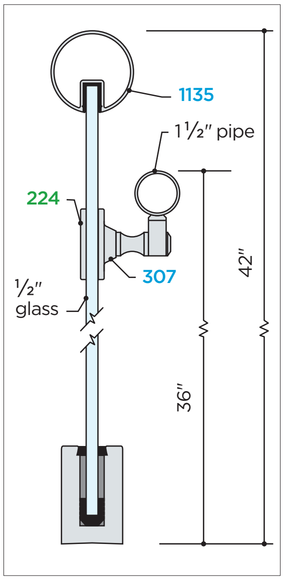
This brochure is printed on FSC® certified paper. 100% of the electricity used to make the paper is offset with Green-e® certified renewable energy. The paper contains a minimum of 10% post-consumer recovered fiber.

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 assure proper match.

HANDRAIL & 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 handrail and guardrail. Handrails are generally defined as being used for guidance and support while the purpose of guardrails is to resist accidental falls. Handrail heights are commonly between 34″ and 38″, while guardrails are 42″ in height.

There is often a requirement that a guardrail have a handrail included as well.

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 16 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 railings are 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.

BUILDING 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 incumbent upon designers to acquaint themselves and comply with the various codes and regulations governing each project.

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 2015
- International Residential Code 2015

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 - 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 1 ¼″ to 2″.

Americans with Disabilities Act (ADA)

- 2010 ADA Standards for Accessible Design.

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 A117.1-09 Accessible and Usable Buildings and Facilites*.

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.

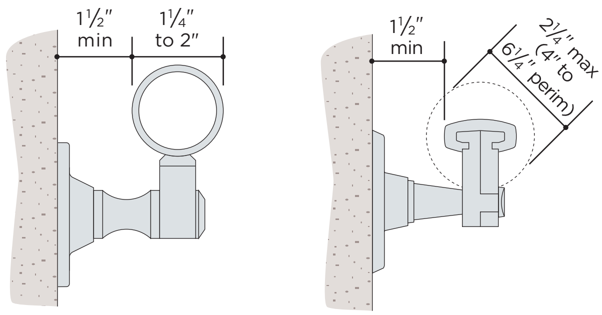
HANDRAIL CLEARANCE

During the past several years the amount of finger clearance required for handrails has been the subject of regulatory discussion. It is believed a consensus on required clearance has now been attained based upon 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 2015
- International Residential Code 2015
- ICC/ANSI A117.1-09

THE ACCESS BOARD GUIDELINES

At the present time there are two editions of the Access Board rules in use, the July 23, 2004 edition and the March 23, 2007 edition. 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 2015, ICC/ANSI A117.1-09 and the Access Board Guidelines published in the Federal Register on July 23, 2004 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 1½" (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 1½" (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	Outside Perimeter	Clearance Required
N.A.	1.25"	3.93"	1¼"
1¼"	1.66"	5.21"	1½"
1½"	1.90"	5.97"	1⅛"

STRUCTURAL REQUIREMENTS

Structural requirements for handrails, guardrails and grab bars are frequently expressed in two ways. An applied loading distributed uniformly along the rail and nonconcurrently 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 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.

Villanova University, Transforming the Campus Landscape – Phase IV
Fabricator: Roy J. Shelton, Inc. Quakertown, PA | Architect: Mark B. Thompson Associates LLC (Architecture & Planning), ML Baird & Company (Landscape Architecture)
General Contractor: Hunter Roberts Construction Group, Philadelphia, PA

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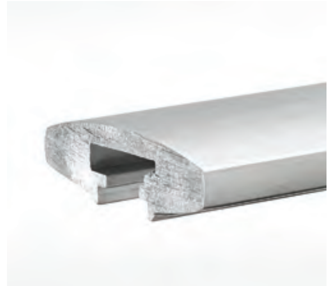

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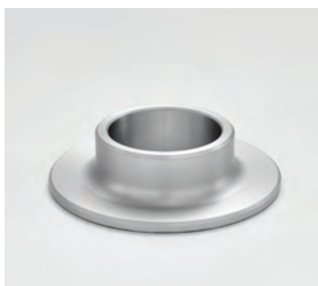

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1622 Page 91

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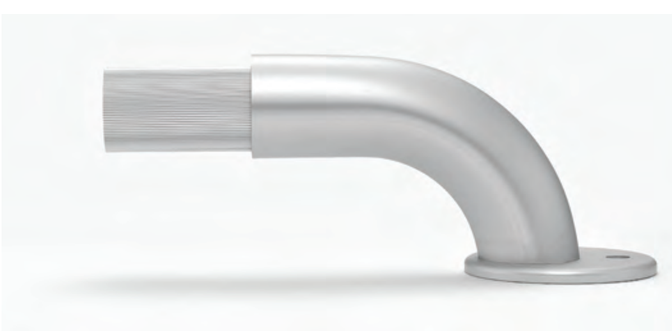


Tubing, Bars and Shapes Page 108

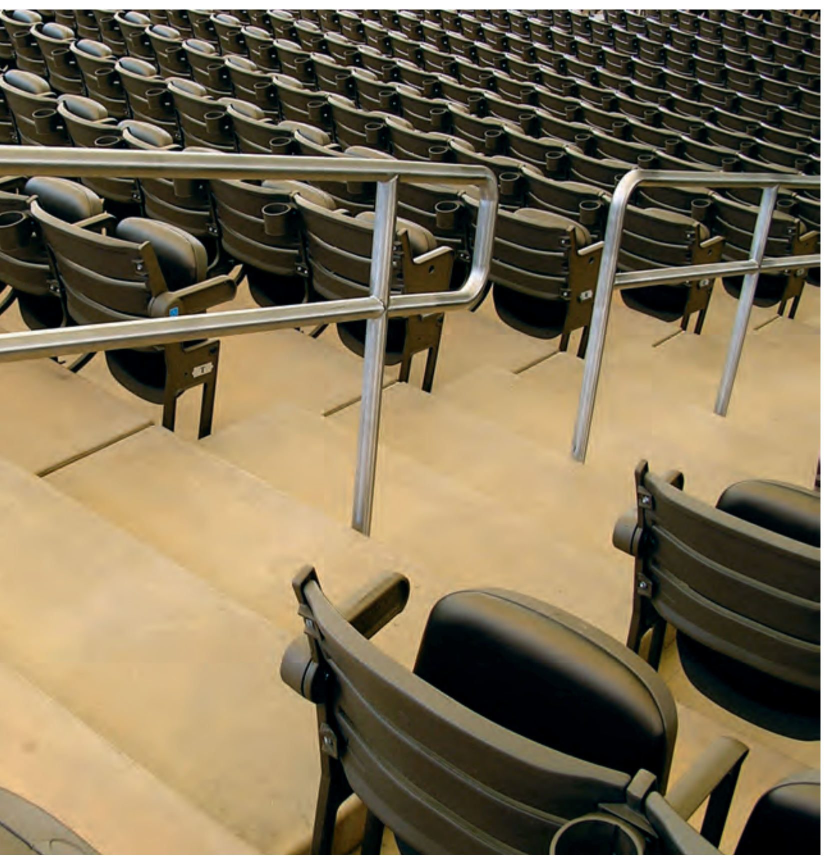
Palmer Library, Palmer, MA | Fabricator: SMJ Metal Company, Inc. dba Ralph's Blacksmith Shop | Architect: Caolo & Bieniek Associates, Inc. | General Contractor: RAC Builders

Oyler School, Cincinnati, OH | Fabricator: Bluegrass Iron Works, Ludlow, KY
Designer: Steve Hollingsworth, KY

Norte Dame University Cedar Grove Cemetery, New York, NY | Fabricator & Architect: Builders Iron Works, Mishawaka, IN
General Contractor: Ziolkowski Construction, South Bend, IN

The Edge Apartments, Milpitas, CA | Fabricator: Silicon Valley Iron Works Inc., San Jose, CA | General Contractor: Palisade Builders Inc., Campbell, CA Architect: Humphreys & Partners Architects, L.P., Newport Beach, CA

Minnesota State Capitol, St. Paul, MN | Fabricator: Bauer Industries, LLC, St. Paul, MN General Contractor: J.E. Dunn Construction Group, Kansas City, MO Photographer: Alyssa Lee Photography



Sun Valley Music Pavillion, Sun Valley, ID | Architect: Ruscitto/Latham/Blanton, Sun Valley, ID Fabricator: Diversified Metal Products, Inc., Idaho Falls, ID

Catalog 21: 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.

Since 1910, Julius Blum & Co., Inc. has provided ornamental metal components of the highest quality to the architectural trades. Proper packaging is a priority as is domestic sourcing. Items shown in this Catalog are carried in stock in substantial quantities.

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.

JB® GLASS RAILING COMPONENTS

Private Club | Fabricator: Century Glass, Waltham, MA | Architect: Jefferson Group Architect, Pawtucket, RI | Interior Design: Studio JBD, Pawtucket, RI

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 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 discretion of the specifier.

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 handrail, 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.

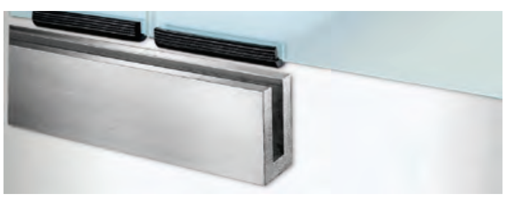
Bronze glass rail sections are extruded from alloy C38500, architectural bronze.

Nickel-Silver extrusions are of alloy C79800. Nickel-silver is a copper alloy, similar in appearance to stainless steel with golden highlights. Nickel-silver sheets are available in various widths for use as cladding for shoe mouldings.

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.

Acrylic/Wood glass rail section is produced from oak which has been impregnated with acrylic plastic according to the Permagrain® Radiation Process. This provides a hard surface and permanent finish which has twice the resistance to indentation and several times the resistance to abrasion as the same conventional hardwood finish. It is laminated from several strips to obtain greater strength and continuous uniform lengths.

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

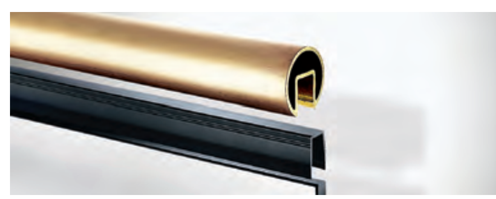


GLASS MOUNTING

Resilient setting blocks support and cushion glass panels as they are inserted in 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 **JB®** Glass-Mounted Handrail Adapter Kit with **Carlstadt®** wall brackets.

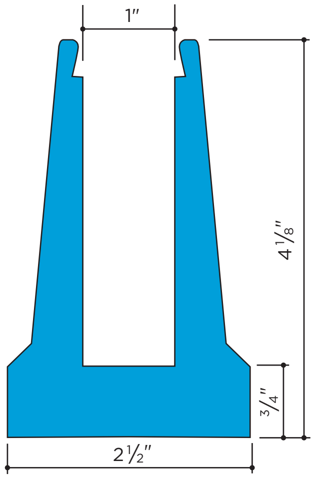
CORNER BENDS, MITER CORNERS, END CAPS

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. Brackets may be mounted on ½″ or ¾″ tempered glass using **JB®** Glass-Mounted Handrail Adapter Kit.

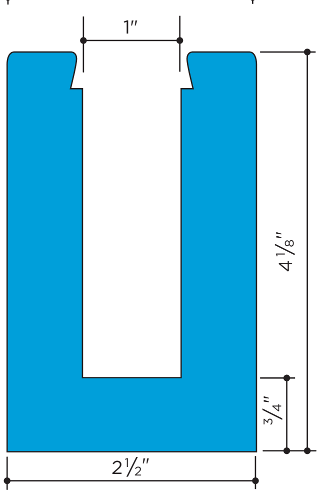
ALUMINUM PLASTIC

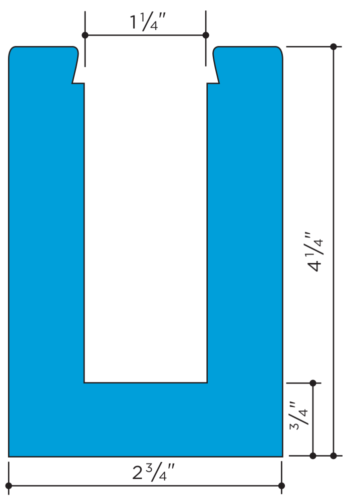
SHOE MOULDING

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



Alloy 6061-T6	
1141 Aluminum	5.42 lb/ft





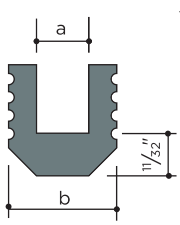
Alloy 6063-T52	
1142 Aluminum	8.24 lb/ft

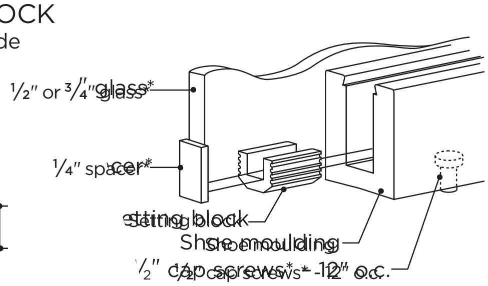
Alloy 6063-T52	
1143* Aluminum	8.64 lb/ft

* For use with ¾" glass

SETTING BLOCK

Polyvinyl Chloride





* Material supplied by others

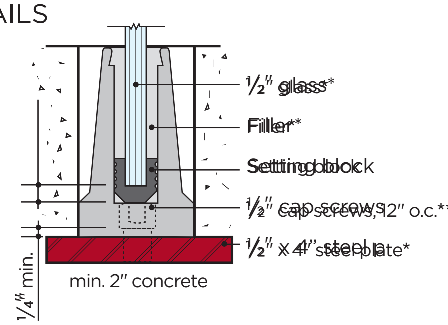
	a	b	Coil Length
8711	½"	1"	25'
8710	¾"	1¼"	40'

SHOE MOUNTING DETAILS

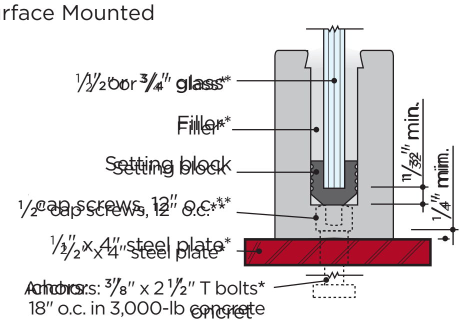
Proper mounting of the shoe moulding is crucial to the strength of JB® Glass Railing. While there are alternate methods of attachment, the assembly details on this page depict the four ways in which the shoe mouldings have been tested.

ASSEMBLY DETAILS

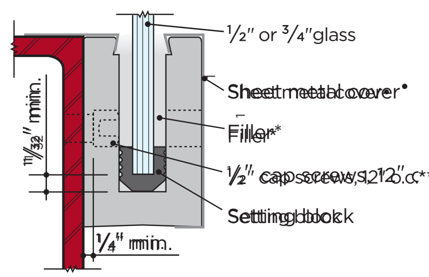
Flush Mounted



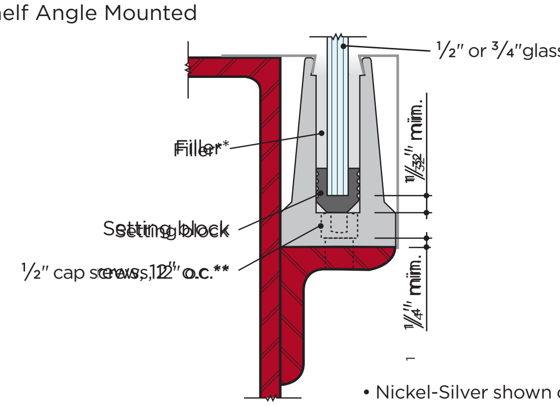
Surface Mounted



Fascia Mounted



Shelf Angle Mounted



• Nickel-Silver shown on page 11
* Material supplied by others
**Mounting Bolt: ½″ stainless steel socket head cap screw. Used on 12″ centers

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

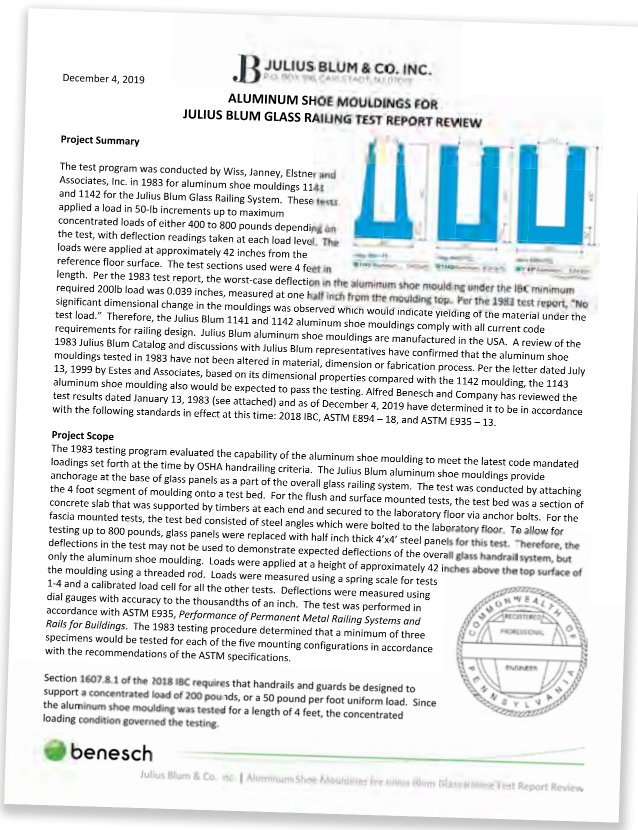
NICKEL-SILVER

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.

Complete **JB® Glass Rail Shoe Moulding** test report is available upon request.

Reprinted below is the summary, reviewed in 2019 by engineering firm Alfred Benesch & Company, of the structural test of the **JB® Glass Rail Shoe Moulding**.



December 4, 2019

JULIUS BLUM & CO. INC.

ALUMINUM SHOE MOULDINGS FOR JULIUS BLUM GLASS RAILING TEST REPORT REVIEW

Project Summary

The test program was conducted by Wiss, Janney, Elstner and Associates, Inc. in 1983 for aluminum shoe mouldings 1141 and 1142 for the Julius Blum Glass Railing System. These tests applied a load in 50-lb increments up to maximum concentrated loads of either 400 to 800 pounds depending on the test, with deflection readings taken at each load level. The loads were applied at approximately 42 inches from the reference floor surface. The test sections used were 4 feet in length. Per the 1983 test report, the worst-case deflection in the aluminum shoe moulding under the IBC minimum required 200lb load was 0.039 inches, measured at one half inch from the moulding top. Per the 1983 test report, "No significant dimensional change in the mouldings was observed which would indicate yielding of the material under the test load." Therefore, the Julius Blum 1141 and 1142 aluminum shoe mouldings comply with all current code requirements for railing design. Julius Blum aluminum shoe mouldings are manufactured in the USA. A review of the 1983 Julius Blum Catalog and discussions with Julius Blum representatives have confirmed that the aluminum shoe mouldings tested in 1983 have not been altered in material, dimension or fabrication process. Per the letter dated July 13, 1999 by Estes and Associates, based on its dimensional properties compared with the 1142 moulding, the 1143 aluminum shoe moulding also would be expected to pass the testing. Alfred Benesch and Company has reviewed the test results dated January 13, 1983 (see attached) and as of December 4, 2019 have determined it to be in accordance with the following standards in effect at this time: 2018 IBC, ASTM E894 – 18, and ASTM E935 – 13.

Project Scope

The 1983 testing program evaluated the capability of the aluminum shoe moulding to meet the latest code mandated loadings set forth at the time by OSHA handrailing criteria. The Julius Blum aluminum shoe mouldings provide anchorage at the base of glass panels as a part of the overall glass railing system. The test was conducted by attaching the 4 foot segment of moulding onto a test bed. For the flush and surface mounted tests, the test bed was a section of concrete slab that was supported by timbers at each end and secured to the laboratory floor via anchor bolts. For the fascia mounted tests, the test bed consisted of steel angles which were bolted to the laboratory floor. To allow for testing up to 800 pounds, glass panels were replaced with half inch thick 4'x4' steel panels for this test. Therefore, the deflections in the test may not be used to demonstrate expected deflections of the overall glass handrail system, but only the aluminum shoe moulding. Loads were applied at a height of approximately 42 inches above the top surface of the moulding using a threaded rod. Loads were measured using a spring scale for tests 1-4 and a calibrated load cell for all the other tests. Deflections were measured using dial gauges with accuracy to the thousandths of an inch. The test was performed in accordance with ASTM E935, *Performance of Permanent Metal Railing Systems and Rails for Buildings*. The 1983 testing procedure determined that a minimum of three specimens would be tested for each of the five mounting configurations in accordance with the recommendations of the ASTM specifications.

Section 1607.8.1 of the 2018 IBC requires that handrails and guards be designed to support a concentrated load of 200 pounds, or a 50 pound per foot uniform load. Since the aluminum shoe moulding was tested for a length of 4 feet, the concentrated loading condition governed the testing.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER

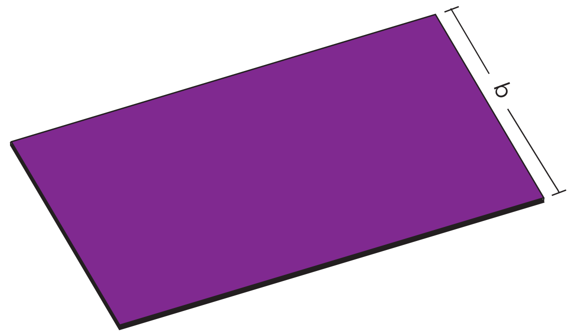
benesch

Julius Blum & Co. Inc. | Aluminum Shoe Mouldings for Julius Blum Glass Railing Test Report Review

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

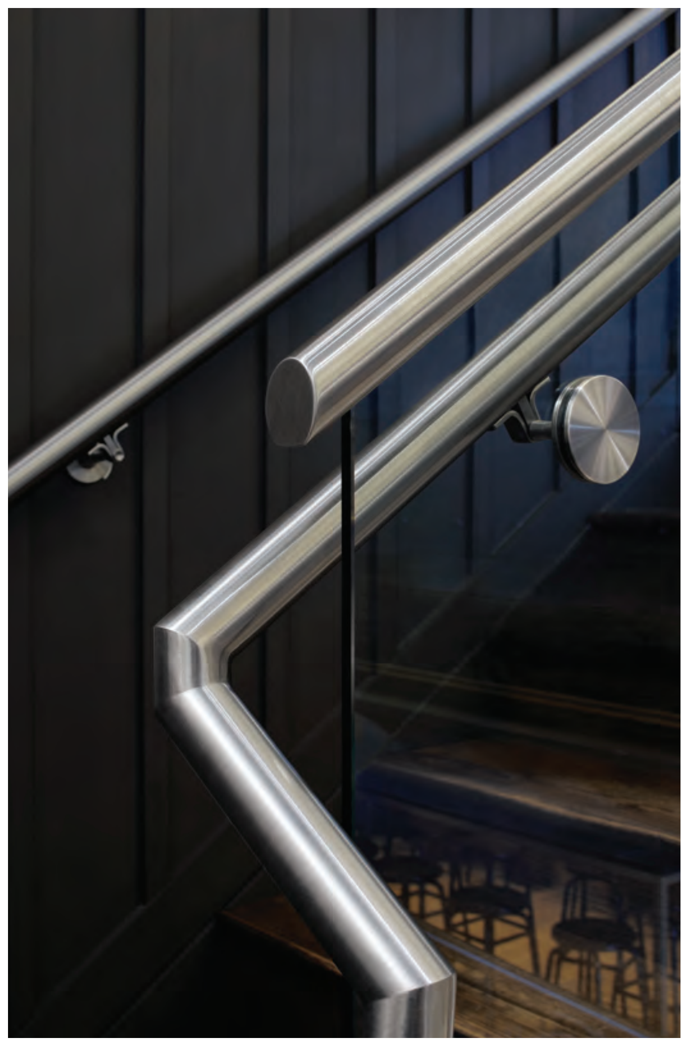
NICKEL-SILVER SHEET

Satin Finish and masked one side
7' lengths, Alloy C78200



	b		Thickness
Nickel-Silver	8"	x	18ga
Nickel-Silver	19"	x	18ga

Note: Can be used to clad shoe moulding. See detail page 10.

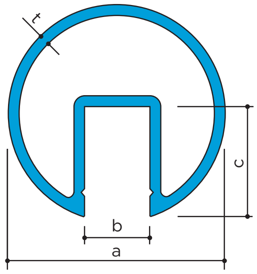


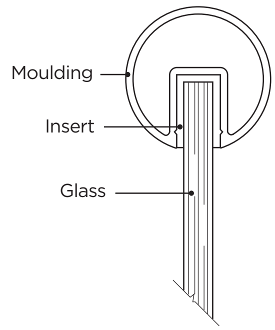
Office Tavern Grill, Morristown, NJ | Fabricator: AR Fabricatiors, East Hanover, NJ | Architect: Frank J Rawding, AIA, Morristown, NJ | General Contractor: Dover Commercial Construction, Barnegat, NJ | Interior Designer: Jackson Creative Group, Middletown, RI

ALUMINUM STAINLESS ACRYLIC/WOOD NICKEL-SILVER PLASTIC

HANDRAIL MOULDINGS

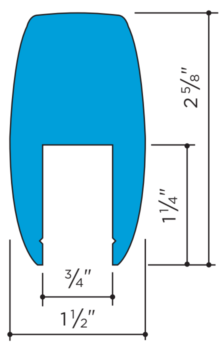
20′ lengths. For use with ½″ glass, except as noted



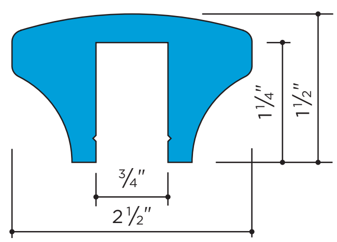


		a	b	c	t	lb/ft
1130	Aluminum	1.900"	¾"	1¼"	.109"	1.01
1132	Aluminum	2½"	¾"	1¼"	.125"	1.52
1137	Aluminum	3"	¾"	1¼"	.125"	1.72
1154†	Aluminum	3"	1"	1¼"	.125"	1.73
1135	Aluminum	3½"	¾"	1¼"	.125"	1.95
1155†	Aluminum	3½"	1"	1¼"	.125"	1.97

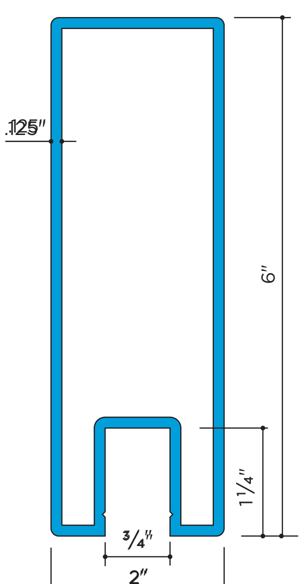
† For use with ¾" glass



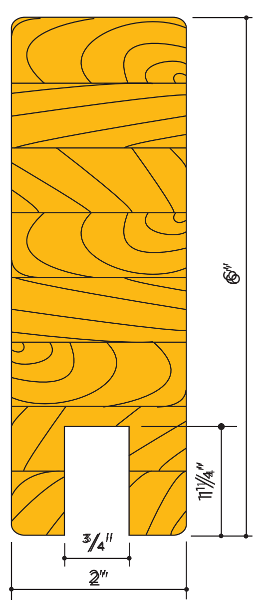
1133 Aluminum 3.02 lb/ft



1134 Aluminum 2.40 lb/ft



1136 Aluminum 2.70 lb/ft



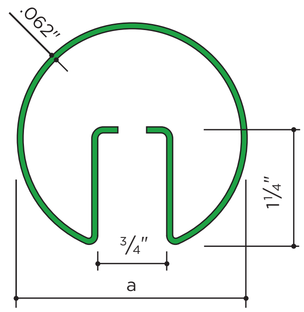
8662* Oak Acrylic/Wood

* 16' lengths

Approximate color and grain configuration

HANDRAIL MOULDINGS

20′ lengths



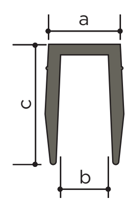
		a	lb/ft	Finish
1430*	Stainless	1.900"	1.70	No.2B
1432*	Stainless	2½"	1.96	No.2B
1452	Stainless	2½"	1.96	No.4
1433*	Stainless	3"	2.46	No.2B
1453	Stainless	3"	2.46	No.4
1472*	Stainless	4"	3.17	No.2B
1473	Stainless	4"	3.17	No.4

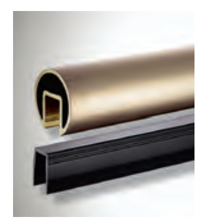
* Suitable for polishing

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

PROTECTIVE INSERTS

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

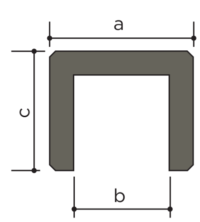




		Glass Size	a	b	c
8709	Polyvinyl Chloride	½"	¾"	½"	1"
8713	Polyvinyl Chloride	½"	¾"	½"	1⅛"
8714	Polyvinyl Chloride	¾"	1"	¾"	1¼"

EDGE PROTECTOR

Clear Copolymer
7′ lengths

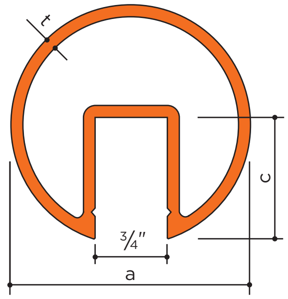


Fasten with windshield sealer type of clear adhesive or clear double stick foam tape.

	Glass Size	a	b	c
8715	½"	.510"	½"	⅝"
8716	¾"	.760"	¾"	⅝"

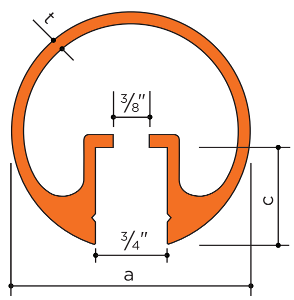
BRONZE PLASTIC NICKEL-SILVER

HANDRAIL MOULDINGS
20′ lengths, except as noted

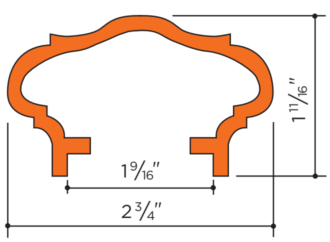


		a	c	t	lb/ft
1230	Bronze	1.900"	3/4"	.100"	3.43
1233*	Bronze	3"	1 1/4"	.125"	6.05
1235**	Bronze	3 1/2"	1 1/4"	.187"	8.70

* 16′ lengths ** 12′ lengths

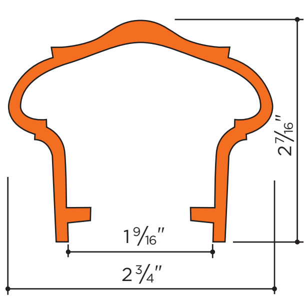


		a	c	t	lb/ft
1232	Bronze	2 1/2"	1"	.125"	5.19



4538* Bronze 3.15 lb/ft

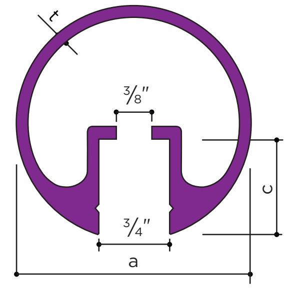
* 16′ lengths Use with **8738** insert for 1/2" glass



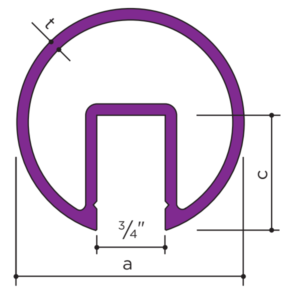
4533* Bronze 3.66 lb/ft

* 16′ lengths; Use with **8738** insert for 1/2" glass

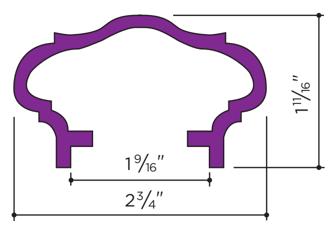
HANDRAIL MOULDINGS
16′ lengths, except as noted



		a	c	t	lb/ft
1330	Nickel-Silver	1.900"	3/4"	.125"	3.43
1332	Nickel-Silver	2 1/2"	1"	.125"	5.19



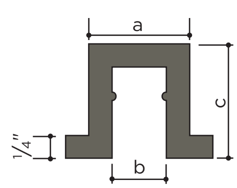
		a	c	t	lb/ft
1333	Nickel-Silver	3"	1 1/4"	.125"	5.28



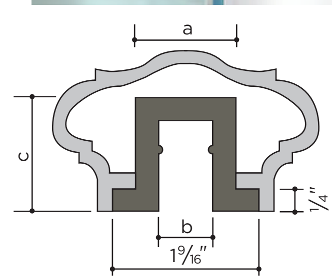
5538* Nickel-Silver 2.96 lb/ft

* 20′ lengths; Use with **8738** insert for 1/2" glass

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



	a	b	c
8738	1"	1/2"	1 1/4"



5538 or 4538 with **8738** insert used with 6121 moulding (see pg. 107) on 1/2" glass

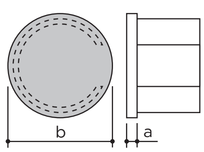
ALUMINUM BRONZE NICKEL-SILVER STAINLESS ACRYLIC/WOOD

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•†	

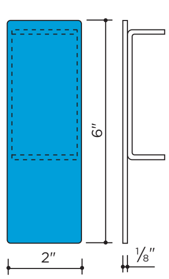
* No. 2B Finish ** No. 4 Finish
† Polished and lacquered, 180 grit • Matches profile

END CAPS

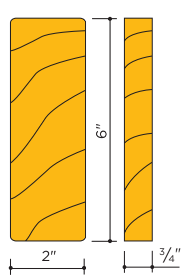


		a	b
7280	Aluminum	1/8"	1.900"
1180	Aluminum	1/8"	2½"
1182	Aluminum	1/8"	3"
1181	Aluminum	1/8"	3½"
1282	Bronze	1/4"	1.900"
1280	Bronze	1/4"	2½"
1283	Bronze	1/4"	3"
1281	Bronze	1/4"	3½"
4538N	Bronze	2"	•
1330N	Nickel-Silver	1/4"	1.900"
1332N	Nickel-Silver	1/4"	2½"
1333N	Nickel-Silver	1/4"	3"
5538N	Nickel-Silver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

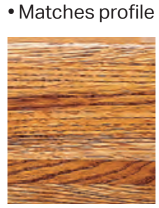
• Matches profile



1186 Aluminum

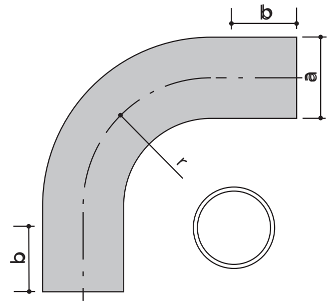


8662N Oak/Acrylic Wood



Approximate color and grain configuration

90° RADIUS ELBOW

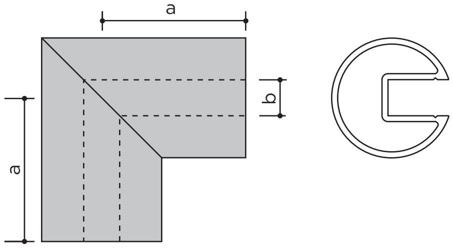


		a	r	Wall	b
7210	Aluminum	1.900"	3"	.109"	2"
1110	Aluminum	2½"	5"	.125"	2½"
1120	Aluminum	3"	5"	.125"	2½"
1122	Aluminum	3½"	5"	.125"	2½"
1222	Bronze	1.900"	3"	.100"	2½"
1210	Bronze	2½"	5"	.125"	2½"
1220	Bronze	3"	6"	.125"	2½"
1330C	Nickel-Silver	1.900"	3"	.109"	2½"
1332C	Nickel-Silver	2½"	5"	.125"	2½"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

Office Tavern Grill, Morristown, NJ | Fabricator: AR Fabricators, East Hanover, NJ | Architect: Frank J Rawding, AIA, Morristown, NJ | General Contractor: Dover Commercial Construction, Barnegat, NJ | Interior Designer: Jackson Creative Group, Middletown, RI

ALUMINUM BRONZE NICKEL-SILVER STAINLESS

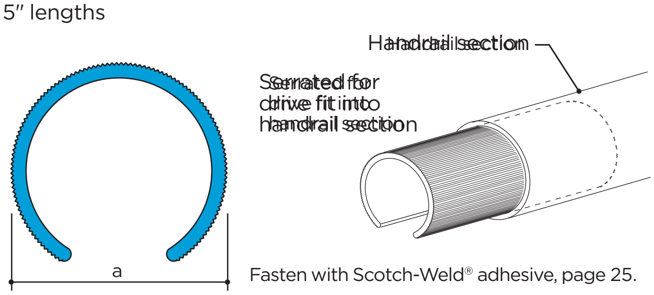
90° MITER ELBOW



		OD	Wall	a	b
1111	Aluminum	2 1/2"	.125"	3"	3/4"
1115	Aluminum	3"	.125"	4 1/2"	3/4"
1113	Aluminum	3"	.125"	4 1/2"	1"
1112	Aluminum	3 1/2"	.125"	4 1/2"	3/4"
1114	Aluminum	3 1/2"	.125"	4 1/2"	1"
1214	Bronze	1.900"	.100"	3"	3/4"
1211	Bronze	2 1/2"	.125"	3"	3/4"
1213	Bronze	3"	.125"	4 1/2"	3/4"
1212	Bronze	3 1/2"	.187"	4 1/2"	3/4"
1414	Stainless	1.900"	.062"	3"	3/4"
1411	Stainless	2 1/2"	.062"	3"	3/4"
1413	Stainless	3"	.062"	4 1/2"	3/4"
1473M	Stainless	4"	.062"	4 1/2"	3/4"

CONNECTOR SLEEVE

5" lengths

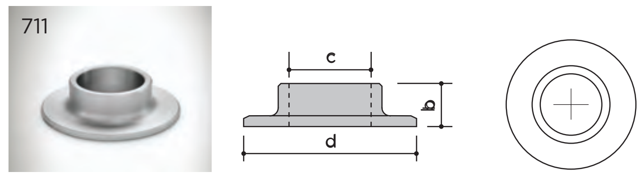


Fasten with Scotch-Weld® adhesive, page 25.

		a
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

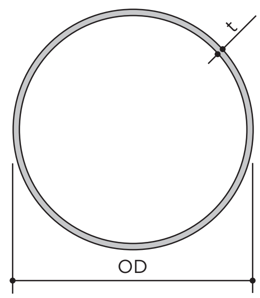
Satin Finish



		OD	b	c	d
711	Aluminum	1.900"	1"	1.94"	4"
1125	Aluminum	2 1/2"	1"	2.54"	4 3/4"
1123	Aluminum	3"	1"	3.04"	5"
811	Bronze	1.900"	1"	1.94"	4"
1225	Bronze	2 1/2"	1"	2.54"	4 3/4"
1223	Bronze	3"	1"	3.04"	5"
411	Nickel-Silver	1.900"	1"	1.94"	4"
1325	Nickel-Silver	2 1/2"	1"	2.54"	4 3/4"
1323	Nickel-Silver	3"	1"	3.04"	5"
211	Stainless	1.900"	7/8"	1.94"	4 1/2"
1425	Stainless	2 1/2"	1 1/16"	2.54"	4 7/8"
1423	Stainless	3"	1 7/16"	3.04"	6 1/8"

O.D. 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	2 1/2"	.125"	1.119	.933	.659	.527
Aluminum	3"	.125"	1.328	1.129	1.169	.779
Aluminum	3 1/2"	.125"	1.559	1.325	1.890	1.080
Bronze	1.900"	.100"	2.070	.565	.230	.242
Bronze	2 1/2"	.125"	3.441	.933	.659	.527
Bronze	3"	.125"	4.500	1.129	1.169	.779
Bronze††	3 1/2"	.125"	4.850	1.325	1.890	1.080
Nickel-Silver	1.900"	.109"	2.250	.614	.247	.260
Nickel-Silver†	2 1/2"	.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	2 1/2"	.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

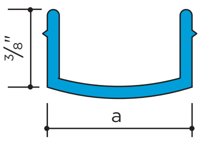
ALUMINUM BRONZE NICKEL-SILVER STAINLESS

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

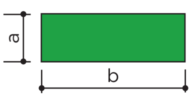
5′ lengths, Flat



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

For use with aluminum, nickel-silver and bronze handrails

12′ to 14′ random lengths

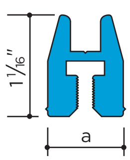


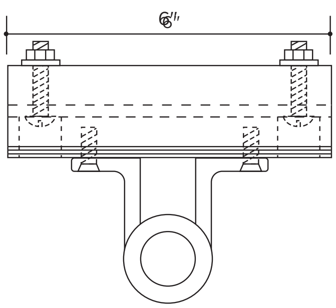
	a	b	lb/ft
Stainless	3/16"	3/4"	.48

For use with stainless steel handrails

ANCHOR PLUG

Fits recess in handrail

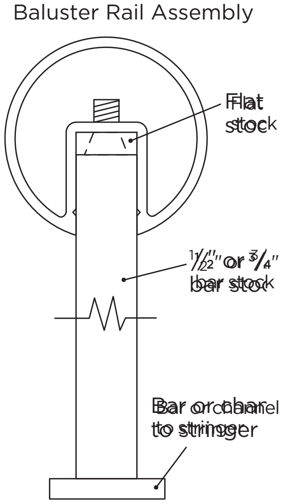




		a
1162	Aluminum	3/4"
1161	Aluminum	1"

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

Baluster Rail Assembly



Emily Morgan Hotel, San Antonio, Texas | Architect: Hellmuth-Obata & Kassabaum Inc. | Fabricator: Berger Iron Works, Houston, Texas

GLASS-MOUNTED HANDRAIL

Handrail may be mounted to the face of the tempered glass balustrade using a combination of **Carlstadt**® 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:

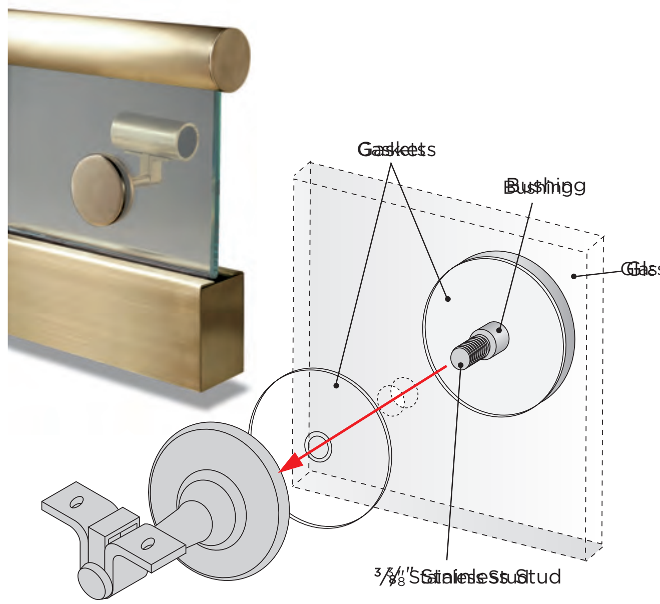
1 Prior to tempering, for 1/2″ glass drill a 5/8″ clear hole; for 3/4″glass drill a 7/8″ clear hole

(Do not attempt to drill a hole in tempered glass—it will most likely break)

2 Insert the bushing in the hole

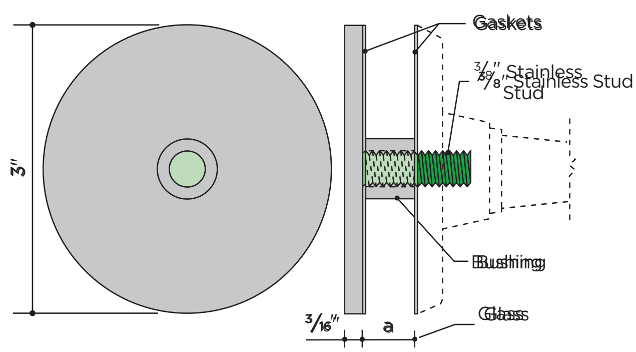
3 Insert the stud welded disc with gasket through the bushing; place the gasket on the other side

4 Thread on bracket and tighten



GLASS-MOUNTED HANDRAIL ADAPTER KIT

For 1/2″ and 3/4″ glass
Satin Finish



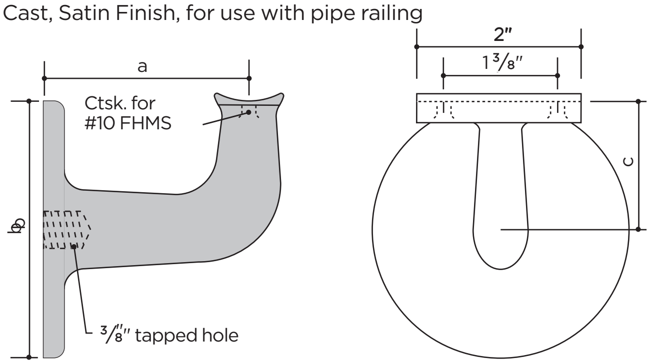
		Glass Size	a	Bushing Diameter
824	Bronze	1/2"	1/2"	5/8"
840	Bronze	3/4"	3/4"	7/8"
224*	Stainless	1/2"	1/2"	5/8"
240*	Stainless	3/4"	3/4"	7/8"
1624	Nickel-Silver	1/2"	1/2"	5/8"
1640	Nickel-Silver	3/4"	3/4"	7/8"

* For use with aluminum and stainless brackets

ALUMINUM BRONZE NICKEL-SILVER STAINLESS

WALL BRACKETS

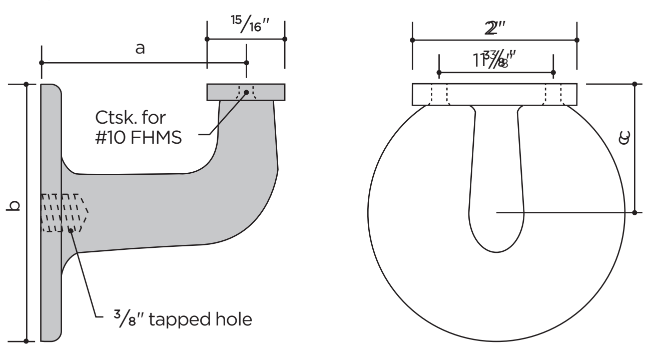
Cast, Satin Finish, for use with pipe railing



		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

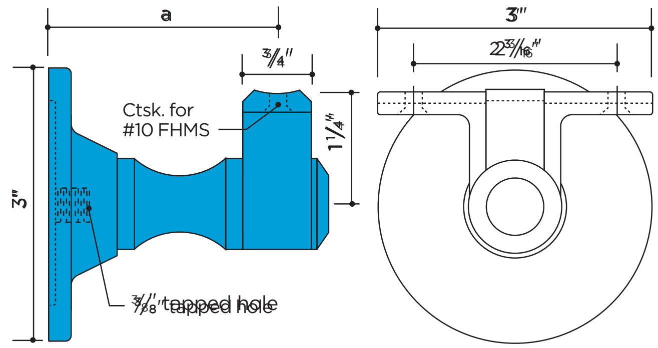
Cast, Satin Finish



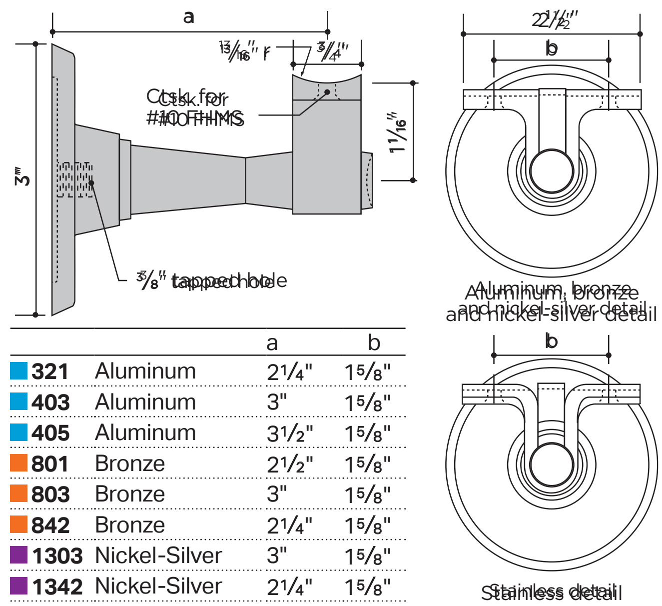
		a	b	c
371	Aluminum	2 1/2"	3 1/8"	1 9/16"
302	Aluminum	3 1/8"	3 3/4"	1 7/8"
370	Bronze	2 1/2"	3 1/8"	1 9/16"
304	Bronze	3 1/8"	3 3/4"	1 7/8"
170	Nickel-Silver	2 1/2"	3 1/8"	1 9/16"
270	Stainless	2 1/2"	3 1/8"	1 9/16"

CARLSTADT® SELF-ALIGNING WALL BRACKETS

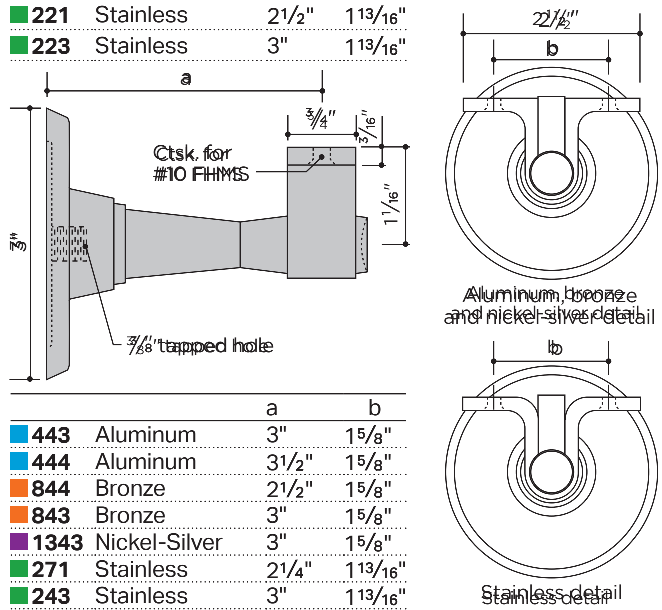
Satin Finish



		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"
801	Bronze	2 1/2"	1 5/8"
803	Bronze	3"	1 5/8"
842	Bronze	2 1/4"	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"



		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

G Robert House, Jr. Surface Water Treatment Plant, City of Suffolk, VA | Fabricator: Shoreline Industries Inc., Portsmouth, VA
General Contractor: MEB General Contractors, Chesapeake, VA

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 assure 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 and 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.

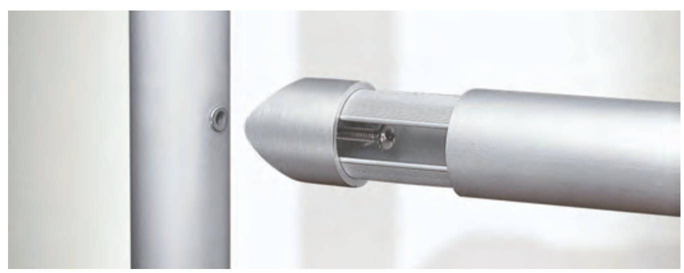
Americans with Disabilities Act (ADA): *The Americans with Disabilities Act* adopted by Congress in 1992 required circular handrails to be 1¼″ minimum and 1½″ maximum. However, the *Guidance on the 2010 ADA Standards for Accessible Design - September 2010*, published by the *US Department of Justice*,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

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.

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.



OPTIONS FOR MOUNTING

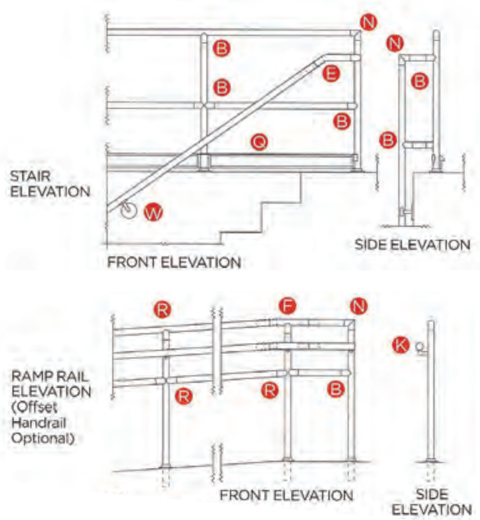
Connectorail® posts may be embedded in floor slab with a cover flange, surface mounted with a heavy-duty floor flange, or side mounted on fascia or stringer by means of a fascia flange. A reinforcing insert is used at the base of the post for added strength and stiffness. A socket for removable railings—with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

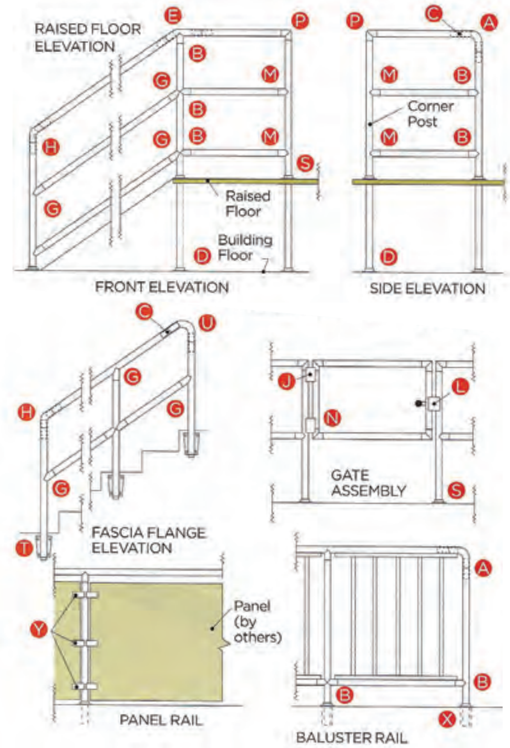
CONTINUOUS POSTS AND RAILS

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

Verify all dimensions before cutting.





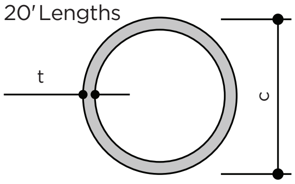
FITTINGS KEY:

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

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**).

CONNECTORAIL® PIPE

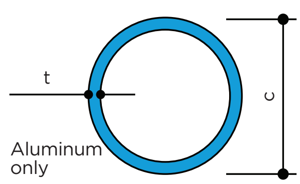
20' Lengths



- 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

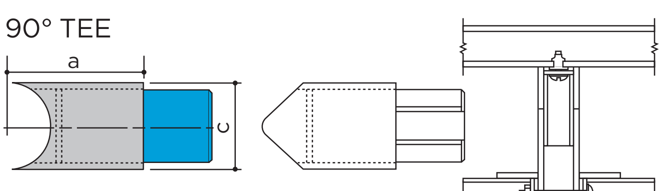
HIGH STRENGTH CONNECTORAIL® POSTS



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"

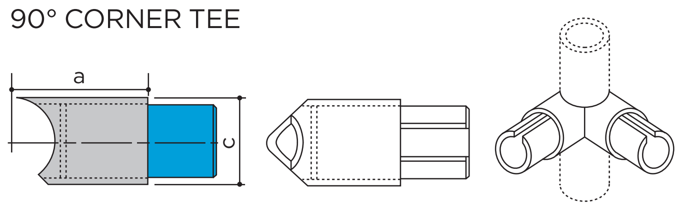
90° TEE



Use threaded rivet and SEMS screw for tee joints; through bolt and lock nut for crosses (see page 25)

		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"

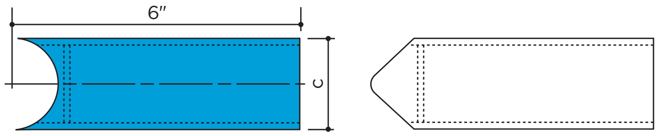
90° CORNER TEE



		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"

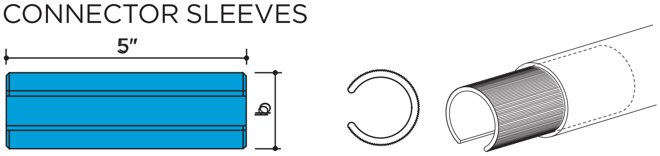
ALUMINUM BRONZE NICKEL-SILVER STAINLESS

90° 6″ TEE
Aluminum only



		Pipe	Sched.	c
7150	Aluminum	1 1/4"	10	1.660"
7450	Aluminum	1 1/4"	40	1.660"
7250	Aluminum	1 1/2"	10	1.900"
7550	Aluminum	1 1/2"	40	1.900"

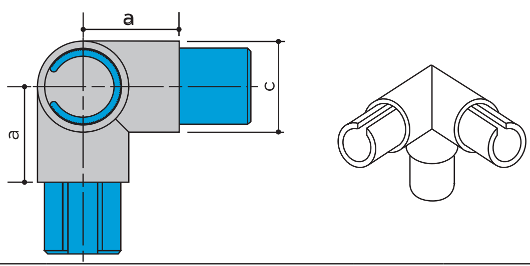
CONNECTOR SLEEVES



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

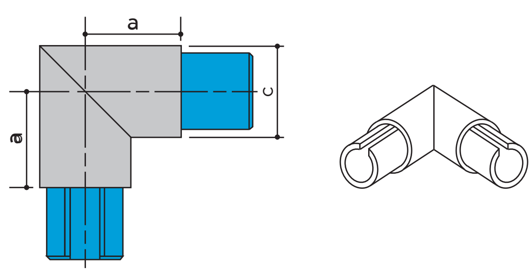
		Pipe	Sched.	b
7163	Aluminum	1 1/4"	10	1.442"
7463	Aluminum	1 1/4"	40	1.380"
7263	Aluminum	1 1/2"	10	1.682"
7563	Aluminum	1 1/2"	40	1.610"
9363	Aluminum	1 1/2"	5	1.770"

90° THREE-WAY ELBOW



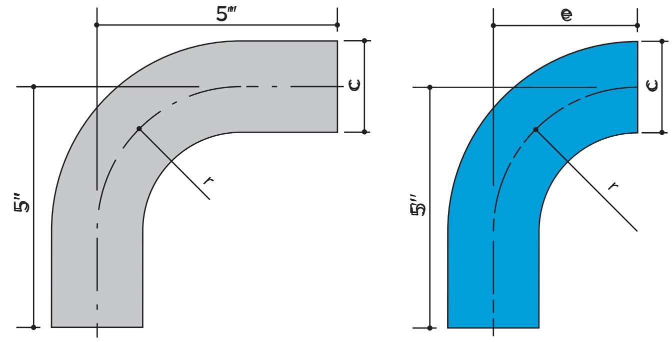
		Pipe	Sched.	c	a
7130	Aluminum	1 1/4"	10	1.660"	2"
7430	Aluminum	1 1/4"	40	1.660"	2"
7230	Aluminum	1 1/2"	10	1.900"	2"
7530	Aluminum	1 1/2"	40	1.900"	2"
9330	Stainless	1 1/2"	5	1.900"	3"

90° MITER ELBOW



		Pipe	Sched.	c	a
7111	Aluminum	1 1/4"	10	1.660"	2"
7411	Aluminum	1 1/4"	40	1.660"	2"
7211	Aluminum	1 1/2"	10	1.900"	2"
7511	Aluminum	1 1/2"	40	1.900"	2"
9311	Stainless	1 1/2"	5	1.900"	3"

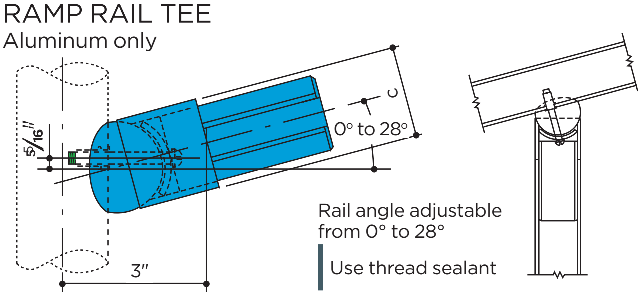
90° RADIUS ELBOW



		Pipe	Sched.	c	r	e
7110	Aluminum	1 1/4"	10	1.660"	2 1/2"	
7120*	Aluminum	1 1/4"	10	1.660"	2 1/2"	2 1/2"
7410	Aluminum	1 1/4"	40	1.660"	2 1/2"	
7420*	Aluminum	1 1/4"	40	1.660"	2 1/2"	2 1/2"
7210	Aluminum	1 1/2"	10	1.900"	3"	
7220*	Aluminum	1 1/2"	10	1.900"	3"	3"
7510	Aluminum	1 1/2"	40	1.900"	3"	
7520*	Aluminum	1 1/2"	40	1.900"	3"	3"
8610	Bronze	1 1/4"	40	1.660"	2 1/2"	
8810	Bronze	1 1/2"	40	1.900"	3"	
1330C	Nickel-Silver	1 1/2"	10	1.900"	3"	
9310	Stainless	1 1/2"	5	1.900"	3"	

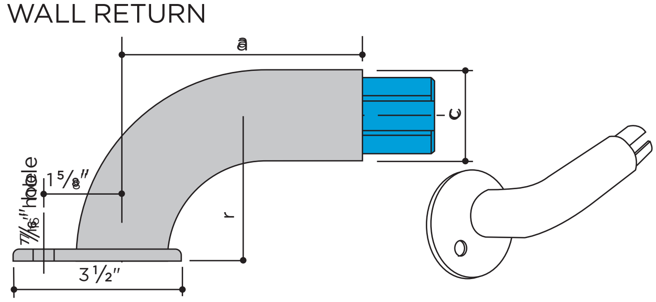
* For wall return

RAMP RAIL TEE
Aluminum only



		Pipe	Sched.	c
7443	Aluminum	1 1/4"	40	1.660"
7243	Aluminum	1 1/2"	10	1.900"
7543	Aluminum	1 1/2"	40	1.900"

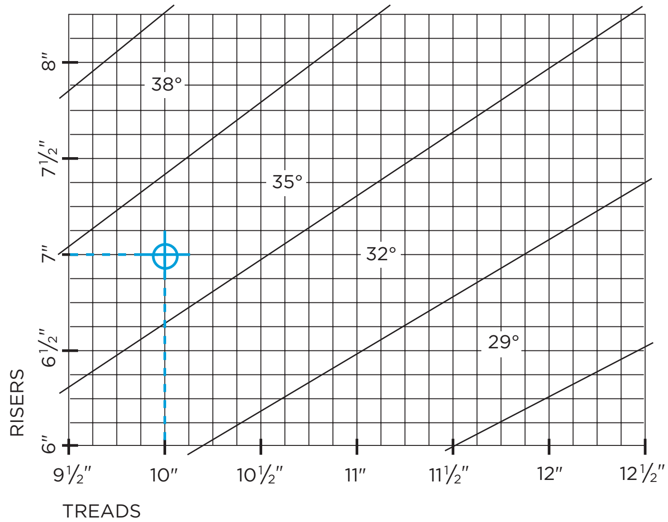
WALL RETURN



		Pipe	Sched.	c	r	a
7173	Aluminum	1 1/4"	10	1.660"	2 1/2"	5"
7473	Aluminum	1 1/4"	40	1.660"	2 1/2"	5"
7473-3	Aluminum	1 1/4"	40	1.660"	3"	5"
7273	Aluminum	1 1/2"	10	1.900"	3"	5"
7573	Aluminum	1 1/2"	40	1.900"	3"	5"
8673	Bronze	1 1/4"	40	1.660"	2 1/2"	5"
8873	Bronze	1 1/2"	40	1.900"	3"	5"
1373	Nickel-Silver	1 1/2"	10	1.900"	3"	6"
9373	Stainless	1 1/2"	5	1.900"	3"	5"
9372	Stainless	1 1/2"	5	1.900"	2 1/2"	5"

ALUMINUM STAINLESS

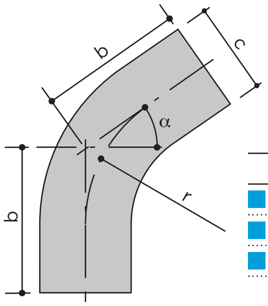
ANGLE FITTING SELECTOR CHART



Angle fittings are carried in stock for 29°, 32°, 35°, 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

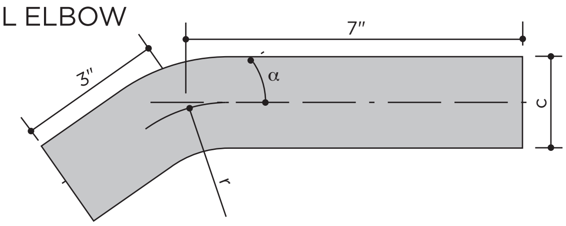


Note: b = 4" for 4° post elbows, while b = 3" for all other post elbows.

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"

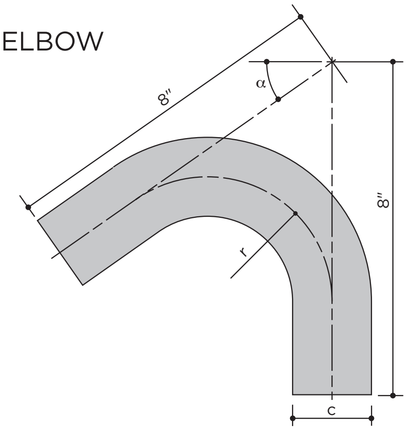
4°α	29°α	32°α	35°α	38°α		Pipe	Sched.	c	r
	7119	7122	7125	7128	Alum.	1¼"	10	1.660"	2½"
7416	7419	7422	7425	7428	Alum.	1¼"	40	1.660"	2½"
7216	7219	7222	7225	7228	Alum.	1½"	10	1.900"	3"
7516	7519	7522	7525	7528	Alum.	1½"	40	1.900"	3"
9316	9319	9322	9325	9328	St. St.	1½"	5	1.900"	3"

RAIL ELBOW



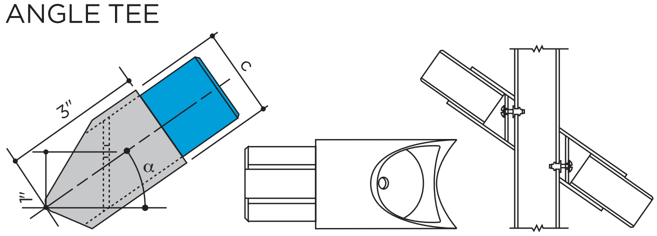
29°α	32°α	35°α	38°α		Pipe	Sched.	c	r
7109	7112	7115	7118	Alum.	1¼"	10	1.660"	2½"
7409	7412	7415	7418	Alum.	1¼"	40	1.660"	2½"
7209	7212	7215	7218	Alum.	1½"	10	1.900"	3"
7509	7512	7515	7518	Alum.	1½"	40	1.900"	3"
9309	9312	9315	9318	St. St.	1½"	5	1.900"	3"

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



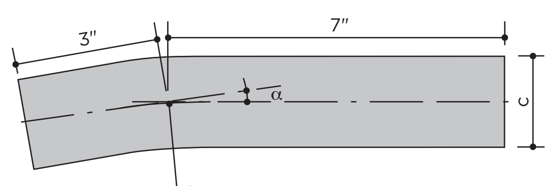
45°α		Pipe	Sched.	c
7451	Alum.	1¼"	40	1.660"
7551	Alum.	1½"	40	1.900"

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

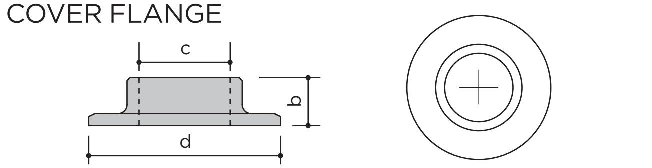
angle	slope	gradient
4°	14:1	7.0%
7°	8:1	12.3%
10°	6:1	17.6%



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"

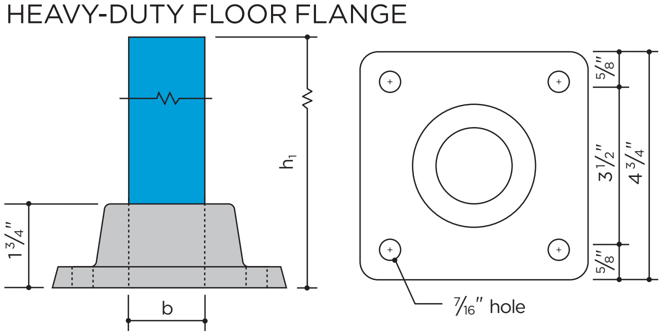
ALUMINUM BRONZE NICKEL-SILVER STAINLESS

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"

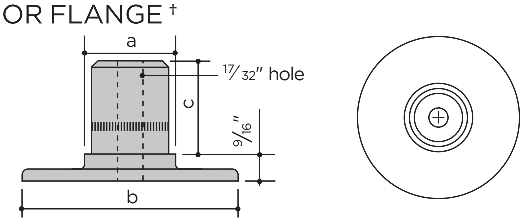
HEAVY-DUTY FLOOR FLANGE



		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 25 for anchor bolt.

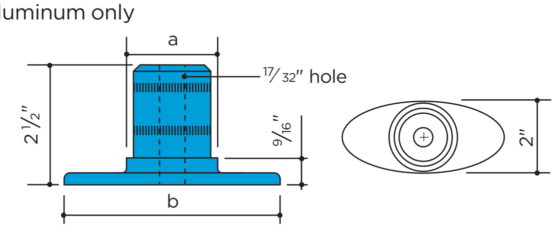
FLOOR FLANGE †



		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

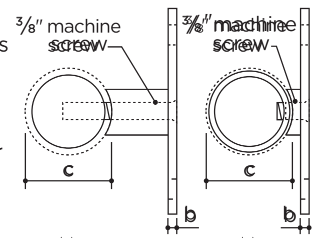


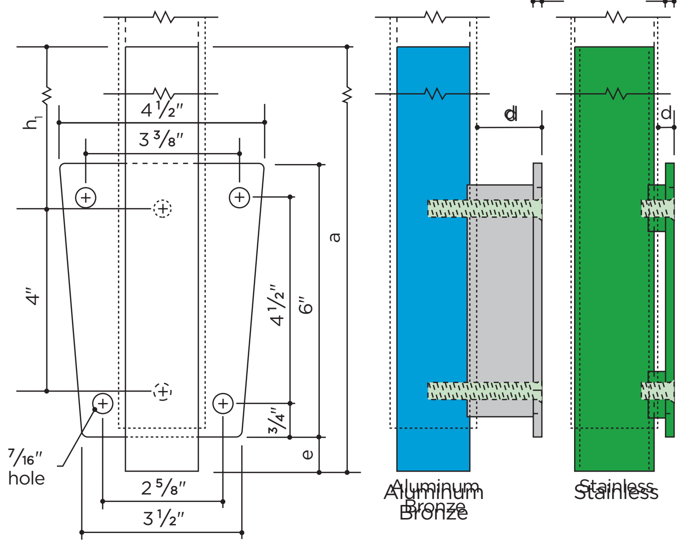
		Pipe	Sched.	a	b
749	Aluminum	1¼"	40	1.660"	4"
750	Aluminum	1½"	40	1.900"	4½"

† **Note:** 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 post. 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.



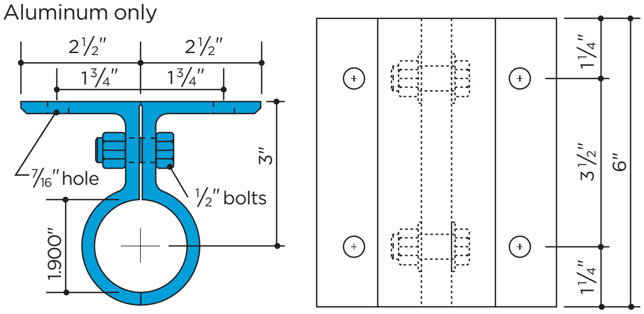


		Pipe	Sched.	a	b	c	d	e	h_1
7190	Alum.	1¼"	10	15"	5/16"	1.660"	7/16"	3/4"	9¼"
7191	Alum.	1¼"	10	15"	5/16"	1.660"	1 9/16"	3/4"	9¼"
755	Alum.	1¼"	40	15"	5/16"	1.660"	7/16"	3/4"	9¼"
756	Alum.	1¼"	40	15"	5/16"	1.660"	1 9/16"	3/4"	9¼"
7290	Alum.	1½"	10	15"	5/16"	1.900"	7/16"	1"	9¼"
7291	Alum.	1½"	10	15"	5/16"	1.900"	1 9/16"	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"	1 9/16"	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"	1 9/16"	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"	1 9/16"	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"	1 9/16"	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"	1½"	1/2"	20½"

See page 25 for anchor bolt.

ROOF RAILING FLANGE

Aluminum only



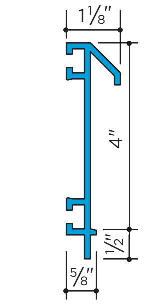
		Pipe	Sched.
748	Aluminum	1½"	all

See page 25 for anchor bolt.

ALUMINUM BRONZE NICKEL-SILVER STAINLESS

TOE BOARD

20′ lengths

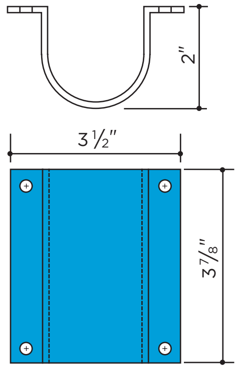


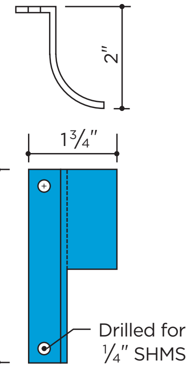
		lb/ft
6446	Alum.	1.13

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

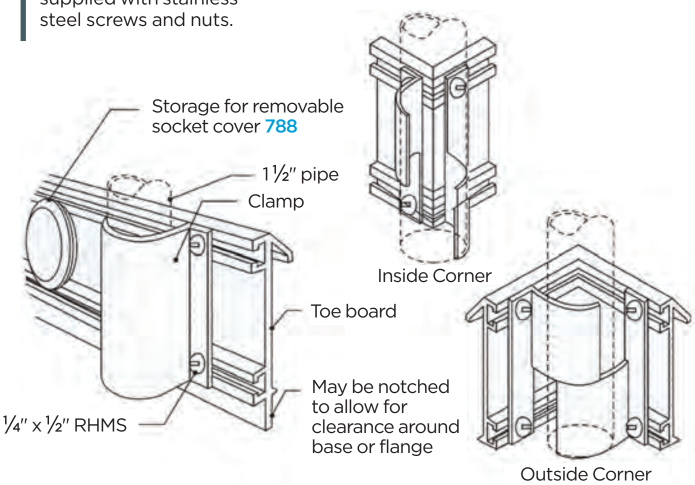
TOE BOARD CLAMPS

For 1½″ pipe

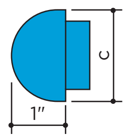




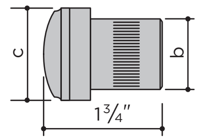
746	Aluminum
747	Aluminum



END CAPS



Chamfer inside of pipe to start then drive cap on



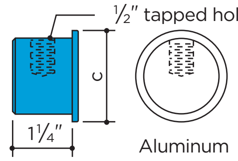
Sched. 40 only

		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″

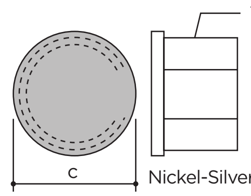
		Pipe	b	c
707*	Al.	1¼″	1.38	1.660″
708*	Al.	1½″	1.61	1.900″
807*	Br.	1¼″	1.37	1.660″
808*	Br.	1½″	1.60	1.900″

* Satin Finish

POST CAPS



Aluminum

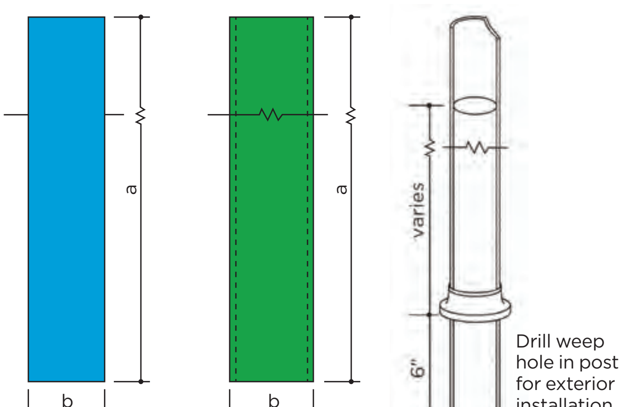


Nickel-Silver; Stainless

		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

REINFORCING BARS



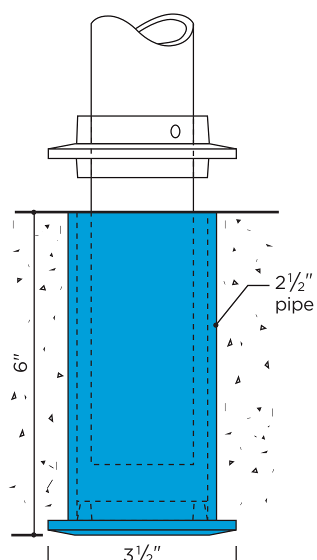
Aluminum (6061-T6)   Stainless

		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

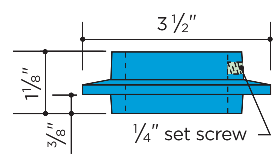
SOCKET



786	Aluminum

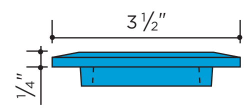
PIPE COLLAR

For 1½″ pipe only



787	Aluminum

SOCKET COVER



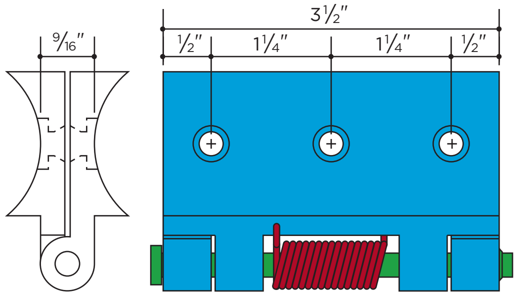
788	Aluminum

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 toe board.

ALUMINUM STAINLESS STEEL STEEL

GATE HINGE

For 1½″ aluminum pipe only

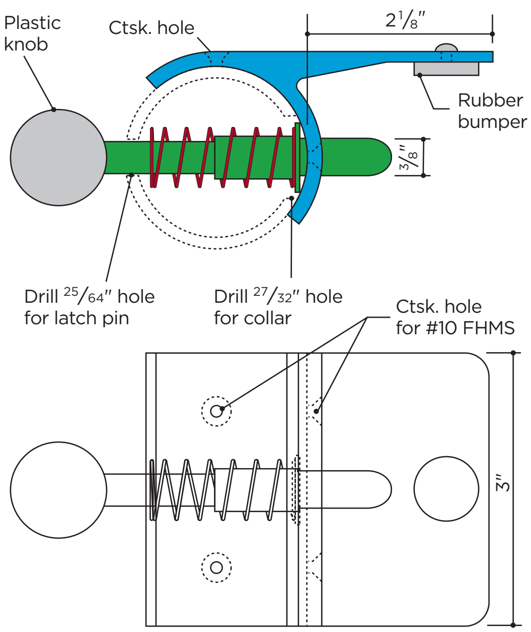


782/3 Aluminum

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, Clear Amber
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.

Cans —1 qt. total Tubes — 4 oz. total

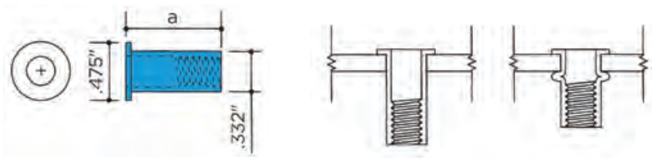
MANUAL RIVET HEADER

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

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 x 1″ with lock washer

RHMS ¼″– 20 x 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

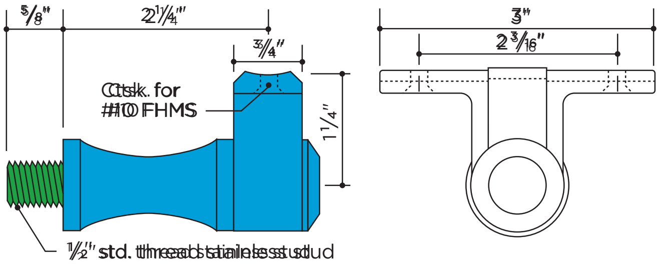
The **Sleeve Anchor Bolt** is an all steel, rust-proofed, multi-purpose anchor bolt intended for use in a wide range of masonry materials. The ⅜″ bolt is recommended for use with **Heavy-Duty Floor Flanges**.

ALUMINUM BRONZE NICKEL-SILVER STAINLESS

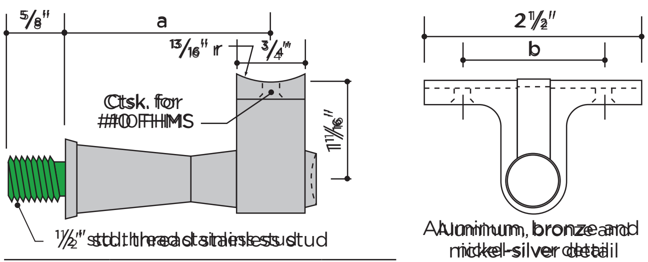
Aluminum brackets are available with a mill finish or a clear anodized finish—AA-M32-C22-A31 (204R1).
When designating clear anodized brackets, add the suffix -A to catalog number listed (e.g. 322-A).

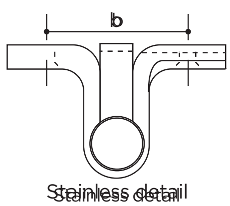
POST BRACKETS

Satin Finish



322	Aluminum	

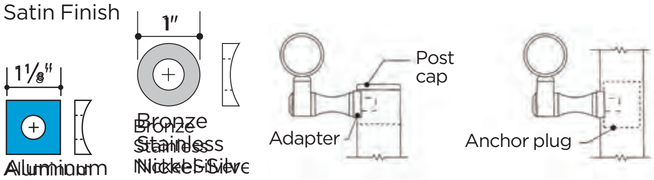




For use with pipe railings		a	b
402	Aluminum	2 1/4"	1 5/8"
402L	Aluminum	2 1/2"	1 5/8"
404	Aluminum	2 3/4"	1 5/8"
802	Bronze	2 1/4"	1 5/8"
1302	Nickel-Silver	2 1/4"	1 5/8"
222	Stainless	2 1/4"	1 13/16"
222L	Stainless	2 1/2"	1 5/8"

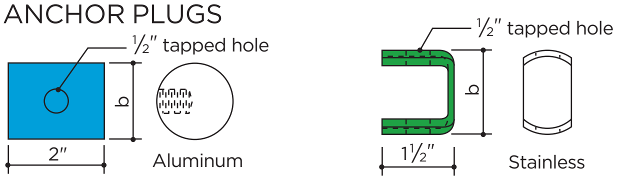
BRACKET POST ADAPTERS

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

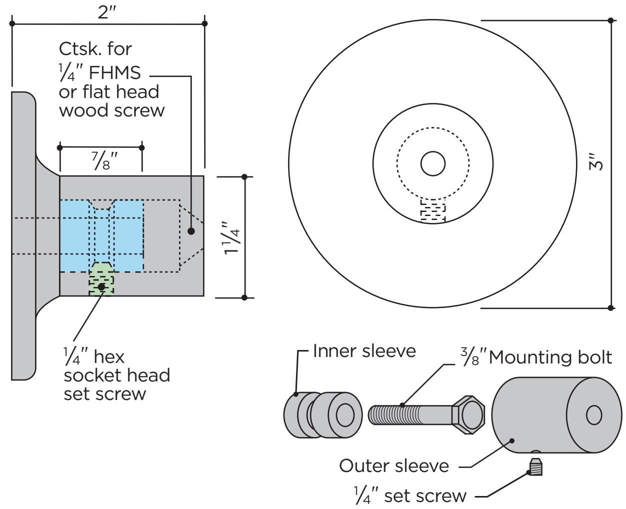


		Pipe Size	Schedule	b
7162	Aluminum	1 1/4"	10	1.427"
7462	Aluminum	1 1/4"	40	1.360"
7262	Aluminum	1 1/2"	10	1.667"
7562	Aluminum	1 1/2"	40	1.585"
9362	Stainless	1 1/2"	5	1.750"

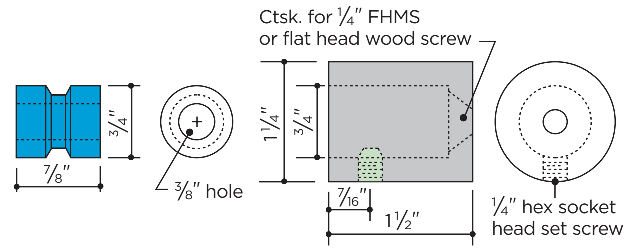
Anchor plugs provide secure mounting for brackets supporting intermediate rails. Aluminum anchor plugs are machined from solid extruded stock; the stainless steel anchor plug is fabricated from heavy metal.

TWO-PIECE MOUNTING BRACKETS

Satin Finish

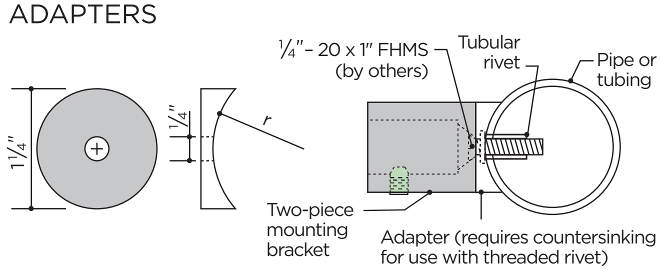


168	Aluminum	
898	Bronze	
298	Stainless	



For elevator car handrails		
166	Aluminum	
896	Bronze	
196	Nickel-Silver	
296	Stainless	

ADAPTERS



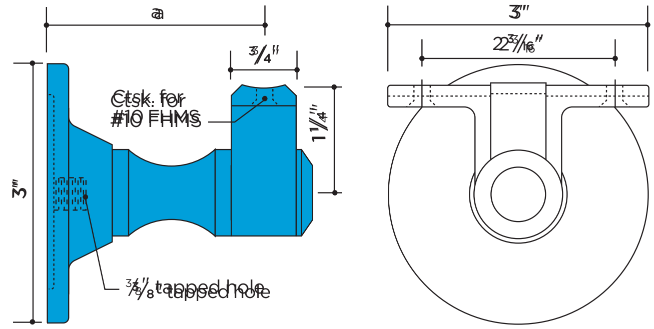
		r	Use With
7164	Aluminum	.830"	1.660" OD
7264	Aluminum	.950"	1.900" OD
8864	Bronze	.950"	1.900" OD
8964	Bronze	.750"	1.500" OD
5264	Nickel-Silver	.750"	1.500" OD
5364	Nickel-Silver	.950"	1.900" OD
9164	Stainless	.830"	1.660" OD
9364	Stainless	.950"	1.900" OD

ALUMINUM BRONZE NICKEL-SILVER STAINLESS

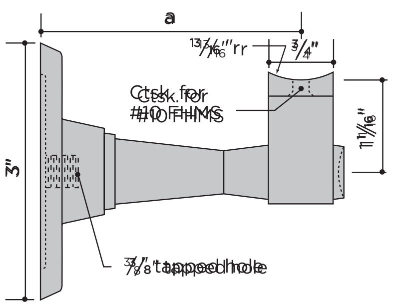
Aluminum brackets are available with a mill finish or a clear anodized finish—AA-M32-C22-A31 (204R1).
When designating clear anodized brackets, add the suffix -A to catalog number listed (e.g. 307-A).

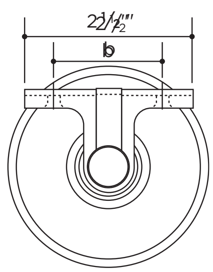
SELF-ALIGNING

Satin Finish, except as noted

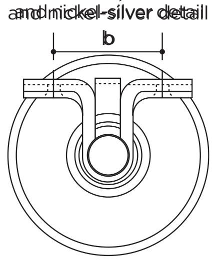


		a
307	Aluminum	2 1/2"
308	Aluminum	3"





Aluminum, bronze and nickel-silver detail



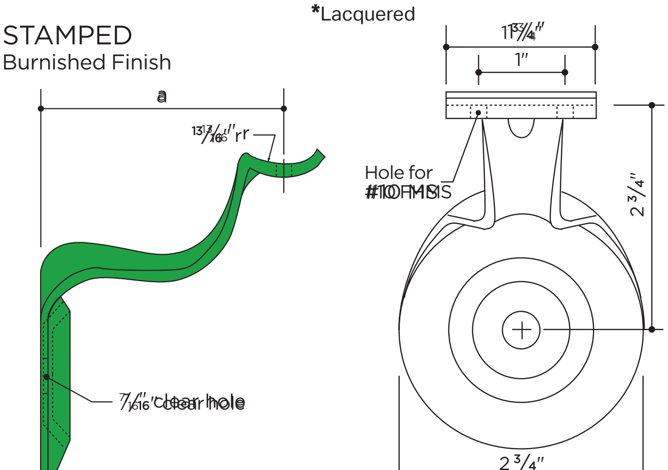
Stainless detail

		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

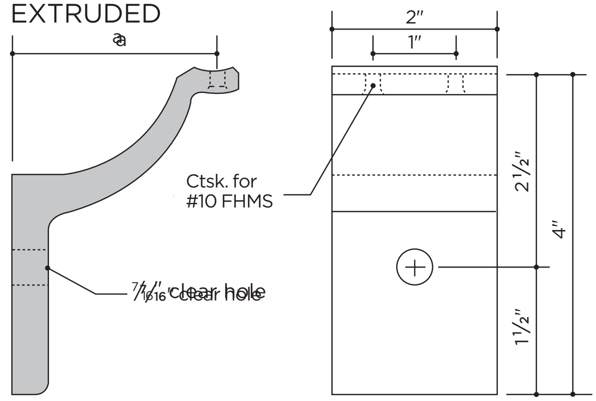
STAMPED

Burnished Finish



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

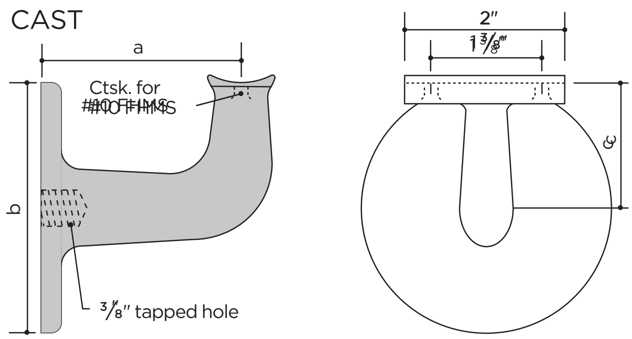
EXTRUDED



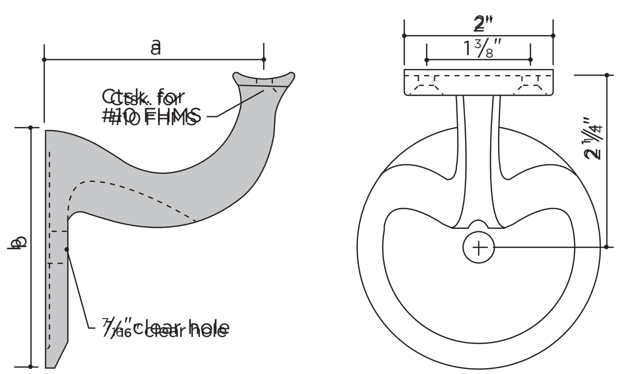
		a
478	Aluminum	2 1/2"
498	Aluminum	3"
892	Bronze	2 1/2"
894	Bronze	3"
192	Nickel-Silver	2 1/2"
218†	Stainless	2 1/2"
220†	Stainless	3"

† 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"



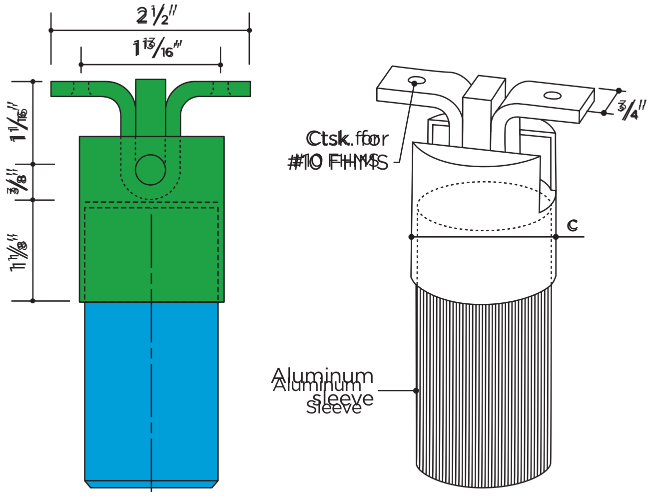
		a	b
384	Aluminum	2 1/2"	2 3/4"
316	Aluminum	3"	3 1/4"
388*	Bronze	2 1/2"	2 3/4"
318*	Bronze	3"	3 1/4"
1088	Stainless	2 1/2"	2 3/4"

*Lacquered

ALUMINUM STAINLESS

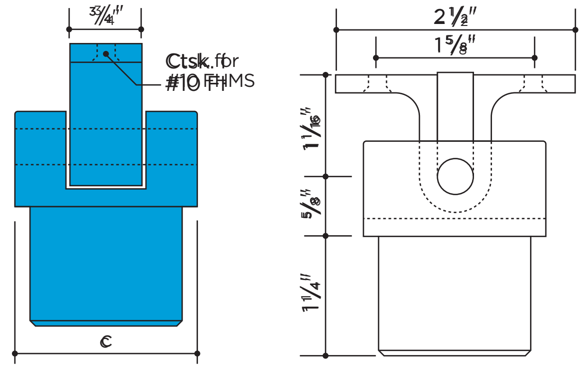
CENTER POST BRACKETS

Mill Finish



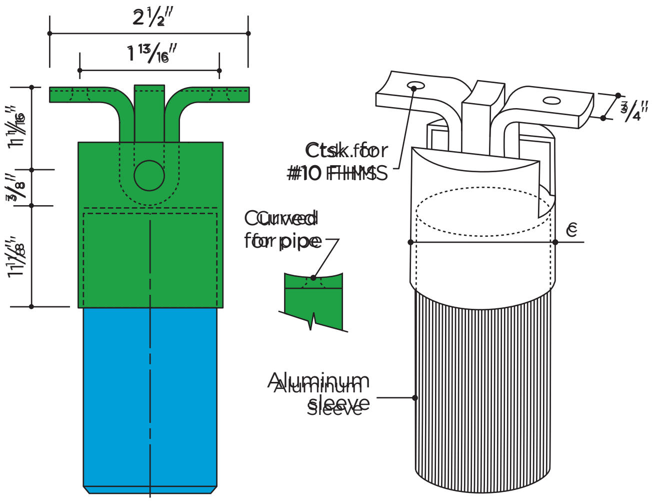
For center mounting of flat-bottomed handrail moulding onto stainless Connectorail® posts

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



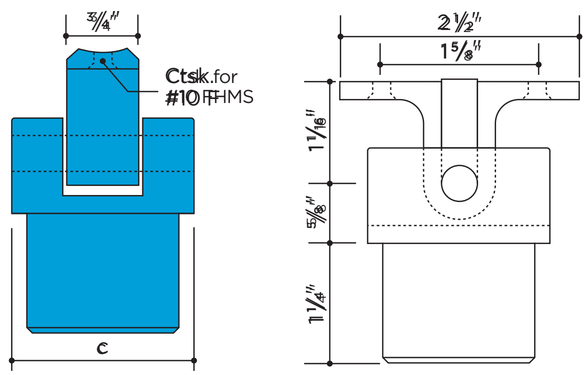
For center mounting of flat-bottomed handrail onto aluminum Connectorail® posts

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"

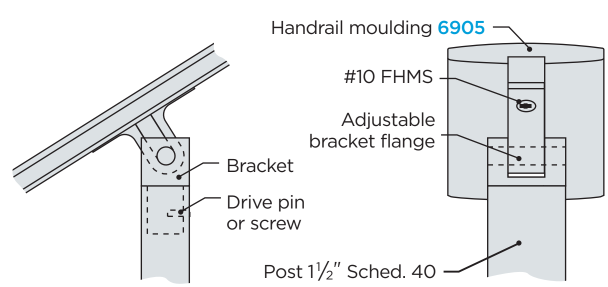


For center mounting of pipe or rounded handrail onto aluminum Connectorail® posts

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)

Assembly Details
Angle may be adjusted as required



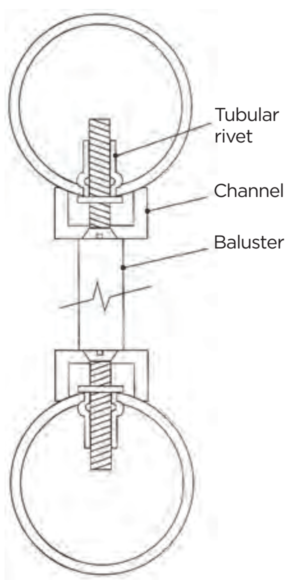
Notre Dame University Crossroads Facility, Notre Dame, IN
Fabricator: Builders Iron Works Inc., Mishawaka, IN | Architect: HOK
General Contractor: Barton-Malow Company

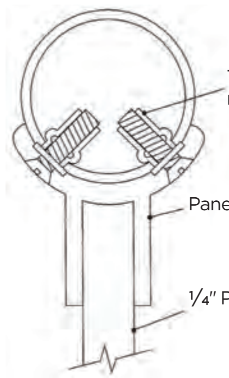
Verify all dimensions before cutting.

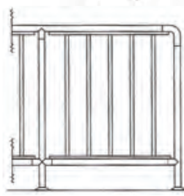
ALUMINUM BRONZE STAINLESS NICKEL-SILVER PVC

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.





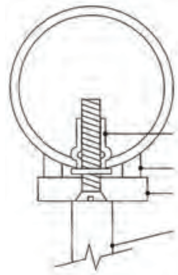


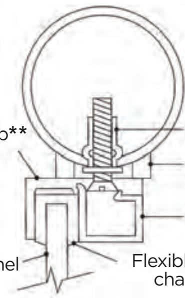
PICKET RAIL - use channel or adapters and flat bar.

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

* Two-piece panel clips, see below

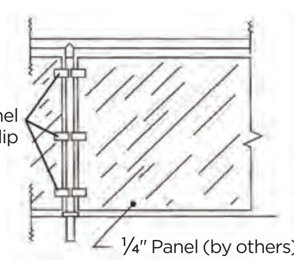
INSTALLATION OF PANEL RAILS





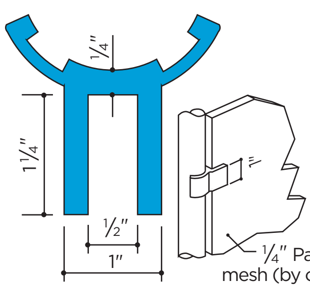
* Adapters	1¼" Pipe	1½" Pipe
Aluminum	7161	7261
Bronze	8661	8861
Stainless	9161	9361

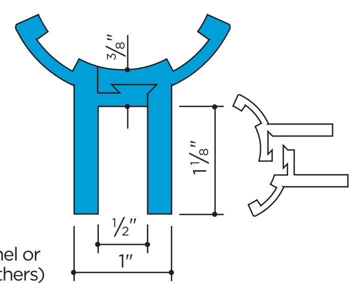
** Glass Stop	Glass Stop	Snap-in
Aluminum, Mill Finish	8106	8107
Aluminum, Anodized	8206	8207
Bronze	4506	4507
Flexible PVC	8708	



PANEL CLIPS

For aluminum pipe only





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

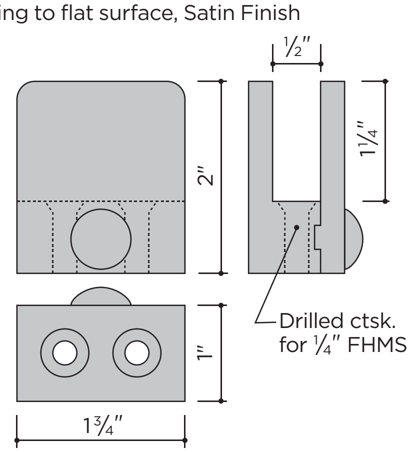
† Packages of 4 pieces

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.

ALUMINUM STAINLESS

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 124-131). Most fittings are dimensioned in whole inches to facilitate layout. Confirm dimensions prior to cutting and/or 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 131 for post spacing tables.

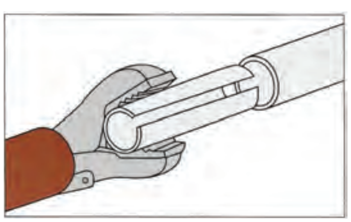
EXPANSION JOINTS

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.

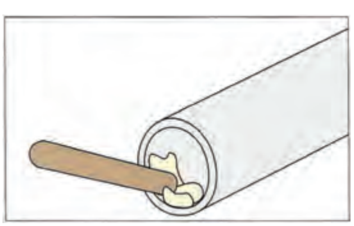
SPLICE JOINTS

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.



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



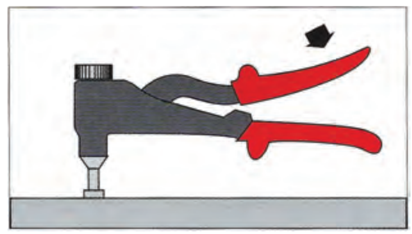
Apply adhesive to inside of pipe.

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

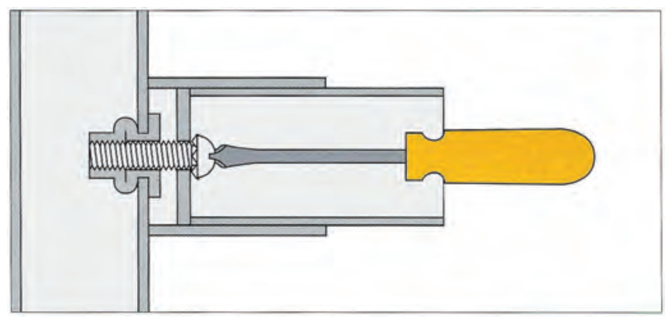
TEE FITTINGS

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.

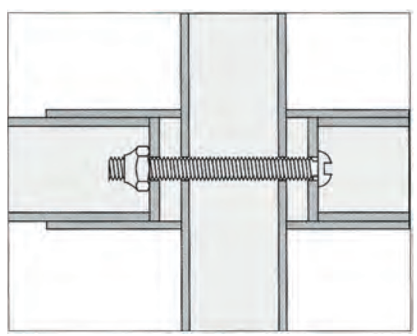
Drill pipe with drill size Q or 11⁄32″ hole. Screw a rivet sleeve-side first onto the mandrel of the tool. Hold the tool in one hand. Using the tool, insert the rivet into the hole until the tool comes to rest against the parent material. Upset rivet by pressing handles together.



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.

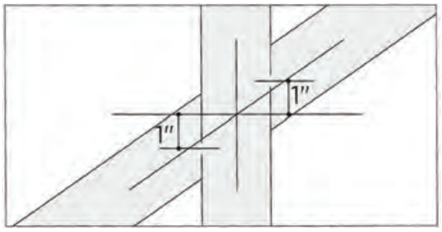


Draw the fittings up tightly from both sides, using a stainless steel lock nut.

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.

Draw the horizontal and vertical center lines. Draw two more vertical lines at one 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.



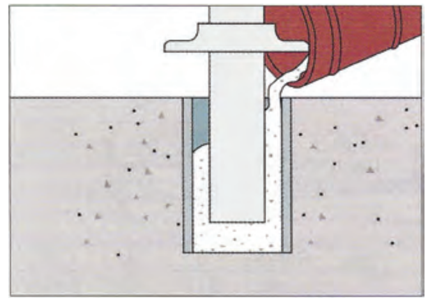
Holes for angle tees, except 4° ramp tee, are located 1″ above and below intersection of center lines of pipe, regardless of stair angle.

MOUNTING POSTS

Embedding in concrete: Posts embedded in concrete should be set to a depth of 5″ below the surface of 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 | Fabricator: Hamilton Metalcraft, Westbury, NY

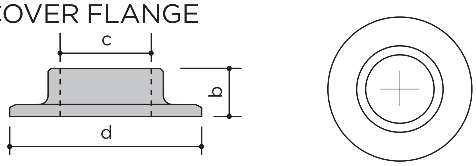
ALUMINUM BRONZE NICKEL-SILVER STAINLESS MALLEABLE IRON / STEEL

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 of Almag 35. Satin finish.
Cast bronze fittings are lacquered bronze alloy (C86500) which matches the color of red brass (C23000) and 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.

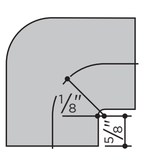
See pages 20 through 28 for other non-ferrous pipe fittings for 1 1/4" and 1 1/2" pipe.

PIPE COVER FLANGE



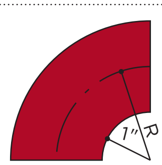
		Pipe	Sched.	b	c	d
714	Aluminum	1"	all	.813"	1.34"	3.625"
710	Aluminum	1 1/4"	all	1"	1.69"	3.813"
711	Aluminum	1 1/2"	all	1"	1.94"	4"
712	Aluminum	2"	all	1"	2.41"	5"
810	Bronze	1 1/4"	all	1"	1.69"	3.810"
811	Bronze	1 1/2"	all	1"	1.94"	4"
411	Nickel-Silver	1 1/2"	all	1"	1.94"	4"
214	Stainless	1"	all	7/8"	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"	11/16"
258*	Stainless	1 1/4"	15/16"
259*	Stainless	1 1/2"	11/16"

* 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"

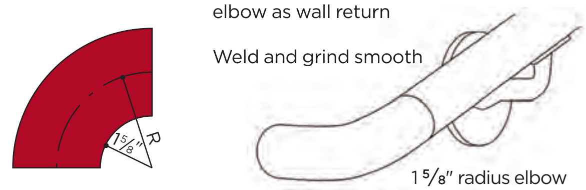
FITTINGS FOR WELDED ASSEMBLY

All fittings are for I.P.S., schedule 40 pipe, except as noted.

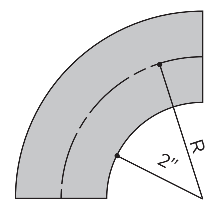
TEES

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

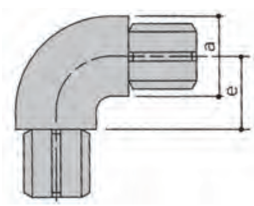


		Pipe	R
948	Steel	1 1/4"	2 7/16"
949	Steel	1 1/2"	2 9/16"



		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

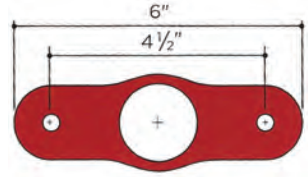


Black	Galv.		Pipe	a	e
618	1618	Malleable Iron	1 1/4"	1 21/32"	1 1/4"
619	1619	Malleable Iron	1 1/2"	1 29/32"	1 1/2"
620		Malleable Iron	2"	2 3/8"	1 7/8"
720*		Aluminum	2"	2 3/8"	1 7/8"

* Satin Finish

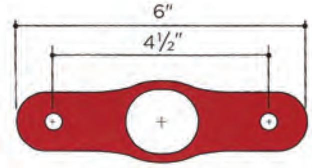
OVAL POST FLANGES

Floor



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

Angle



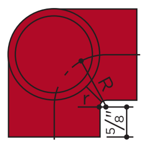
		Pipe
942	Steel	1 1/4"
943	Steel	1 1/2"

ALUMINUM | BRONZE | STAINLESS | CAST IRON / STEEL

FITTINGS FOR WELDED ASSEMBLY

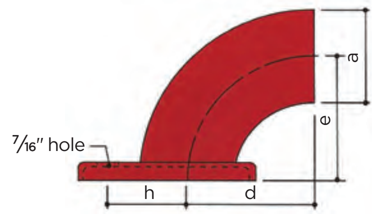
All fittings are for I.P.S., schedule 40 pipe, except as noted.

90° THREE-WAY ELBOW



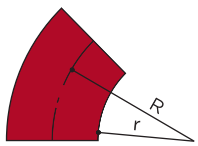
For corner posts

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



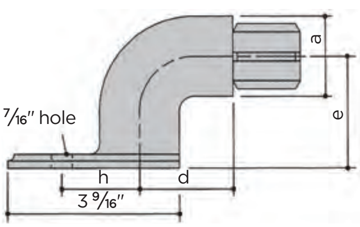
		Pipe	a	d	h	e
983	Steel	1 1/4"	1 21/32"	2 7/16"	1 5/8"	2 1/2"
984	Steel	1 1/4"	1 21/32"	2 13/16"	1 5/8"	3"
985	Steel	1 1/2"	1 29/32"	2 1/4"	1 15/32"	2 1/2"
986	Steel	1 1/2"	1 29/32"	2 15/16"	1 15/32"	3"

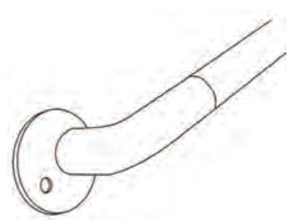
45° ELBOWS



		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"

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"

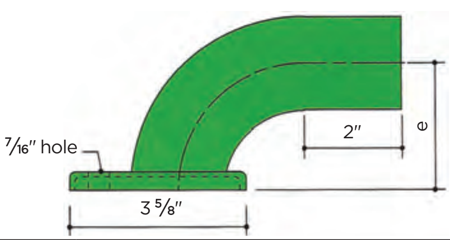
For light wall structural pipe schedule 10

			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

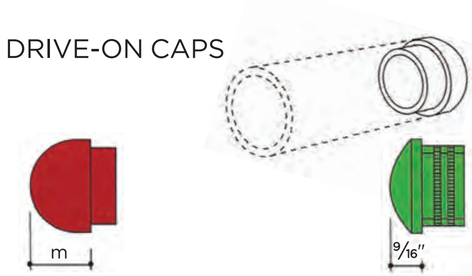


Schedule 40 pipe return and 1/8" formed flange are joined by a concealed weld.

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

* Satin Finish

DRIVE-ON CAPS



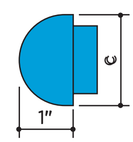
Chamfer inside of pipe to start; then drive cap on.

		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"

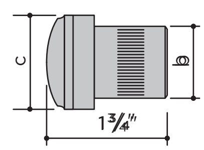
		Pipe
212*	Stainless	1"
277*	Stainless	1 1/4"
278*	Stainless	1 1/2"

* Satin Finish

END CAPS



Chamfer inside of pipe to start; then drive cap on



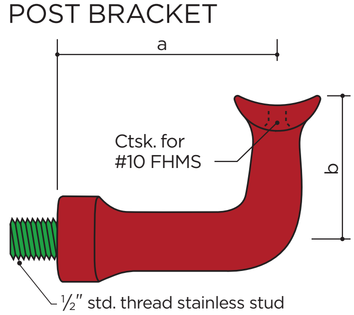
Sch. 40 only

		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

POST BRACKET



		a	b
374	Malleable Iron	2 1/2"	1 9/16"

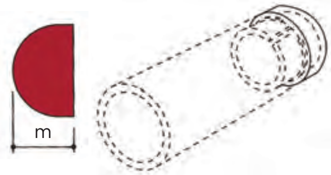
*Adapter, pg. 96

ALUMINUM | STAINLESS | CAST IRON/MALLEABLE IRON / STEEL

FITTINGS FOR WELDED ASSEMBLY

All fittings are for I.P.S., schedule 40 pipe, except as noted.

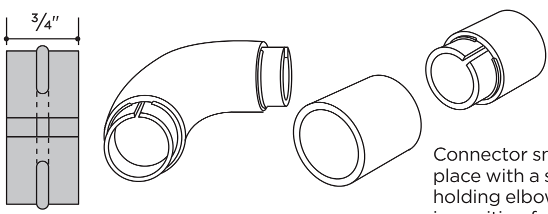
WELD-ON CAPS



Weld and grind smooth.
Use of connector is optional.

		Pipe	m
936	Steel	1"	1"
937	Steel	1 1/4"	1 1/8"
938	Steel	1 1/2"	1 1/4"
939	Steel	2"	1 3/8"

CONNECTOR

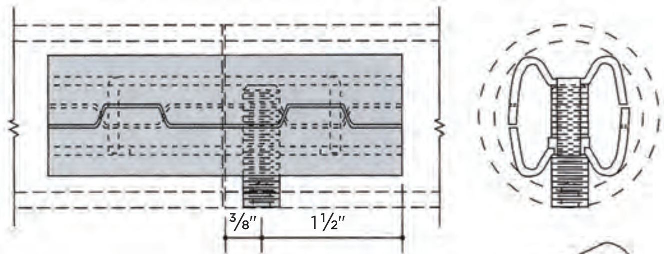


Connector snaps in place with a spring fit, holding elbow and pipe in position for welding.

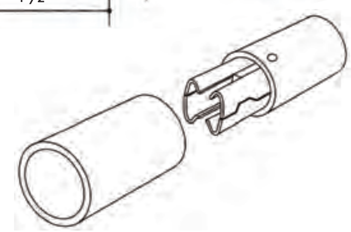
				Pipe
951	Steel	291	Stainless	1"
952	Steel	292	Stainless	1 1/4"
953	Steel	293	Stainless	1 1/2"
954	Steel			2"

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	1 1/4"
923	1923	288		1 1/2"
924				2"
		For schedule 5 pipe		
		286		1 1/4"

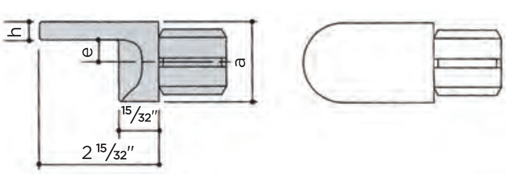
PIPE PLUGS

For schedule 40 pipe			
Black	Galv.		Pipe
606	1606	Cast Iron	1"
607	1607	Cast Iron	1 1/4"
608		Cast Iron	1 1/2"
609	1609	Cast Iron	2"

For light wall structural pipe schedule 10		
Black		Pipe
3607	Cast Iron	1 1/4"
3608	Cast Iron	1 1/2"

SQUARE POST FITTING

Cast

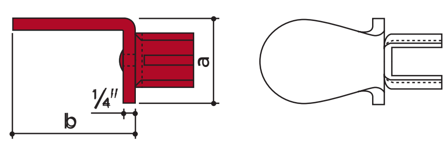


For schedule 40 pipe		Pipe	a	h	e
601	Malleable Iron	1 1/4"	1 21/32"	3/8"	29/64"
602	Malleable Iron	1 1/2"	1 29/32"	7/16"	33/64"
For light wall structural pipe schedule 10					
3601	Malleable Iron	1 1/4"	1 21/32"	3/8"	29/64"
3602	Malleable Iron	1 1/2"	1 29/32"	7/16"	33/64"
For schedule 40 pipe					
701*	Aluminum	1 1/4"	1 21/32"	3/8"	29/64"
702*	Aluminum	1 1/2"	1 29/32"	7/16"	33/64"

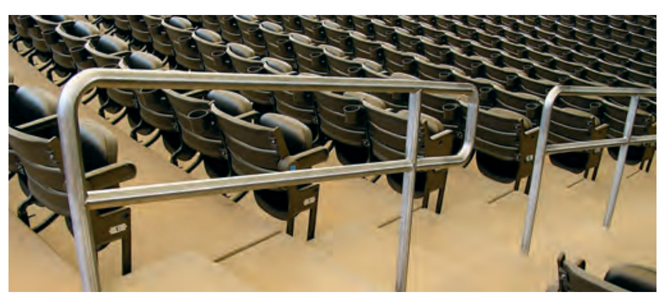
* Satin Finish

SQUARE POST FITTING

Stamped Steel



For schedule 40 pipe		Pipe	a	b
987	Malleable Iron	1 1/4"	1 5/8"	2 5/8"



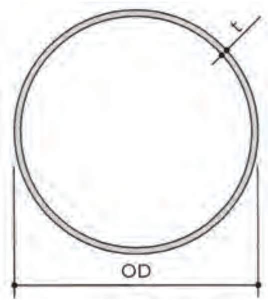
Sun Valley Music Pavillion, Sun Valley, Idaho | Architect: Ruscitto/Latham/Blanton, Sun Valley, Idaho | Fabricator: Diversified Metal Products, Inc., Idaho Falls, Idaho

ALUMINUM BRONZE NICKEL-SILVER STAINLESS

O.D. ROUND TUBING

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

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

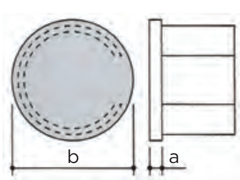


	OD	t	lb/ft	Area	I	S
Aluminum	1.900"	.109"	.721	.614	.247	.260
Aluminum	2½"	.125"	1.119	.933	.659	.527
Aluminum	3"	.125"	1.328	1.129	1.169	.779
Aluminum	3½"	.125"	1.559	1.325	1.890	1.080
Bronze	1.500"	.100"	1.750	.440	.108	.144
Bronze	1.900"	.100"	2.070	.565	.230	.242
Bronze	2½"	.125"	3.441	.933	.659	.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

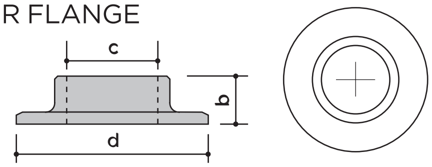
Satin Finish, except as noted



		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.

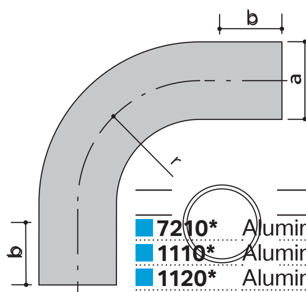
COVER FLANGE

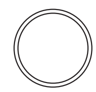


		OD	b	c	d
711	Aluminum	1.900"	1"	1.94"	4"
1125	Aluminum	2½"	1"	2.54"	4¾"
1123	Aluminum	3"	1"	3.04"	5"
811	Bronze	1.900"	1"	1.94"	4"
1225	Bronze	2½"	1"	2.54"	4¾"
1223	Bronze	3"	1"	3.04"	5"
411	Nickel-Silver	1.900"	1"	1.94"	4"
1325	Nickel-Silver	2½"	1"	2.54"	4¾"
1323	Nickel-Silver	3"	1"	3.04"	5"
211	Stainless	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





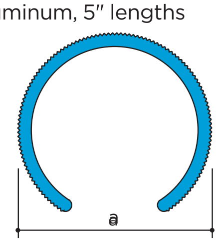
Elbow may be trimmed for use as wall return. For brackets, see pages 26-27.

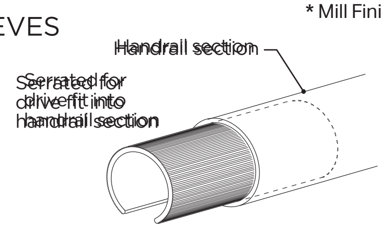
		a	r	Wall	b
7210*	Aluminum	1.900"	3"	.109"	2"
1110*	Aluminum	2½"	5"	.125"	2½"
1120*	Aluminum	3"	5"	.125"	2½"
1122*	Aluminum	3½"	5"	.125"	2½"
1222*	Bronze	1.900"	3"	.100"	2½"
1210*	Bronze	2½"	5"	.125"	2½"
1220*	Bronze	3"	6"	.125"	2½"
6489C*	Bronze	1.500"	3"	.100"	2½"
1330C*	Nickel-Silver	1.900"	3"	.109"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

Wyoming State Capitol, Cheyenne, WY | Fabricator: Bauer Industries, LLC, St. Paul, MN | General: J.E. Dunn Construction Group, Kansas City, MO
Photographer: Talon Six

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 usually require special attention to assure 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 assure a product well-suited for architectural finishing. For structural engineering data, see pages 124-131. For handrail brackets, see pages 91-99.

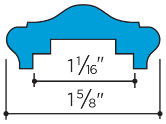
Americans with Disabilities Act (ADA): *The Americans with Disabilities Act* adopted by Congress in 1992 required circular handrails to be 1¼″ minimum and 1½″ maximum. However, the *Guidance on the 2010 ADA Standards for Accessible Design - September 2010*, published by the *US Department of Justice*, has now properly 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. ANSI117.1-09 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.*

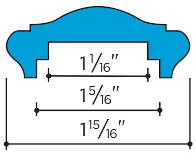
Wyoming State Capitol, Cheyenne, WY | Fabricator: Bauer Industries, LLC, St. Paul, MN | General: J.E. Dunn Construction Group, Kansas City, MO
Photographer: Talon Six

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

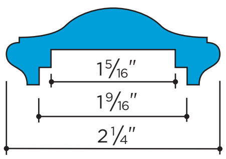
Scale: 6″ = 1′-0″



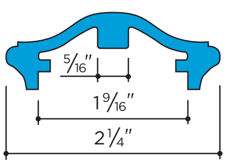
6931 Aluminum .615 lb/ft
Fittings: B-C-CC-CL-CR-E-GL-GR-L-N-S-T-V



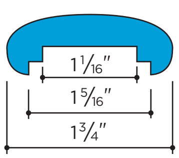
6934 Aluminum .804 lb/ft
Fittings: B-C-CC-CL-CR-E-GL-GR-L-N-S-T-V



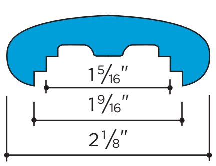
6930 Aluminum .936 lb/ft
Fittings: B-C-CC-CL-CR-E-GL-GR-L-N-S-T-V



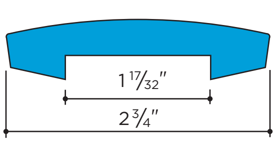
6929 Aluminum .670 lb/ft
Use fittings for **6930**
Outside profile identical to **6930**, for straight runs only



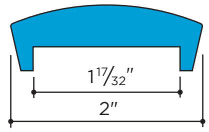
6933 Aluminum .770 lb/ft
Fittings: B-C-CC-CL-CR-GL-GR-N-S-V



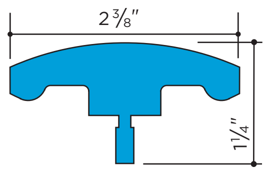
6935 Aluminum .980 lb/ft
Fittings: B-C-CC-CL-CR-E-GL-GR-N-S-T-V



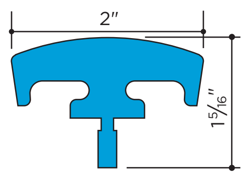
6984• Aluminum 1.301 lb/ft
Fittings: C-N
•Use 1½" x ¼" flat bar for splicing and closing ends



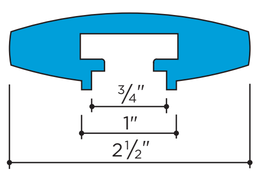
6985• Aluminum .977 lb/ft
Fittings: C-N
•Use 1½" x ¼" flat bar for splicing and closing ends



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

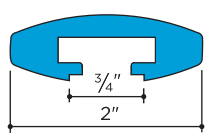


6405 Aluminum 1.39lb/ft
Fittings: C-N Use fittings for **6985**

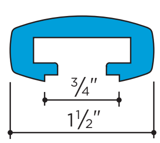


6532 Aluminum 1.440 lb/ft
Fittings: C-N

Mouldings 6530, 6531 and 6532 are used with Carlsrail® self-aligning brackets on page 84. Clamping action eliminates drilling and tapping and helps in field alignment with posts and wall attachments. See page 70 for splices, support bar and end cap. Carlsrail® mouldings are designed for non-welded assembly.

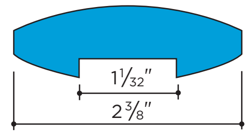


6530 Aluminum .900 lb/ft
Fittings: C-N



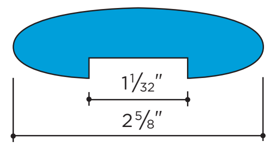
6531 Aluminum .600 lb/ft
Fittings: C-N

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

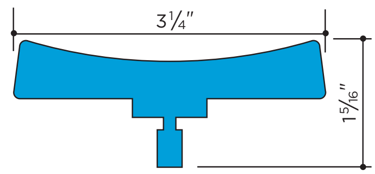


6902 Aluminum 1.464 lb/ft
Fittings: C-N

Mouldings 6901 and 6902 are specially designed for use with **Carlstadt**® aluminum self-aligning brackets 309, 312, 313 and 314 shown on pages 94 and 95. A 1″ x 1/4″ flat bar can be used for splicing and for closing the recess in the handrail moulding.

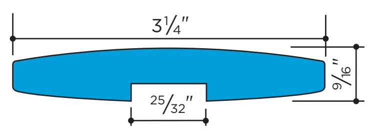


6901 Aluminum 1.661 lb/ft
Fittings: C-N

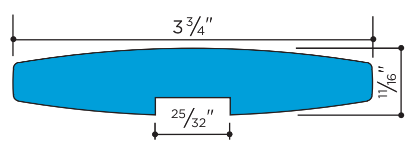


6407 Aluminum 2.00 lb/ft
Fittings: C-N Use fittings for **6907**

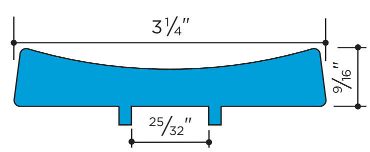
T-handrail mouldings 6402, 6405 and 6407 are used with **Carlstadt**® self-aligning brackets on pages 94-95. Clamping action eliminates drilling and tapping and helps in field alignment with posts and wall attachment.



6905 Aluminum 1.752 lb/ft
Fittings: C-N



6906 Aluminum 2.448 lb/ft
Fittings: C-N

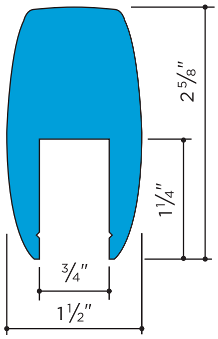


6907 Aluminum 1.776 lb/ft
Fittings: C-N

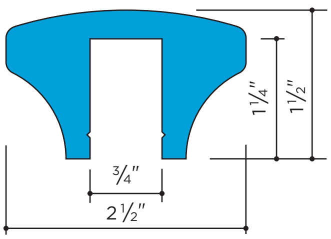
Mouldings 6905, 6906 and 6907 are specially designed for use with **Carlstadt**® self-aligning brackets shown on pages 94-95. A 3/4″ x 3/16″ flat bar may be used for closing the recess in the handrail moulding.

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

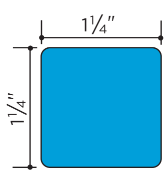
Scale: 6″ = 1′-0″



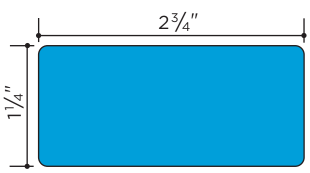
1133* Aluminum 3.02 lb/ft



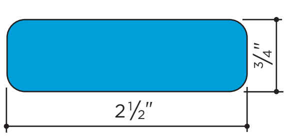
1134* Aluminum 2.40 lb/ft



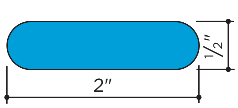
6423* Aluminum 1.876 lb/ft



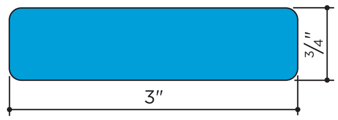
6424* Aluminum 4.124 lb/ft



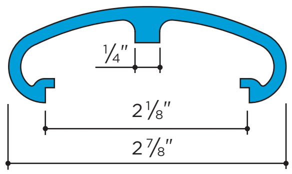
6939* Aluminum 2.214 lb/ft



6988* Aluminum 1.138 lb/ft

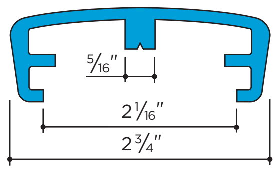


6986* Aluminum 2.684 lb/ft



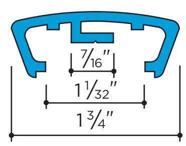
6932 Aluminum .852 lb/ft

Fittings: B-C-N-S



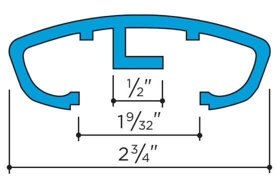
6987 Aluminum .858 lb/ft

Fittings: C-N



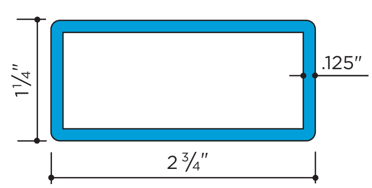
6903• Aluminum .446 lb/ft

•Use with 1″ x 1/2″ x 1/8″ channel



6904• Aluminum .858 lb/ft

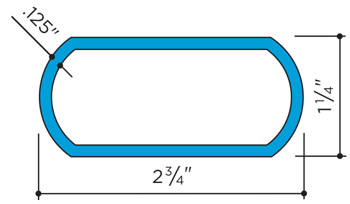
•Use with 1 1/4″ x 3/4″ x 1/8″ channel



6434 Aluminum 6063-T6 1.123 lb/ft

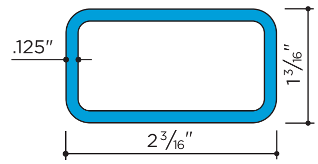
Fittings: N (see page 83)

* No fittings available.



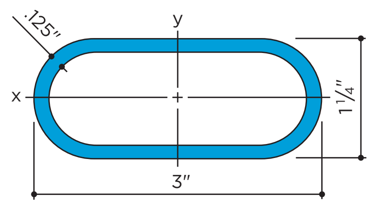
6435 Aluminum 6063-T6 1.075 lb/ft

Fittings: C-N (see pages 43 and 83)



6436 Aluminum .888 lb/ft

Fittings: N



6437 Aluminum 1.057 lb/ft

Fittings: N

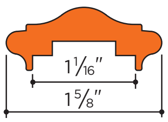
Symbols and Letter Designations for Aluminum Handrail Fittings

When specifying a fitting, add fitting designation to handrail moulding number (e.g. 6930-V). See pages 113 and 116 for available channel sizes.

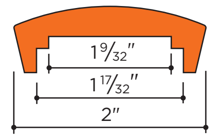
ALUMINUM	
B	Bevel Lamb's Tongue
C	Corner Bend
CC	Channel Corner Bend
CL	Left Channel Lateral Scroll
CR	Right Channel Lateral Scroll
E	Terminal
GL	Left Lateral Scroll
GR	Right Lateral Scroll
L	Corner Piece
N	Square End Piece
S	Straight Lamb's Tongue
T	Center Piece
V	Volute
MALLEABLE IRON	
CC	Channel Corner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

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

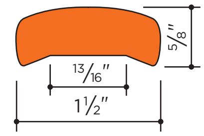
Scale: 6″ = 1′-0″



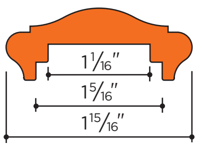
4531 Bronze 1.93 lb/ft
Fittings: B-C-E-GL-GR-L-N-S-U-V



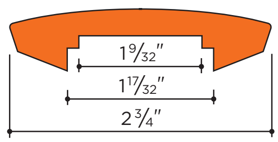
4575 Bronze 2.37 lb/ft
Fittings: C-N



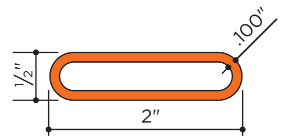
4503 Bronze 2.73 lb/ft
No fittings available



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

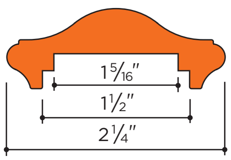


4574 Bronze 3.71 lb/ft
Fittings: C-N

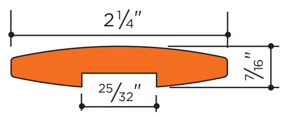


6488 Bronze 1.56 lb/ft
Fittings: N

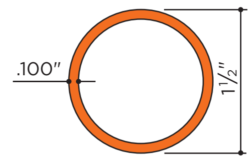
16′ lengths



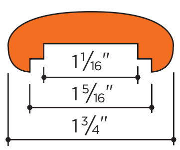
4530 Bronze 3.10 lb/ft
Fittings: B-C-E-GL-GR-L-N-S-T-V



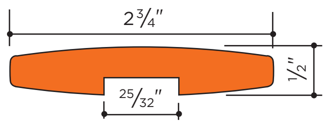
4572 Bronze 2.50 lb/ft
Fittings: C-N



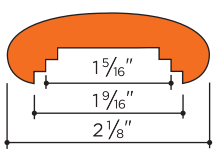
6489 Bronze 1.75 lb/ft
Fittings: C-D-N



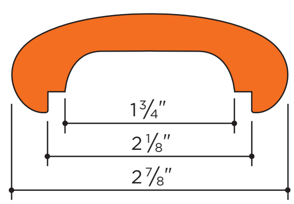
4539 Bronze 2.66 lb/ft
Fittings: B-C-CC-CL-CR-GL-GR-N-S-V



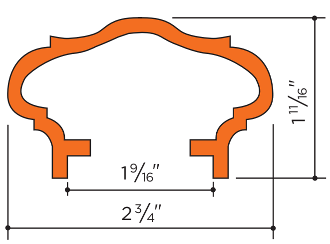
4573 Bronze 4.05 lb/ft
Fittings: C-N



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

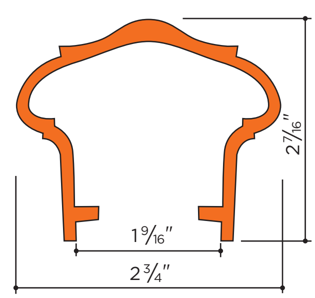


4529 Bronze 4.87 lb/ft
Fittings: N



4538 Bronze 3.15 lb/ft
Fittings: N

16′ lengths



4533 Bronze 3.66 lb/ft
No fittings available

16′ lengths

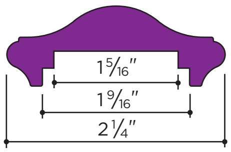
Note: Channel corner bends and channel lateral scrolls are available in bronze and malleable iron.

Symbols and Letter Designations for Bronze Handrail Fittings
When specifying a fitting, add fitting designation to handrail moulding number (e.g. 4530-V). See pages 116-117 for available channel sizes.

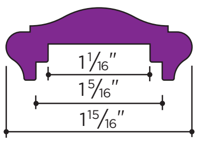
BRONZE	
B	Bevel Lamb's Tongue
C	Corner Bend
CC	Channel Corner Bend
CL	Left Channel Lateral Scroll
CR	Right Channel Lateral Scroll
D	Domed End Cap
E	Terminal
GL	Left Lateral Scroll
GR	Right Lateral Scroll
L	Corner Piece
N	Square End Piece
S	Straight Lamb's Tongue
T	Center Piece
U	End Urn Base
V	Volute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

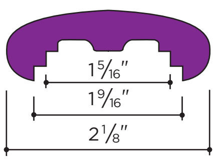
Scale: 6″ = 1′-0″



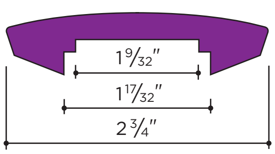
5530 Nickel-Silver 2.91 lb/ft
Fittings: B-C-GL-GR-N-S-V
16′ lengths



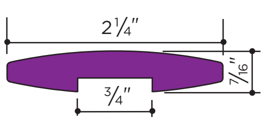
5534 Nickel-Silver 2.52 lb/ft
Fittings: B-C-GL-GR-N-S-V



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

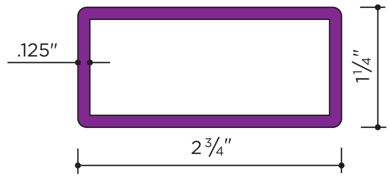


5274 Nickel-Silver 3.71 lb/ft
Fittings: C-N

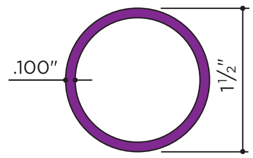


5572 Nickel-Silver 2.50 lb/ft
Fittings: C-N

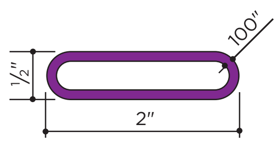
> **Note:** Channel corner bends and channel lateral scrolls are available in nickel-silver and malleable iron.



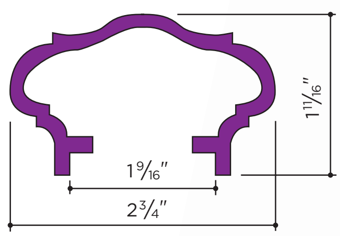
1334 Nickel-Silver 3.40 lb/ft
Fittings: N (See page 83)
16′ lengths



5289 Nickel-Silver 1.75 lb/ft
Fittings: N



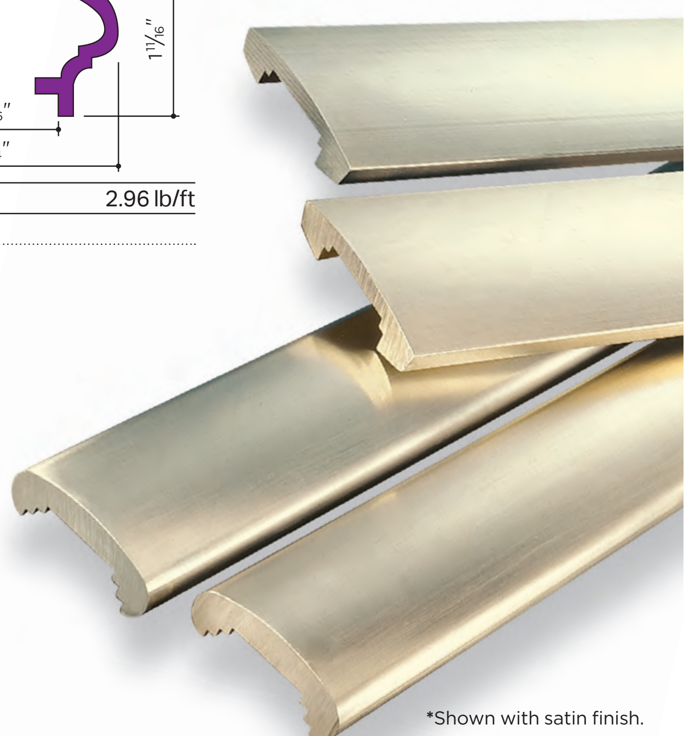
5288 Nickel-Silver 1.56 lb/ft
Fittings: N



5538 Nickel-Silver 2.96 lb/ft
Fittings: N

Symbols and Letter Designations for Nickel-Silver Handrail Fittings
When specifying a fitting, add fitting designation to handrail moulding number (e.g. 5534-V). See pages 116 and 120 for available channel sizes.

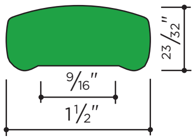
NICKEL-SILVER	
B	Bevel Lamb's Tongue
C	Corner Bend
CC	Channel Corner Bend
CL	Left Channel Lateral Scroll
CR	Right Channel Lateral Scroll
E	Terminal
GL	Left Lateral Scroll
GR	Right Lateral Scroll
L	Corner Piece
N	Square End Piece
S	Straight Lamb's Tongue
V	Volute
MALLEABLE IRON	
CC	Channel Corner Bend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



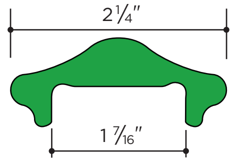
*Shown with satin finish.

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

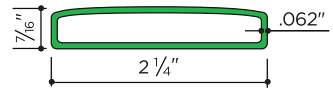
Scale: 6″ = 1′-0″, except as noted



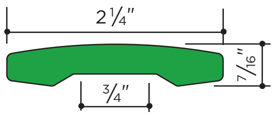
6503 Stainless 2.54 lb/ft
No fittings available
16′ lengths



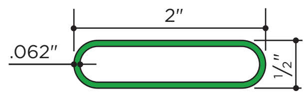
6513 Stainless 2.85 lb/ft
Fittings: N



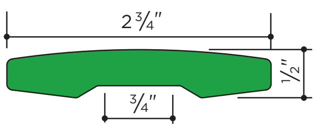
6512 Stainless 1.00 lb/ft
Fittings: N



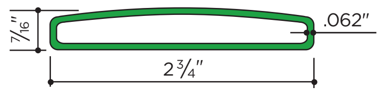
6502 Stainless 2.80 lb/ft
No fittings available
16′ lengths



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



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



6511 Stainless 1.25 lb/ft
Fittings: N

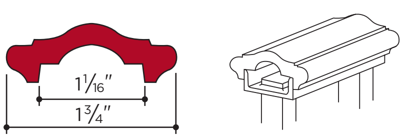
Symbols and Letter Designations for Stainless Steel Handrail Fittings

When specifying a fitting, add fitting designation to handrail moulding number (e.g. 4488-N).

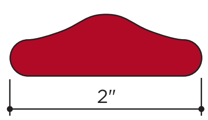
See page 122 for available channel sizes.

STAINLESS	
C	Corner Bend
N	Square End Piece

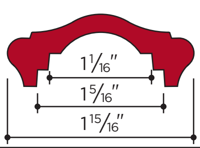
Steel mouldings are hot-rolled carbon steel, C1010. Fittings are cast in malleable iron, making them weldable and bendable.



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

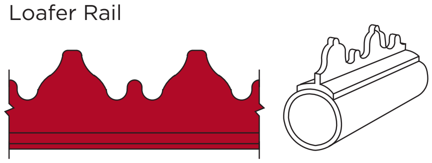


4416 Steel 3.15 lb/ft
No fittings available

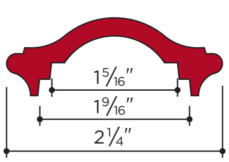


4428 Steel 2.25 lb/ft
Fittings: B-C-CC-CL-CR-E-GL-GR-L-N-S-V

Loafer Rail

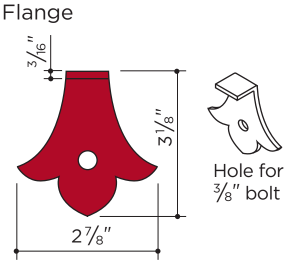


4445 Steel .688 lb/ft
Loafer rail fits over pipe or flat surface to discourage lounging or skating on fences, planters, railings, or storefronts.

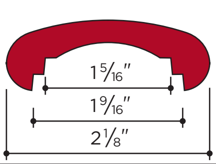


4441 Steel 2.14 lb/ft
Fittings: B-C-CC-CL-CR-E-GL-GR-N-S-T-U-UC-V

Wall Flange



401* Steel
* Scale: 3″ = 1′-0″



4435 Steel 2.65 lb/ft
Fittings: V

Symbols and Letter Designations for Steel Handrail Fittings

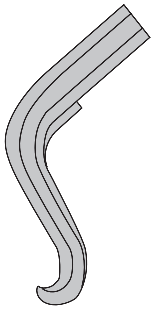
When specifying a fitting, add fitting designation to handrail moulding number (e.g. 4441-V).
See page 116 for available channel sizes.

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

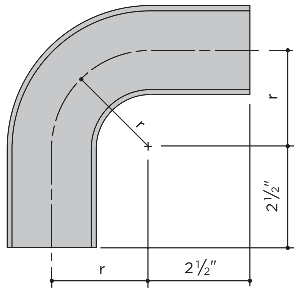
ALUMINUM BRONZE NICKEL-SILVER MALLEABLE IRON / STEEL STAINLESS

HANDRAIL FITTINGS

Satin finish, except as noted. Bronze and nickel-silver fittings are lacquered. See pages 44-46 for specific fittings availability.

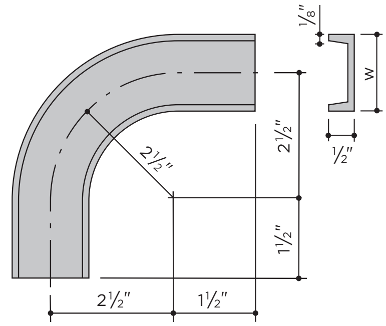


B Bevel Lamb's Tongue



C Corner Bend

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

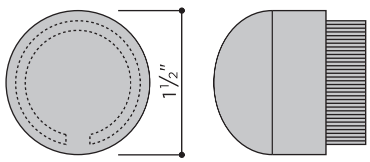


CC Channel Corner Bend

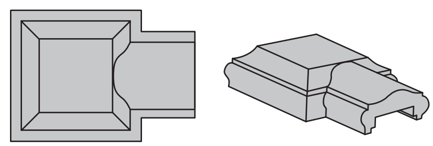
"As Cast" finish

Fits the underside of moulding corner bend.

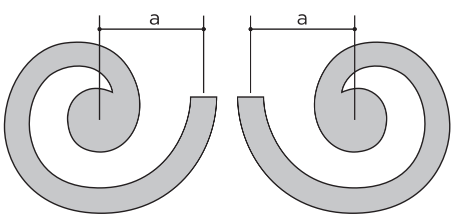
See page 45 for fittings availability.



D Domed End Cap

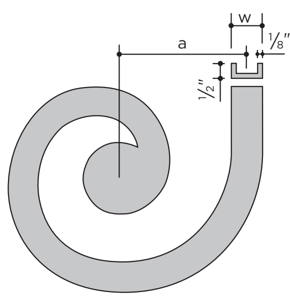


E Terminal



GL Left Lateral Scroll

GR Right Lateral Scroll



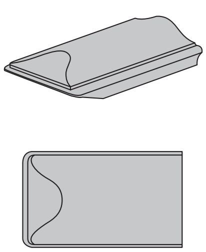
CL Left Channel Lateral Scroll

CR Right Channel Lateral Scroll

Fits the underside of moulding lateral scroll.

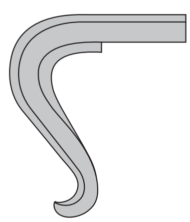
MOULDING LATERAL SCROLLS

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.

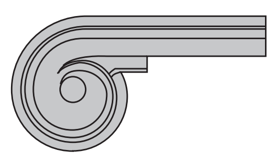


N** Square End Piece

** Stainless and steel with square front corners



S Straight Lamb's Tongue



V Volute

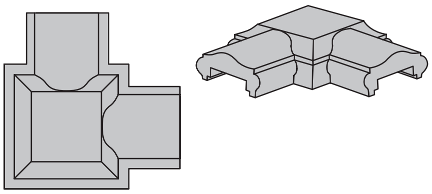
Be aware that due to the differences in tolerances between extruded handrail and cast fittings, butt joints usually require special attention to assure a proper match.

ALUMINUM BRONZE MALLEABLE IRON

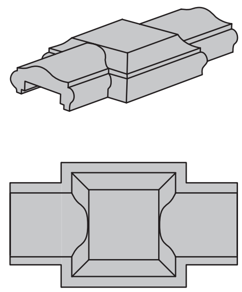
FINIAL BASES, CENTER PIECES, CORNER PIECES, TERMINALS AND URN BASES

Satin finish, except as noted. Bronze and nickel-silver fittings are lacquered. See page 56 for Urn and Ball Finials. Urn bases may be welded or bolted in place with the finial stud.

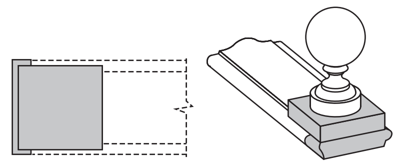
> Be aware that due to the difference in tolerances between extruded handrail and cast fittings, butt joints usually require special attention to assure a proper match.



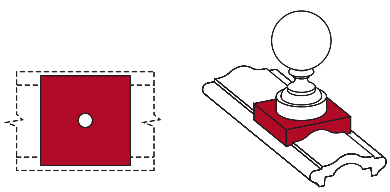
L Corner Piece



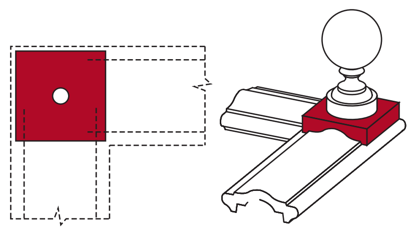
T Center Piece



U End Urn Base



UC Center Urn Base

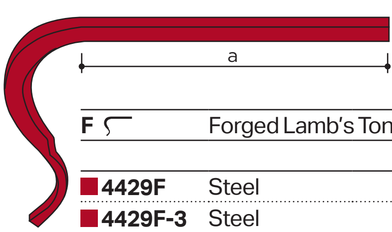


UL Corner Urn Base

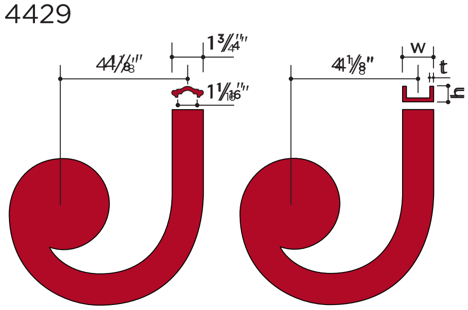
TERMINALS, CENTER PIECES & CORNER PIECE FITTING AVAILABILITY

Handrail Moulding	Terminal End Piece (E)	Corner Piece (L)	Center Piece (T)	End Urn Base (U)	Handrail Moulding	Terminal End Piece (E)	Corner Piece (L)	Center Piece (T)	End Urn Base (U)
6929	**6930E**	**6930L**	**6930T**	–	**4531**	**4531E**	**4531L**	–	**4531U**
6930	**6930E**	**6930L**	**6930T**	–	**4534**	**4534E**	**4534L**	**4534T**	–
6931	**6931E**	**6931L**	**6931T**	–	**4535**	–	–	**4535T**	–
6934	**6934E**	**6934L**	**6934T**	–	**4428**	**4428E**	**4428L**	–	–
6935	**6935E**	–	**6935T**	–	**4429**	**4429E**	**4429L**	**4429T**	**4429U**
4530	**4530E**	**4530L**	**4530T**	–	**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

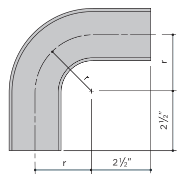
Lateral Channel

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

		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

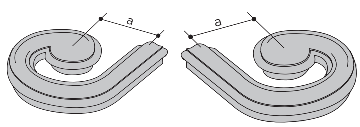
CORNER BEND RADIUS



Corner Bend (C)	Bend Radius (r)	Corner Bend (C)	Bend Radius (r)	Corner Bend (C)	Bend Radius (r)
6435C Aluminum	3"	**6933C** Aluminum	2 1/2"	**4573C** Bronze	3"
6530C Aluminum	4"	**6934C** Aluminum	2 1/2"	**4574C** Bronze	3"
6531C Aluminum	4"	**6935C** Aluminum	2 1/2"	**4575C** Bronze	2 1/2"
6532C Aluminum	4"	**6984C** Aluminum	3"	**6489C** Bronze	5"
6901C Aluminum	2 1/2"	**6985C** Aluminum	2 1/2"	**5235C** Nickel-Silver	2 1/2"
6902C Aluminum	2 1/2"	**6987C** Aluminum	3"	**5274C** Nickel-Silver	3"
6905C Aluminum	3"	**4530C** Bronze	2 1/2"	**5530C** Nickel-Silver	2 1/2"
6906C Aluminum	3"	**4531C** Bronze	2 1/2"	**5534C** Nickel-Silver	2 1/2"
6907C Aluminum	3"	**4534C** Bronze	2 1/2"	**5572C** Nickel-Silver	2 1/2"
6930C Aluminum	2 1/2"	**4535C** Bronze	2 1/2"	**4428C*** Malleable Iron	2 1/2"
6931C Aluminum	2 1/2"	**4539C** Bronze	2 1/2"	**4429C*** Malleable Iron	2 1/2"
6932C Aluminum	3"	**4572C** Bronze	2 1/2"	**4441C*** Malleable Iron	2 1/2"

* "As Cast" finish, no lacquer

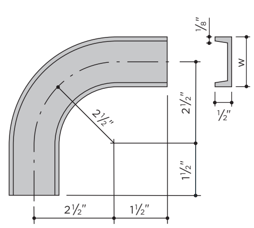
LATERAL SCROLL DIMENSION



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

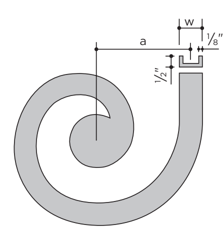
Verify all dimensions before cutting.

CHANNEL CORNER BEND DIMENSIONS



	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



	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"

ALUMINUM BRONZE NICKEL-SILVER MALLEABLE IRON STAINLESS

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	–	–	–
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	–	–	–

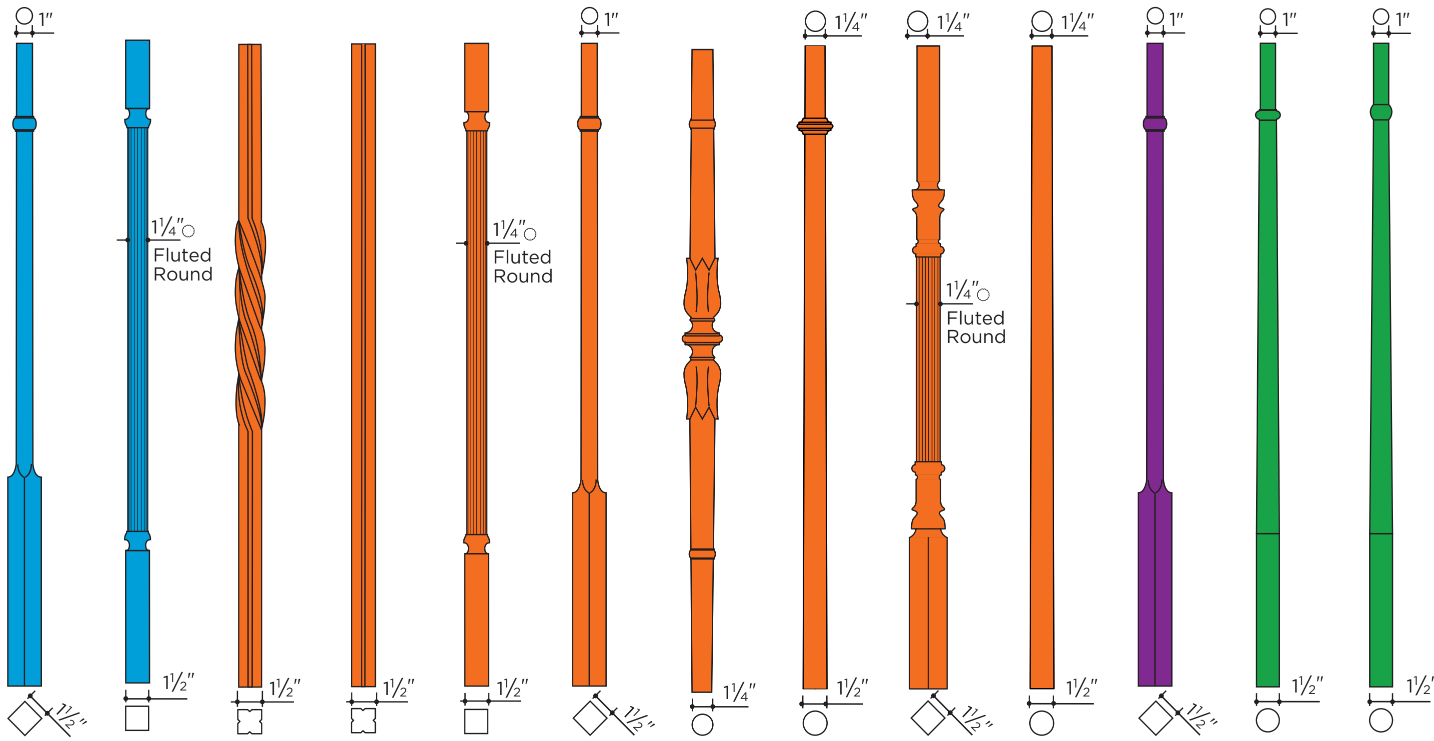
* "As Cast" finish, no lacquer

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

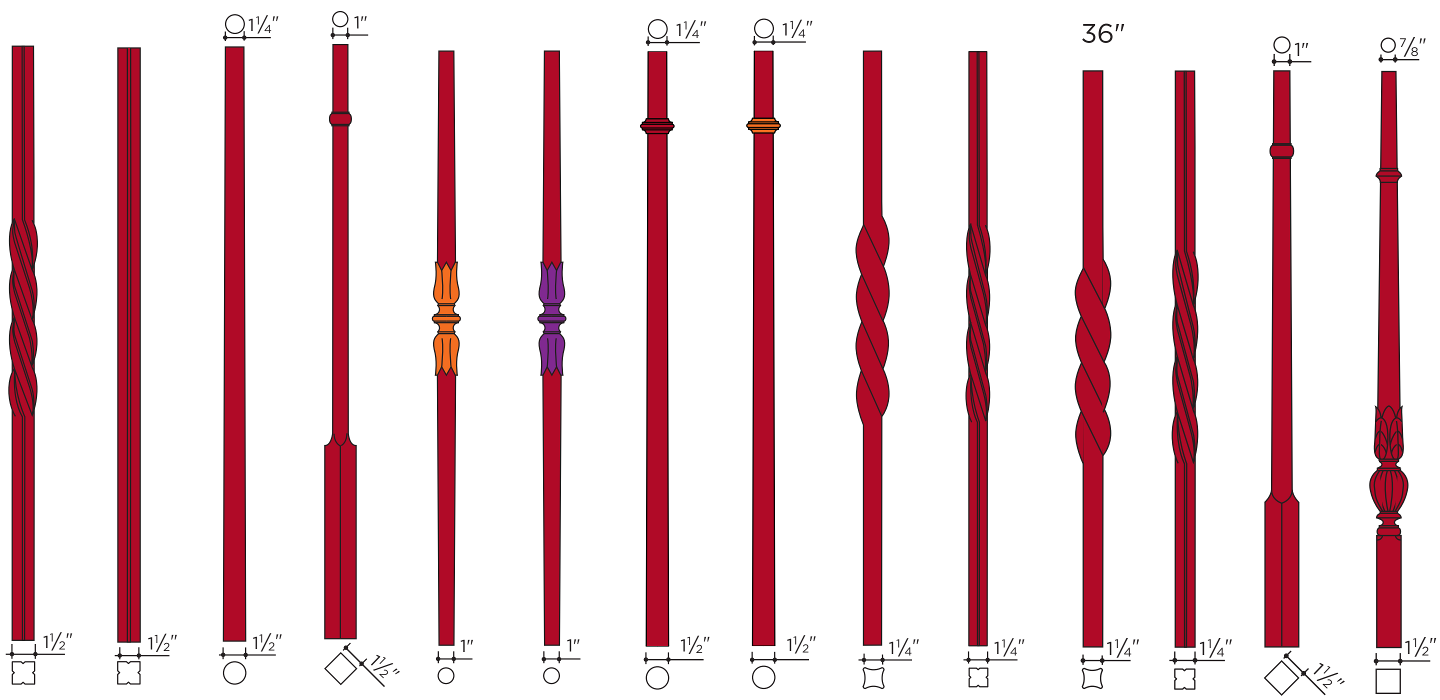
ALUMINUM BRONZE NICKEL-SILVER MALLEABLE IRON/STEEL STAINLESS

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 pg. 52-53.

40″



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



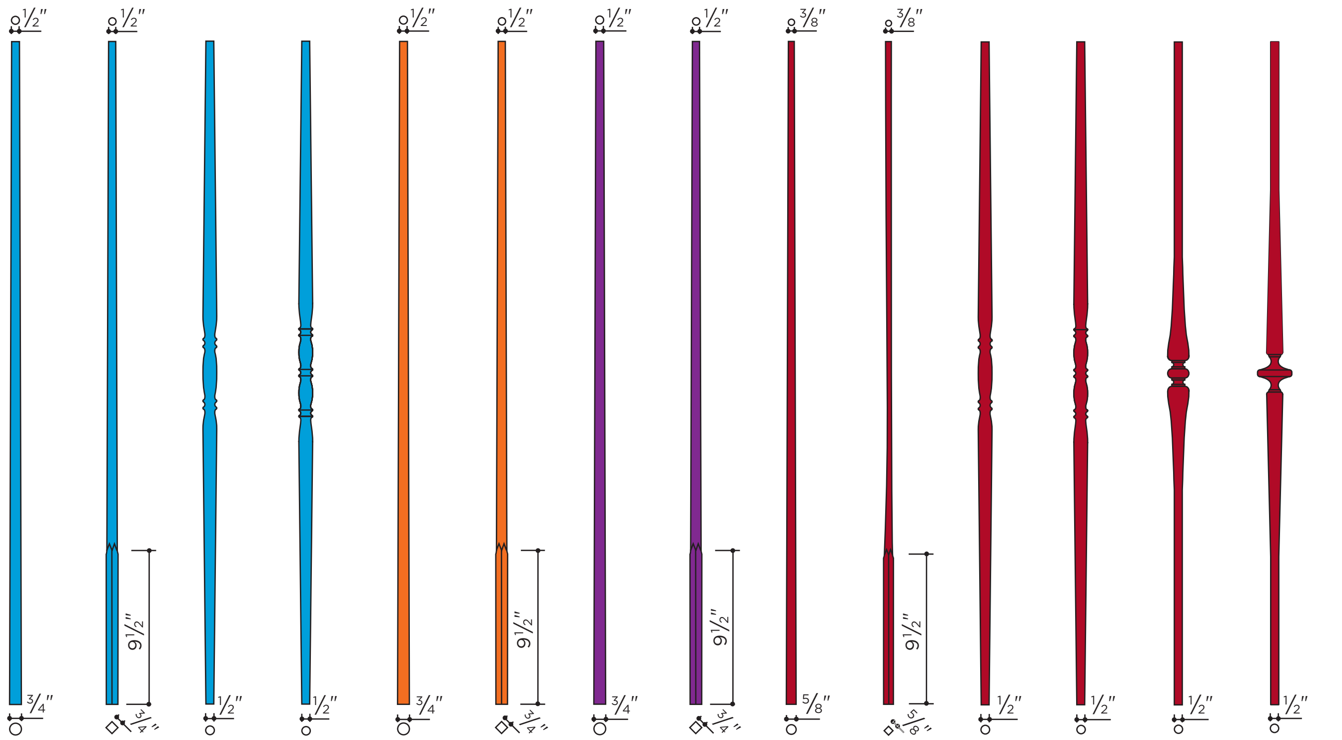
347L	345L	326L	331L	340	341	155	156	332L	343L
Forged Steel	Forged Steel	Forged Steel	Forged Steel	Steel with Bronze Center	Steel with Nickel-Silver Center	Forged Steel	Forged Steel with Bronze	Forged Steel	Forged Steel

332	343	331	333
Forged Steel	Forged Steel	Forged Steel	Malleable Iron

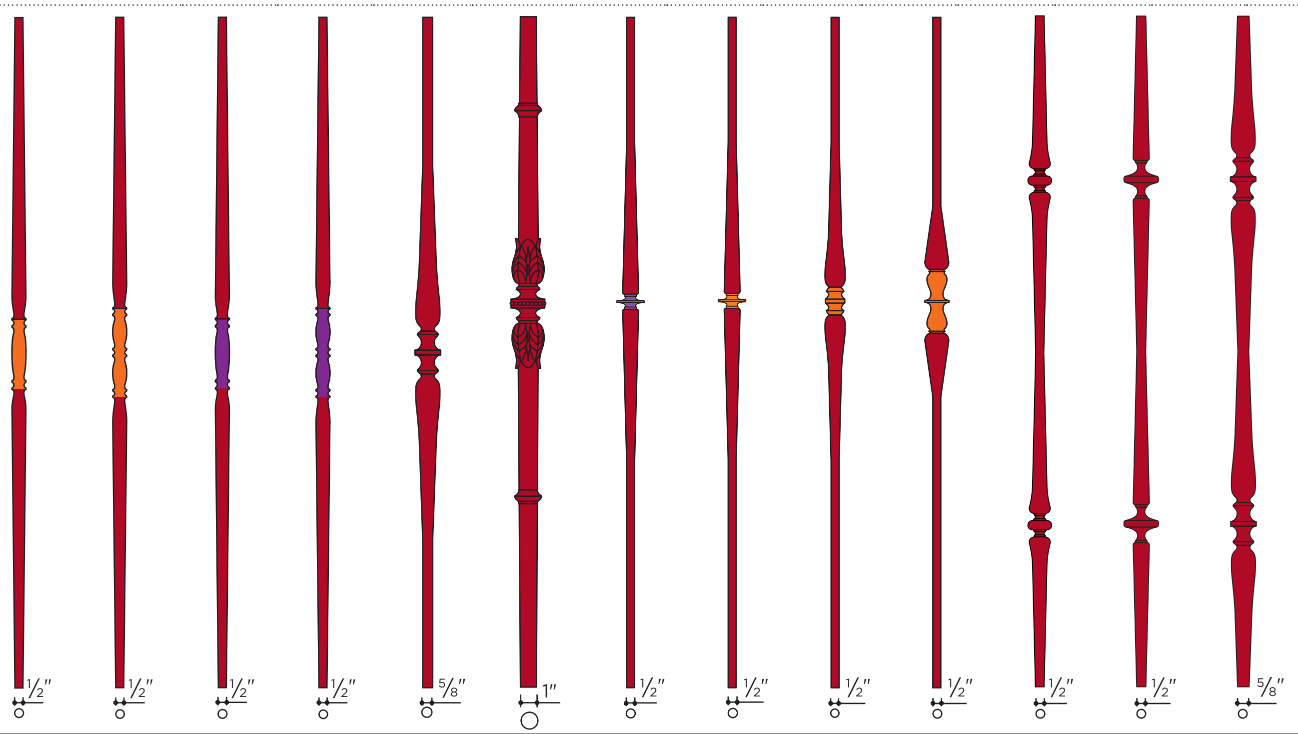
ALUMINUM BRONZE NICKEL-SILVER STEEL / MALLEABLE IRON

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 pg. 52-53.

42″ Scale: 1″ = 1′-0″



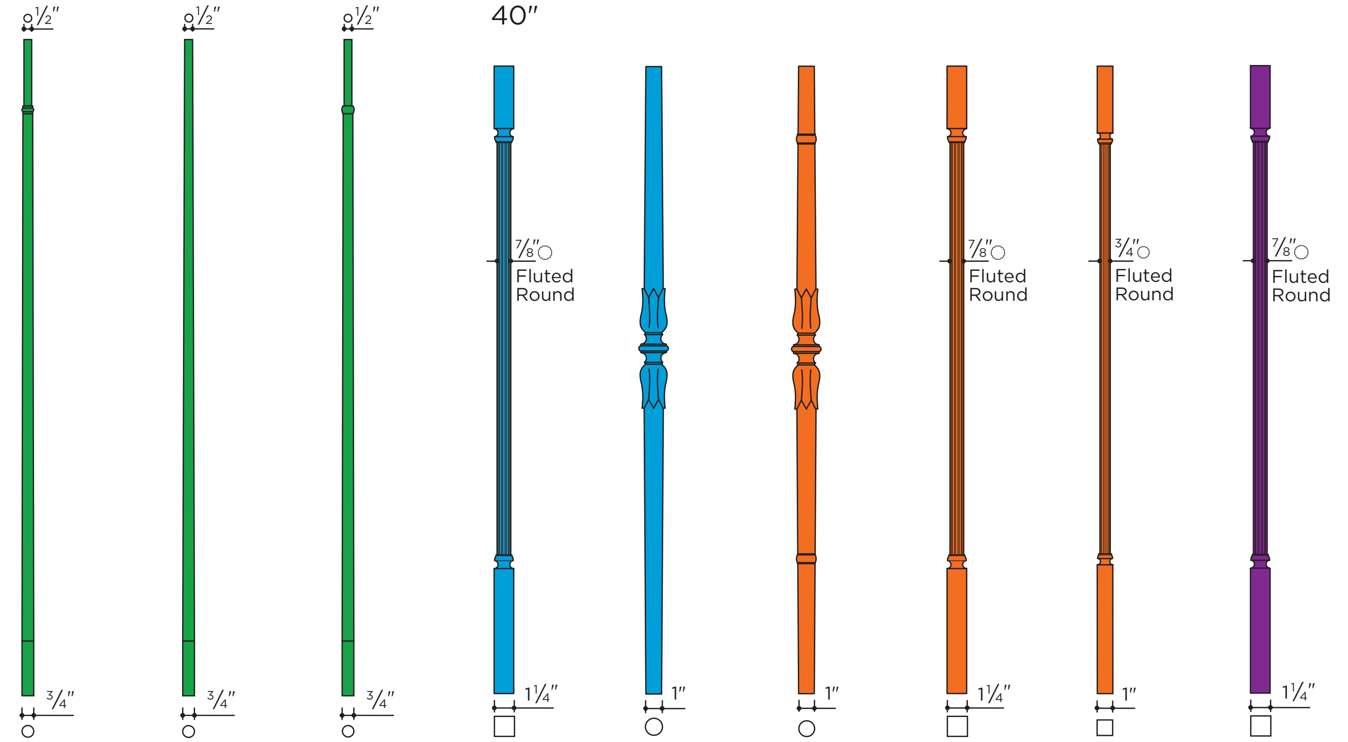
739L	730L	723L	724L	129L	130L	29L	30L	329L	330L	323L	324L	325L	327L
Aluminum	Aluminum	Aluminum	Aluminum	Bronze	Bronze	Nickel-Silver	Nickel-Silver	Steel	Steel	Forged Steel	Forged Steel	Forged Steel	Forged Steel



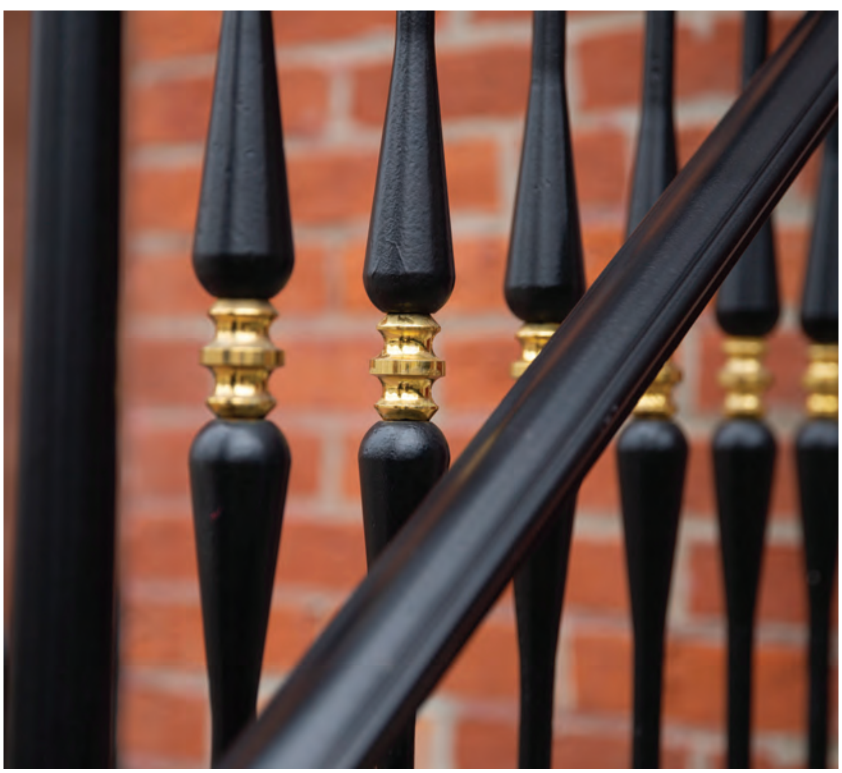
123L	124L	23L	24L	328L	334L	336L	337L	338L	339L	325DL	327DL	328DL
Forged Steel w/ Bronze	Forged Steel w/ Bronze	Forged Steel w/ Nickel-Silver	Forged Steel w/ Nickel-Silver	Forged Steel	Malleable Iron	Forged Steel w/ Nickel-Silver	Forged Steel w/ Bronze	Forged Steel w/ Bronze	Forged Steel w/ Bronze	Forged Steel	Forged Steel	Forged Steel

ALUMINUM BRONZE NICKEL-SILVER MALLEABLE IRON / STEEL STAINLESS

42″ Scale: 1″ = 1′-0″



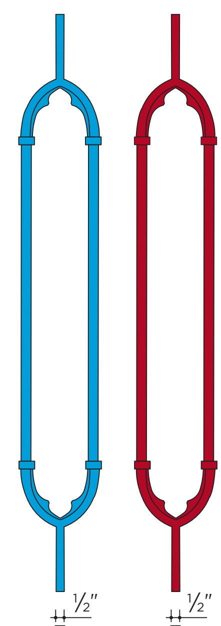
682	683	684	735	740	234	235	239	236
Stainless	Stainless	Stainless	Aluminum	Aluminum	Bronze	Bronze	Bronze	Nickel-Silver



Oyler School, Cincinnati, OH | Fabricator: Bluegrass Iron Works, Ludlow, KY
Designer: Steve Hollingsworth, KY

ORNAMENTAL VALANCE BARS

36″
Conforms to 4″ sphere requirement

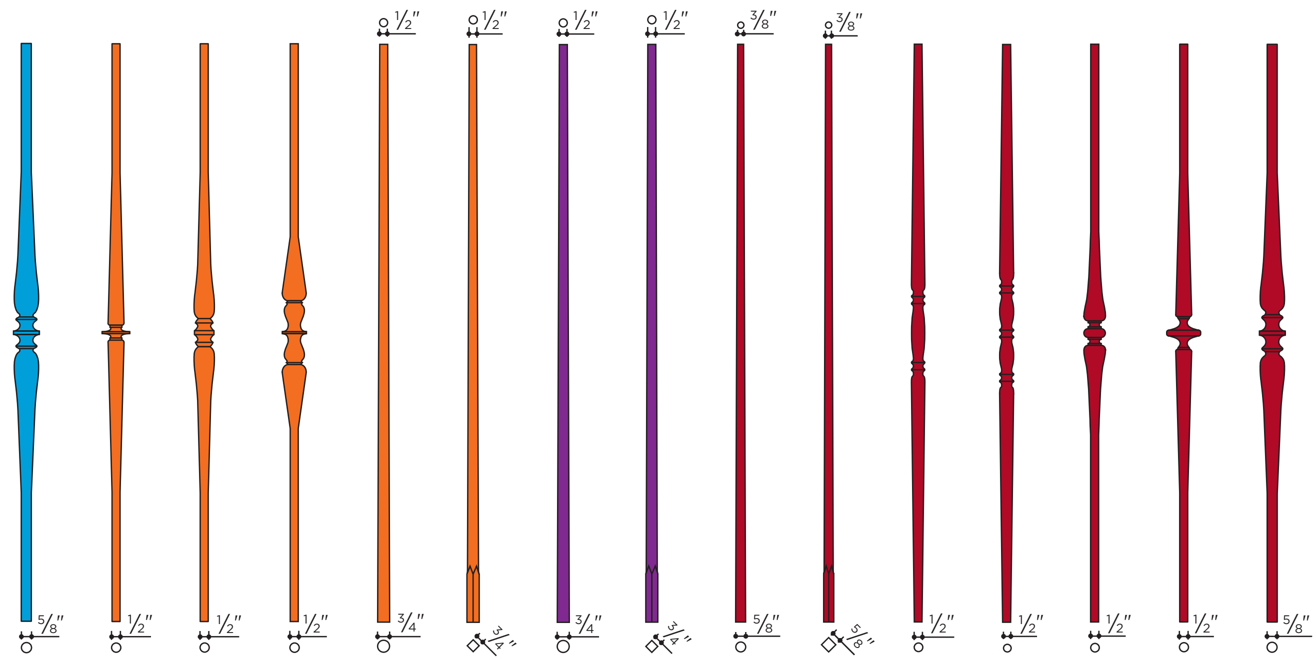


1973	Aluminum
973	Malleable Iron

ALUMINUM BRONZE NICKEL-SILVER STEEL

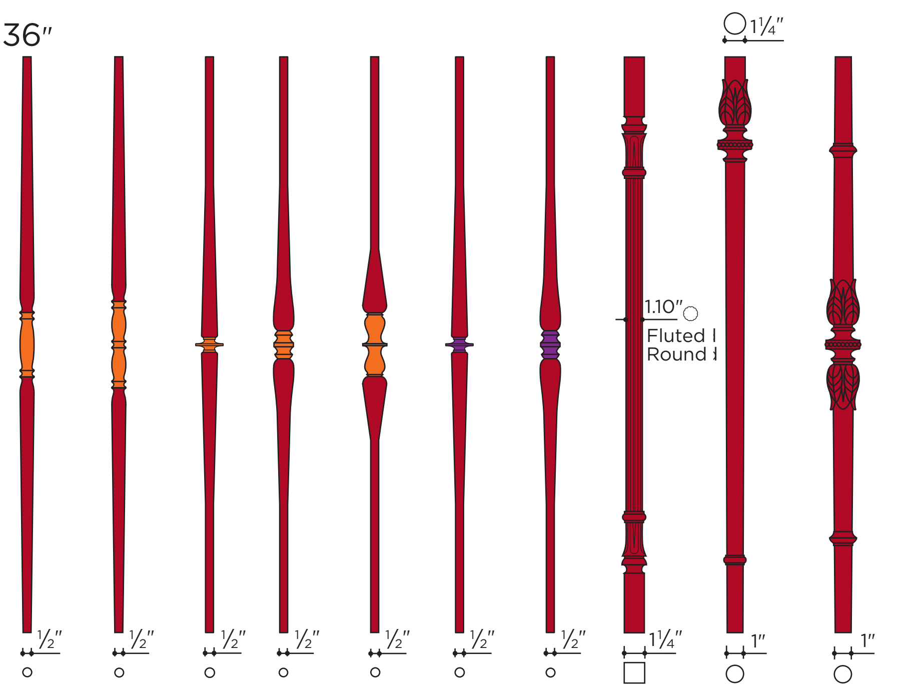
Scale: 1″ = 1′-0″

36″

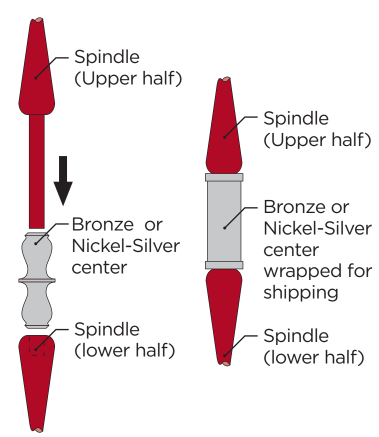


718	137	138	139	129	130	29	30	329	330	323	324	325	327	328
Aluminum	Bronze	Bronze	Bronze	Bronze	Bronze	Nickel-Silver	Nickel-Silver	Steel	Steel	Forged Steel	Forged Steel	Forged Steel	Forged Steel	Forged Steel

36″



123	124	337	338	339	336	358	335	154	334
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



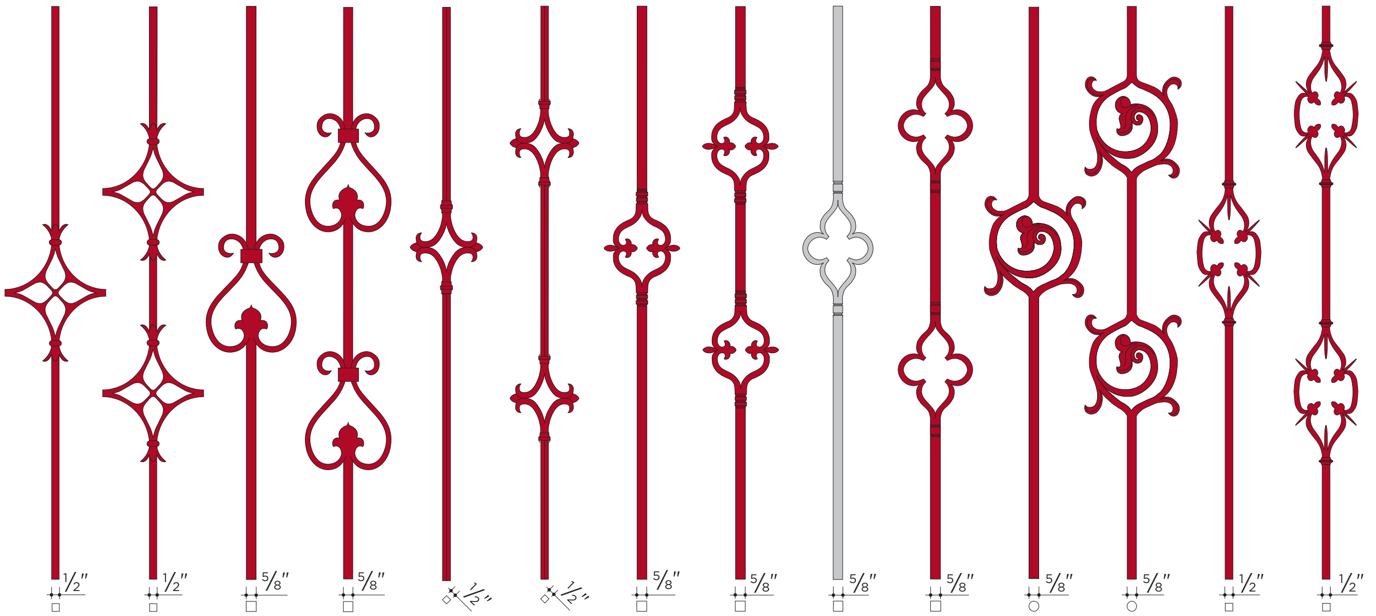
Bronze and Nickel-Silver Center Detail

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.

ALUMINUM MALLEABLE IRON

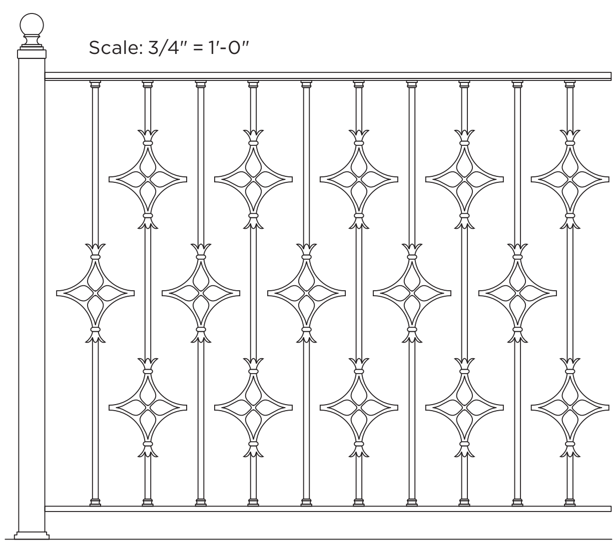
Scale: 1″ = 1′-0″

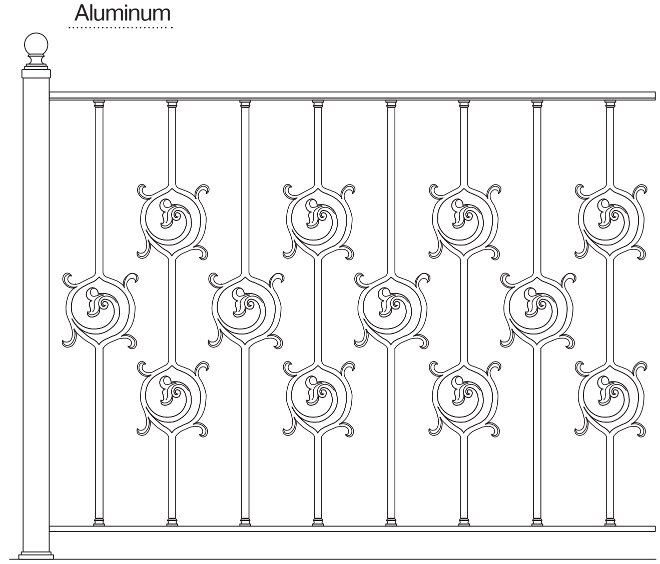
36″



528	**158**	**529**	**159**	**534**	**153**	**530**	**530D**	**531**	**531D**	**532**	**532D**	**533**	**533D**
Mal. Iron	Mal. Iron	Mal. Iron	Mal. Iron	Mal. Iron	Mal. Iron	Mal. Iron	Mal. Iron	Mal. Iron	Mal. Iron	Mal. Iron	Mal. Iron	Mal. Iron	Mal. Iron
								1531					
								Aluminum					

Scale: 3/4″ = 1′-0″





*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"

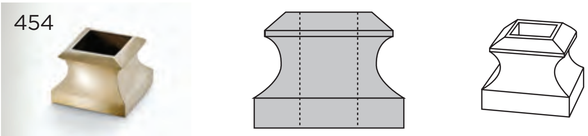
Spindle		Width at widest point
530D	Malleable Iron	5 7/8"
153	Malleable Iron	6"
159	Malleable Iron	6"
534	Malleable Iron	6"
532	Malleable Iron	6 7/16"
532D	Malleable Iron	6 7/16"
528	Malleable Iron	7"
158	Malleable Iron	7"

* See page 49

ALUMINUM BRONZE NICKEL-SILVER MALLEABLE IRON / STEEL

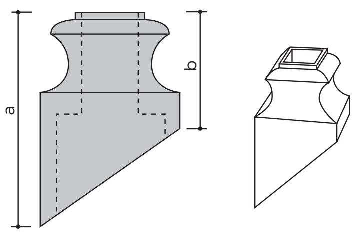
Bases, Collars and Flanges are furnished with clear holes for bar sizes shown. Non-ferrous (aluminum, bronze, nickel-silver) items are machined to match extruded sections and are satin finished, except as noted. Polished bronze and nickel-silver components are lacquered. Ferrous items are cast in malleable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

BASES



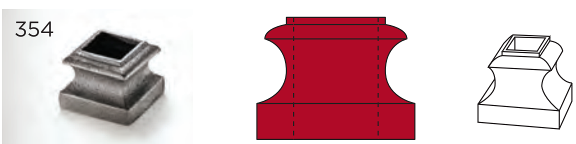
Square Hole

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"



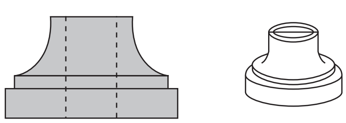
Square Hole

		Hole	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"



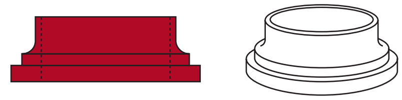
Square Hole

		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"



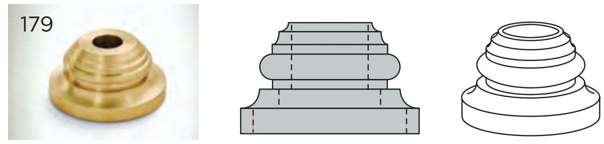
Round Hole

		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"



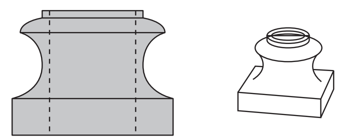
Round Hole

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



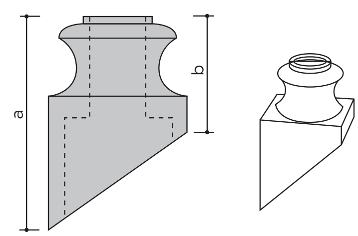
Round Hole

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

Aluminum	Bronze	Nickel-Silver	Mal. 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"



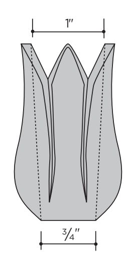
Round Hole

		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"

Round Hole

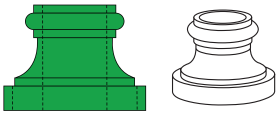
		Hole	Height
264	Bronze	1"	2 5/8"
434	Nickel-Silver	1"	2 5/8"

Matches center of 234, 340 and 341 post



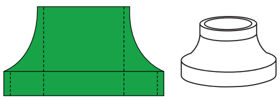
ALUMINUM | BRONZE | NICKEL-SILVER | MALLEABLE IRON/STEEL | STAINLESS

BASES



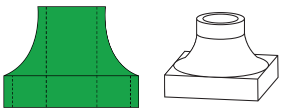
Round Hole

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



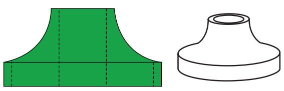
Round Hole

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



Round Hole

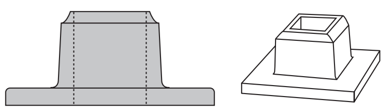
	Hole	Width	Height
694 Stainless	3/4"	2"	1 1/2"



Round Hole

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

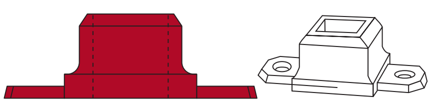
TUBE SOCKETS



Square Hole

Mal. Iron	Aluminum	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	3"	5 1/4"	2 3/8"

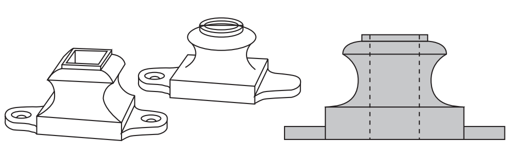
FLANGES



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"	13/16"
351	Malleable Iron	5/8"	1 3/16"	13/16"
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



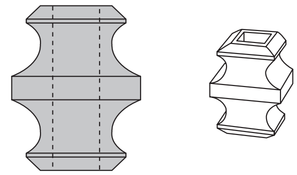
Square Hole

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

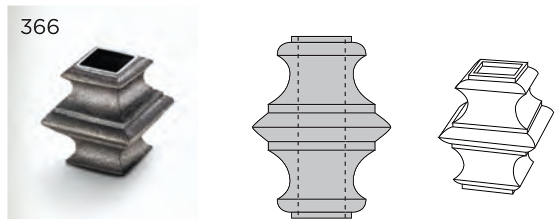
Malleable Iron	Aluminum	Bronze	Hole	Base	Height
395			3/8"	1 5/16"	1"
396	776	276	1/2"	1 5/16"	1"
397	797	297	5/8"	1 7/16"	1 1/8"

COLLARS



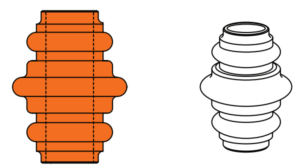
Square Hole

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"



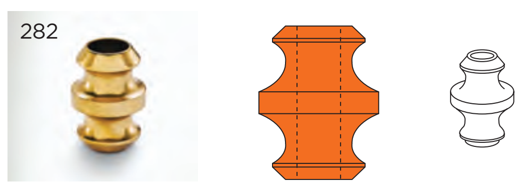
Square Hole

		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"



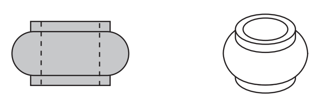
Round Hole

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



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, 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

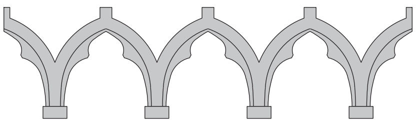
Steel	Bronze	Nickel-Silver	Hole	OD	Height
73	872		3/8"	3/4"	13/32"
74	274	474	5/8"	1"	1/2"

ALUMINUM MALLEABLE IRON

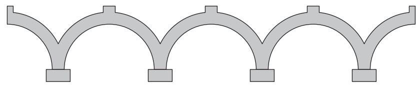
Scale: 1 ½″ = 1'-0″

ORNAMENTAL VALANCES

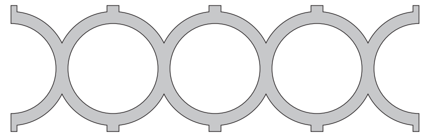
These castings are useful in various combinations to create ornamental railings with minimal openings. When used with 1/2″ square bars, the maximum opening will be 3 3/4″, thereby conforming to the 4″ sphere requirement.



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

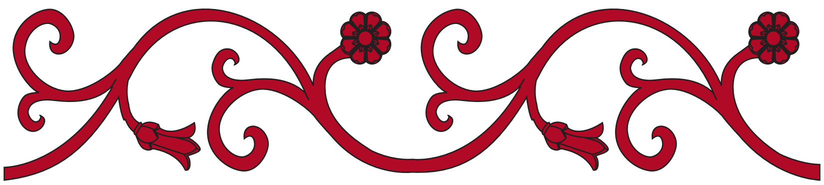


		lbs	ht	wd
1971	Aluminum	.8	3"	17"
971	Malleable Iron	2.2	3"	17"



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

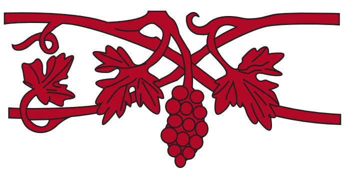
Corinthian



		lbs	ht	wd
550	Malleable Iron	6.7	7 1/8"	34"

		lbs	ht	wd
552	Malleable Iron	4.3	10"	19"

Bordeaux

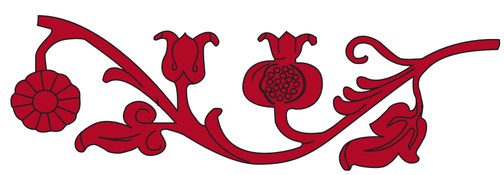


		lbs	ht	wd
514	Malleable Iron	3.4	6 1/2"	14"

Dresden

		lbs	ht	wd
572	Malleable Iron	5.7	6 7/8"	22 1/2"

Siena



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

		lbs	ht	wd
522	Malleable Iron	8.4	6 7/16"	20 3/8"

		lbs	ht	wd
523	Malleable Iron	6.9	6 7/16"	20 1/4"

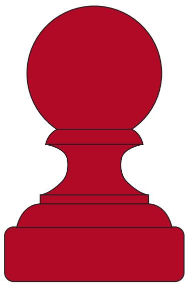
Primavera

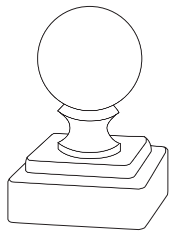
584

		lbs	ht	wd
584	Malleable Iron	9.9	6 1/2"	29"

ALUMINUM | BRONZE | STAINLESS | MALLEABLE IRON / STEEL

BALL CAPS



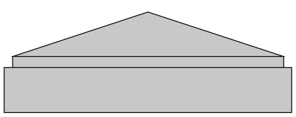


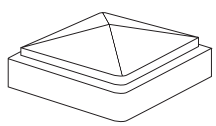
Rounded inside corners

		Tube Size	Ball Diam.	Height
5320	Malleable Iron	2" × 2"	1 13/16"	3¾"
5325	Malleable Iron	2½" × 2½"	2⅛"	4⅛"
5330	Malleable Iron	3" × 3"	2 3/16"	4⅝"
5335	Malleable Iron	3½" × 3½"	2½"	5⅛"
5340	Malleable Iron	4" × 4"	2¾"	5½"

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	1½" × 1½"
5620	Mal. Iron	2" × 2"
5625	Mal. Iron	2½" × 2½"
5632	Mal. Iron	3" × 2"
5630	Mal. Iron	3" × 3"
5635	Mal. Iron	3½" × 3½"
5640	Mal. Iron	4" × 4"
5642	Mal. Iron	4" × 2"
56425	Mal. Iron	4" × 2½"
5643	Mal. Iron	4" × 3"
5652	Mal. Iron	5" × 2"
56525	Mal. Iron	5" × 2½"
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"

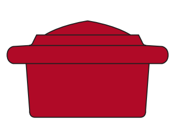
Satin Finish

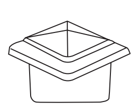
		Tube Size
5720	Cast Bronze	2" × 2"
5730	Cast Bronze	3" × 3"
5740	Cast Bronze	4" × 4"
5784	Cast Bronze	8" × 4"

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"

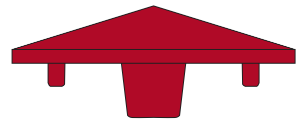
DRIVE-ON CAP





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

CAP TYPE C

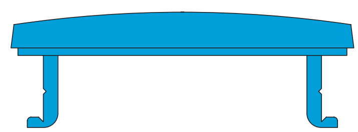


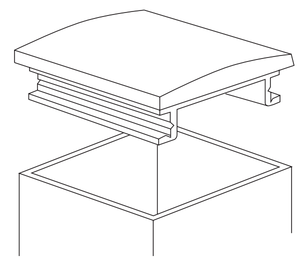
		Tube Size*
5415	Malleable Iron	1½" × 1½"
5440	Malleable Iron	4" × 4"

* 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 ⅛" wall tubing with sharp corners and are easily ground down to fit 3/16" or ¼" wall tubing.

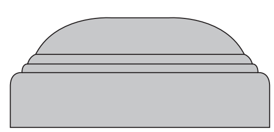


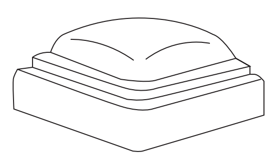


		Tube Size
5120	Extruded Aluminum	2" × 2"
5130	Extruded Aluminum	3" × 3"
5132	Extruded Aluminum	3" × 2"
5140	Extruded Aluminum	4" × 4"
5142	Extruded Aluminum	4" × 2"
5143	Extruded Aluminum	4" × 3"
5152	Extruded Aluminum	5" × 2"
5153	Extruded Aluminum	5" × 3"
5162	Extruded Aluminum	6" × 2"
5163	Extruded 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.



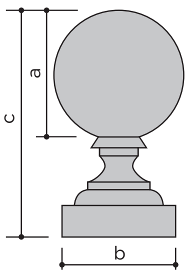


		Tube Size
5920	Pressed Steel	2" × 2"
5925	Pressed Steel	2½" × 2½"
5930	Pressed Steel	3"× 3"
5935	Pressed Steel	3½" × 3½"
5943	Pressed Steel	4" × 3"
5940	Pressed Steel	4" × 4"
5963	Pressed Steel	6" × 3"
5933	Pressed Stainless Steel	3" × 3"
5944	Pressed Stainless Steel	4" × 4"

ALUMINUM BRONZE NICKEL-SILVER MALLEABLE IRON

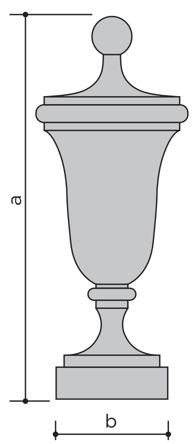
URN AND BALL FINIALS

Bronze, nickel-silver and aluminum urns and finials are polished. Bronze and nickel-silver items are clear lacquered. All urns and finials are supplied with a 3/8" tapped hole in the base. Finial & urn bases see pg. 44.



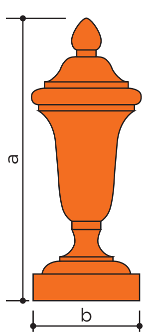
Square Base		a	b	c
3145	Bronze	2"	1 3/4"	3 1/2"
3144	Bronze	1 3/4"	1 1/2"	3 1/8"
3143	Bronze	1 1/2"	1 1/4"	2 3/4"
3142	Bronze	1 1/4"	1 1/8"	2 3/8"
3545	Mal. Iron	2"	1 3/4"	3 1/2"
3544	Mal. Iron	1 3/4"	1 1/2"	3 1/8"
3543	Mal. Iron	1 1/2"	1 1/4"	2 3/4"
3542*	Mal. Iron	1 1/4"	1 1/8"	2 3/8"
3541	Mal. Iron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



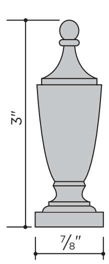
Square Base		a	b
3323	Aluminum	3"	1"
3126	Bronze	6"	1 3/4"
3125	Bronze	5"	1 1/2"
3124	Bronze	4"	1 1/4"
3123	Bronze	3"	1"
3526	Malleable Iron	6"	1 3/4"
3525	Malleable Iron	5"	1 1/2"
3524	Malleable Iron	4"	1 1/4"
3523	Malleable Iron	3"	1"

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"



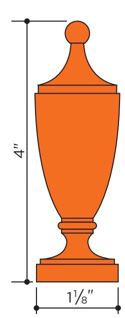
Square Base		a	b
3134	Bronze	4"	1 1/2"
3133	Bronze	3"	1"

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



Round Base	
3277†	Aluminum
3073	Bronze

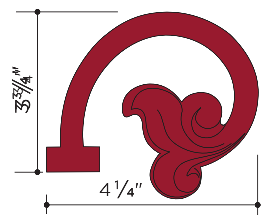
† Unpolished



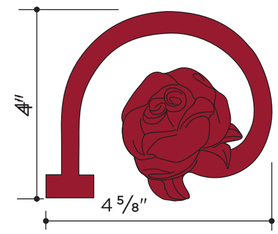
Round Base	
3064	Bronze

SPINDLE TOPS

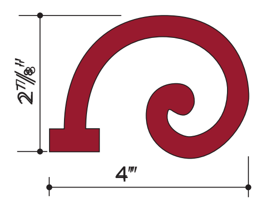
Spindle tops may be used above and/or below 1/2" square bar and may be adjusted to any angle. Scale: 3" = 1'-0"



526-R 1.04 lbs



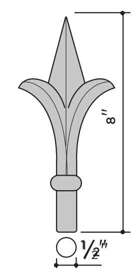
572-R 1.00 lbs



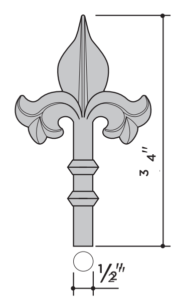
598-R 0.60 lbs

PICKETS

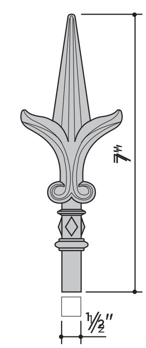
Shanks: 1" lengths



3 Aluminum
4 Malleable Iron



11 Aluminum
12 Malleable Iron

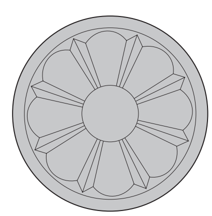


53 Aluminum
54 Malleable Iron

All castings are double faced

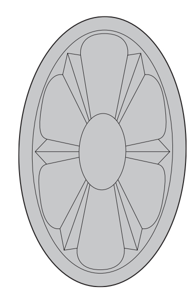
CAST ROSETTES

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



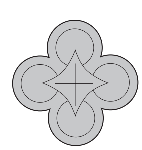
		OD
2454	Aluminum	2 3/4"
2654	Bronze	2 3/4"
1654	Nickel-Silver	2 3/4"
2554*	Malleable Iron	2 3/4"

* As Cast



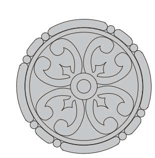
		OD
2453	Aluminum	3 5/16" x 2 1/16"
2653	Bronze	3 5/16" x 2 1/16"
1653	Nickel-Silver	3 5/16" x 2 1/16"
2553*	Malleable Iron	3 1/2" x 2 3/16"

* 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"

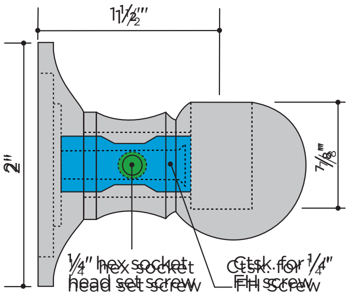
* As Cast

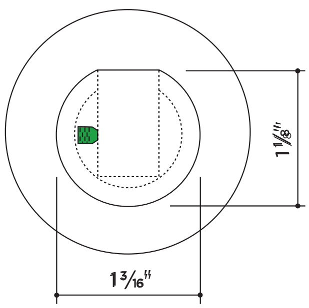
BRONZE NICKEL-SILVER STEEL

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.

PLAIN SPINDLE CUP

Rounded Hole

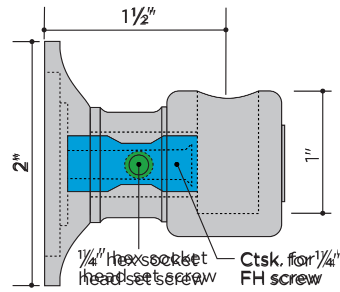


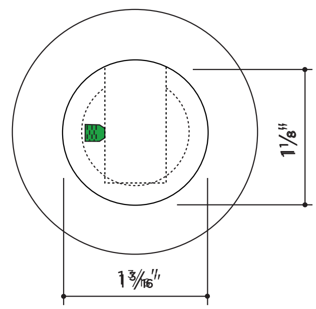


		Hole
883	Bronze	1/2"
183	Nickel-Silver	1/2"
1983	Steel	1/2"

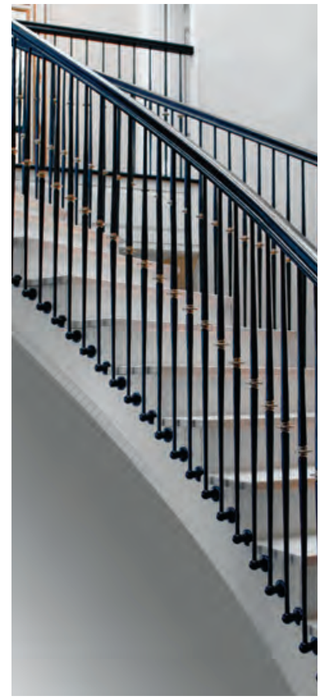
RINGED SPINDLE CUP

Rounded Hole



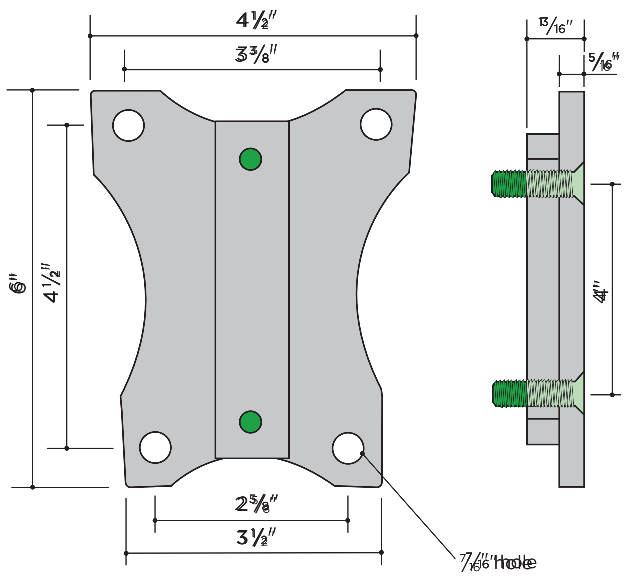


		Hole
884	Bronze	1/2"
184	Nickel-Silver	1/2"
1984	Steel	1/2"

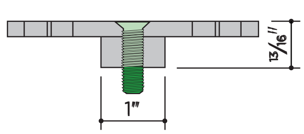


Private Home, San Francisco, CA.

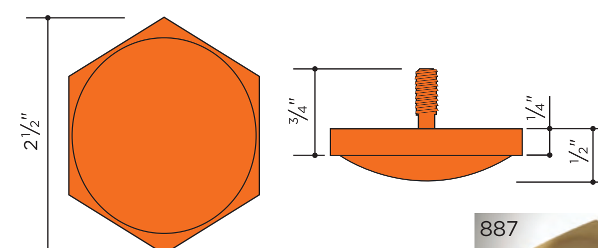
TRADITIONAL POST FASCIA FLANGE

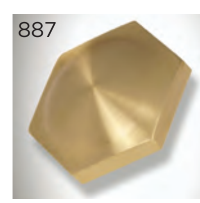


888	Bronze
198	Nickel-Silver
1988	Steel



TRADITIONAL POST LOWER COVER

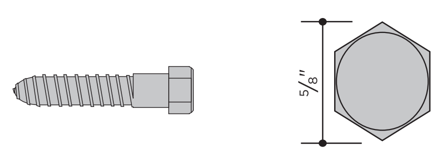




887	Bronze

DECORATIVE HEX HEAD LAG SCREW

For mounting fascia flange



Brass	Finished Head	3/8" × 2"
Nickel-Silver	Finished Head	3/8" × 2"

TREILLAGE & ORNAMENTAL RAILING PANELS

Private Residence, New York, NY

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.

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.

ORNAMENTAL COLLARS

Designed to fit over ½″ or ⅝″ 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.

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 does 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 it 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.

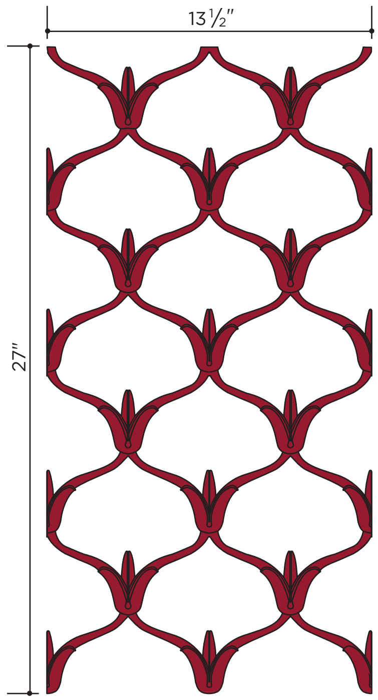
Malleable Iron Castings are not priced to compete with gray iron castings. Despite the unsuitability of gray iron for intricate ornamental castings, many ornamental patterns are offered in this cheaper material. Since the manufacture of gray iron castings requires fewer operations than heat-treated malleable 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 due to the initial lower cost. In the long run, its permanence and the 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.

ALUMINUM MALLEABLE IRON

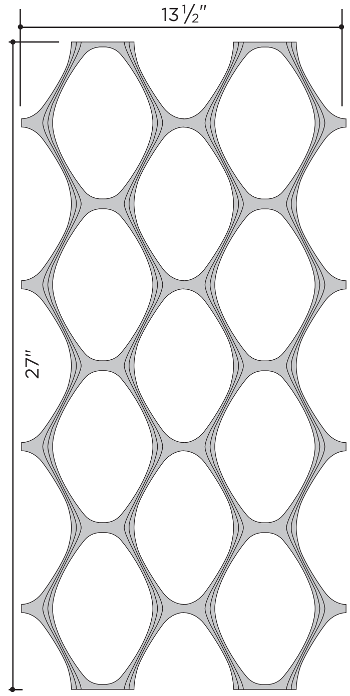
All castings are double faced. Scale: 1½″ = 1′-0″

AMSTERDAM



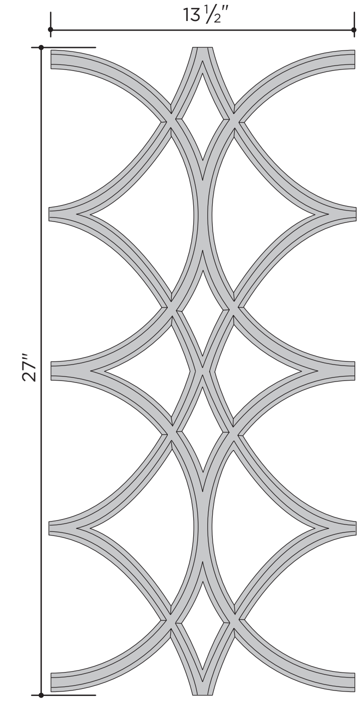
590	Malleable Iron	10.5 lbs

GOSSAMER



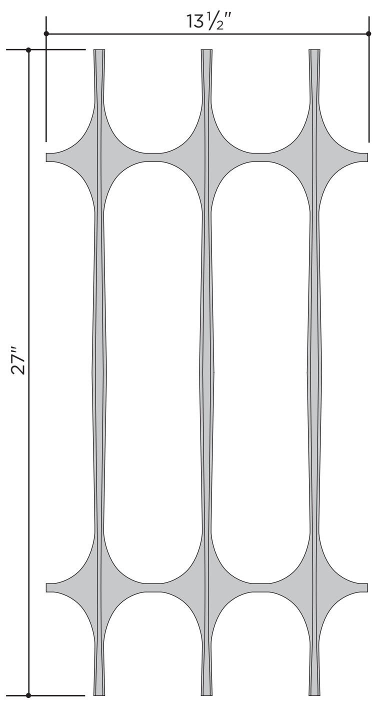
1585	Aluminum	3.4 lbs
585	Mal. Iron	10.2 lbs

ARABESQUE



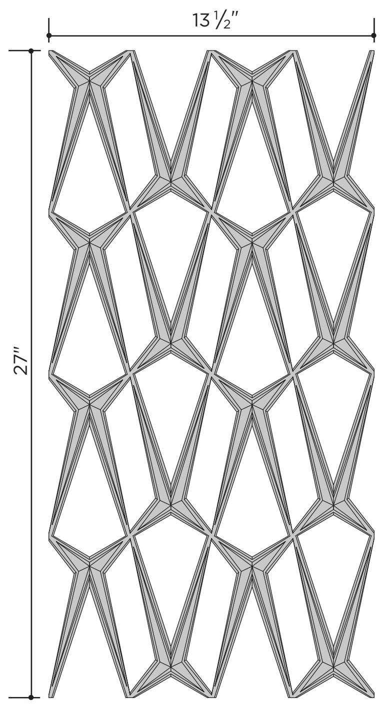
1961	Aluminum	2.6 lbs
961	Mal. Iron	7.7 lbs

SENTRY



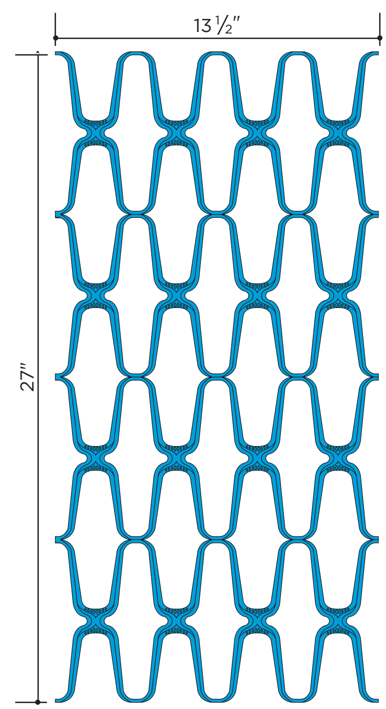
1579	Aluminum	2.8 lbs
579	Malleable Iron	8.4 lbs

CASCADE



1583	Aluminum	4.3 lbs
583	Malleable Iron	12.8 lbs

LATTICE

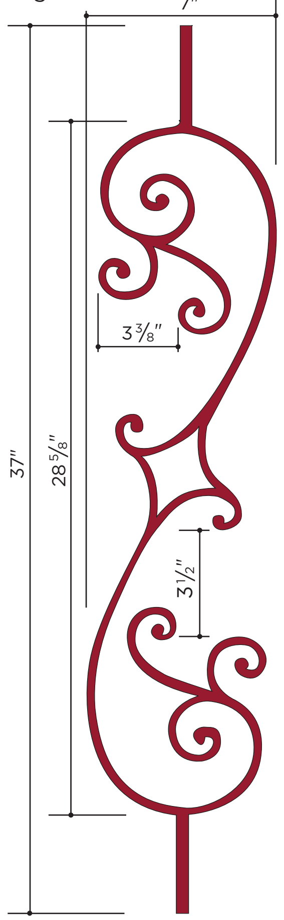


1508	Aluminum	3.1 lbs

MALLEABLE IRON

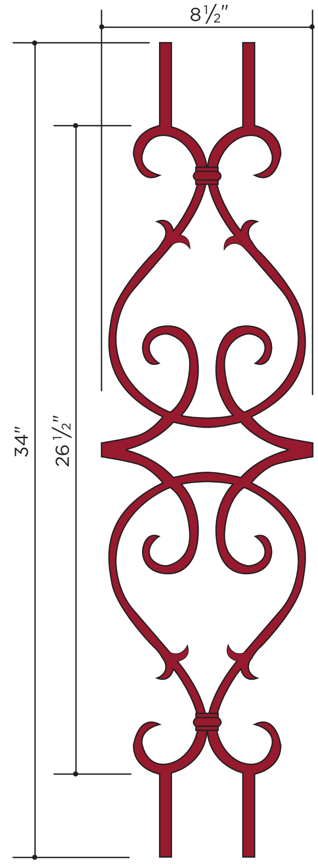
CHATEAU
Railing Panels

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

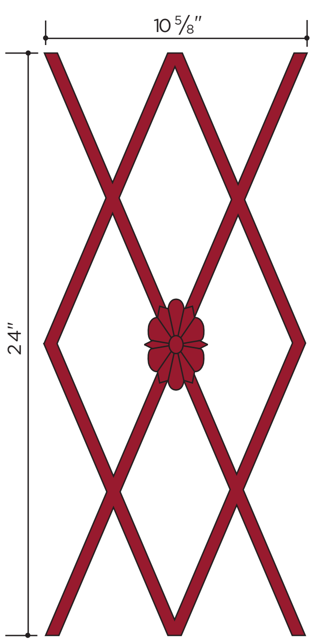


537* Malleable Iron 5.5 lbs
Cross Section: Scroll – 1/2" × 5/16"
Ends – 1/2" × 1/2"

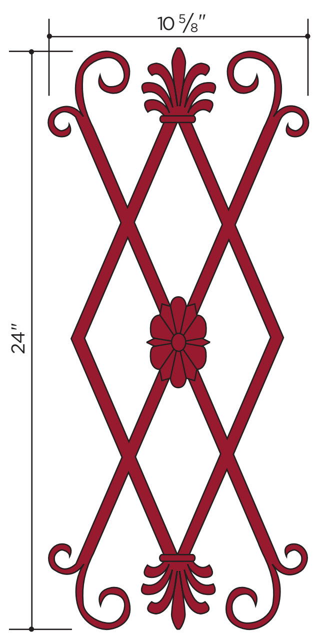
538* Malleable Iron 7.0 lbs
Cross Section: Scroll – 5/8" × 7/16"
Ends – 1/2" × 1/2"



539* Malleable Iron 7.8 lbs
Cross Section: Scroll – 5/8" × 7/16"
Ends – 1/2" × 1/2"



540 Malleable Iron 9 lbs
Cross Section: 5/8" × 1/2"



541* Malleable Iron 10 lbs
Cross Section: 5/8" × 1/2"

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

Panels 540 and 541 may be combined both horizontally and vertically.

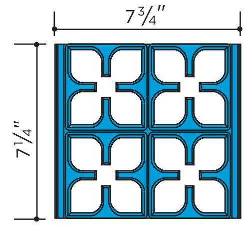
ALUMINUM MALLEABLE IRON

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

TRECENTO

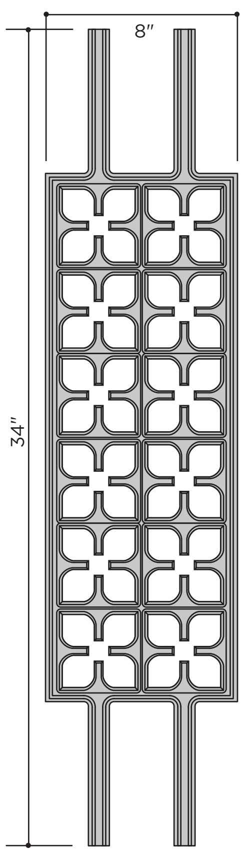
Trecento panel 1963 dovetails with mullions 6433 or 6432. Panels can be arranged in continuous runs or make right-angle turns, tees or crosses. Panels can be stacked to form solid screens or separated by lengths of filler rod 6431 to achieve a more open effect. Filler rod 6431 may also be used to close 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



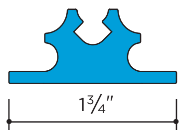
1963	Aluminum	.80 lb/ft

Railing Panel



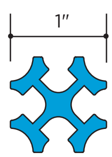
1962	Aluminum	4.3 lbs
962	Mal. Iron	12.6 lbs

Edge Mullion*
20′ lengths



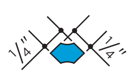
6432	Aluminum	.660 lb/ft

Mullion*
20′ lengths



6433	Aluminum	.493 lb/ft

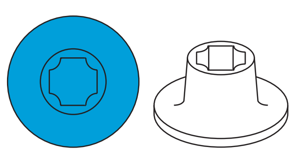
Filler Rod*
6′ lengths



6431	Aluminum	.063 lb/ft

* Scale: 6" = 1′-0"

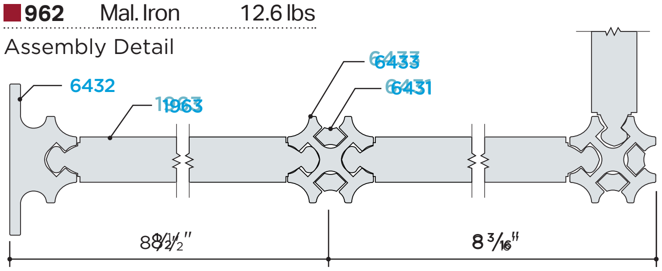
Socket



763	Aluminum	
For mullion **6433**	2¾" diameter flange	

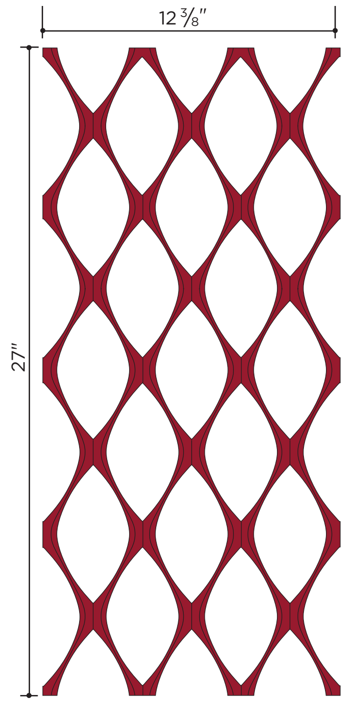
Scale: 3" = 1′-0"

Assembly Detail



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

ONDINE



960	Mal. Iron	7.9 lbs

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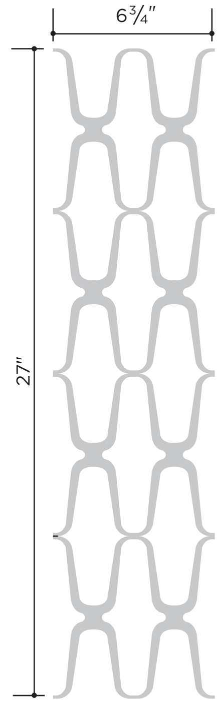
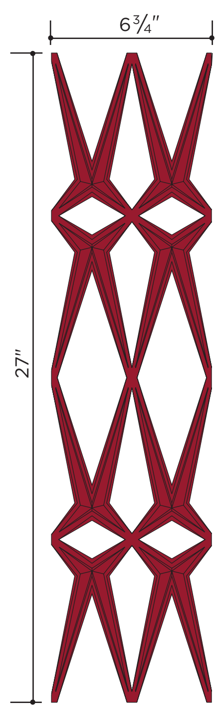


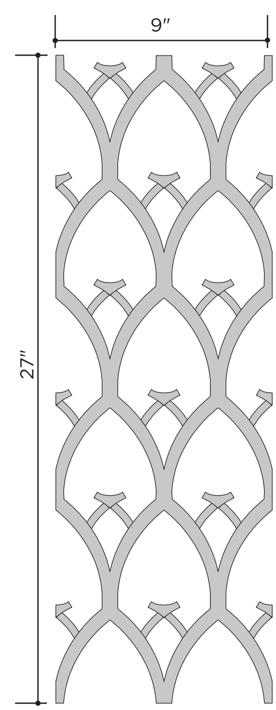
1504	Aluminum	1.5 lbs
504	Malleable Iron	4.5 lbs

DIAMOND



542	Malleable Iron	6.4 lbs

CANTERBURY



1589	Aluminum	3.0 lbs
589	Mal. Iron	8.8 lbs

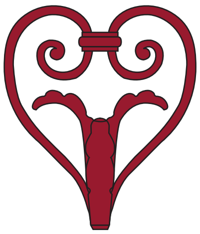
MALLEABLE IRON

All castings are double faced. Scale: 1 1⁄2″ = 1′-0″, except as noted.

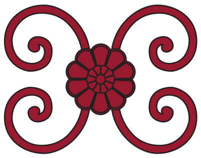
CAMBRIDGE

Ornamental Panels

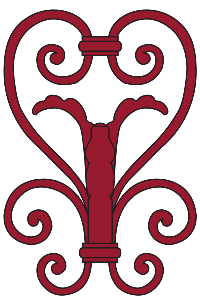
The four elements of the Cambridge design can be combined in many different ways to form panels, columns or friezes. The castings are cored to slide over a 1⁄2″ square bar.



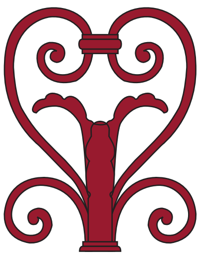
597	2.6 lbs
Ht: 9 5⁄16"	Wd: 8"



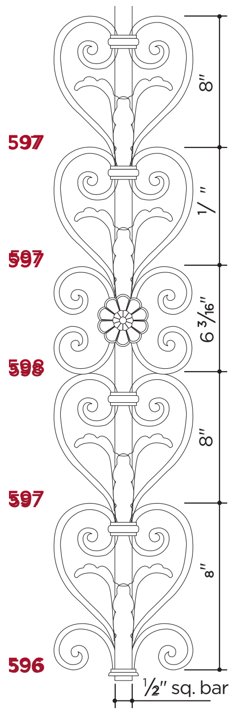
598	2.8 lbs
Ht: 6 3⁄16"	Wd: 8"



599	4.1 lbs
Ht: 11 7⁄8"	Wd: 8"



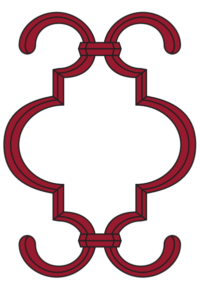
596	3.6 lbs
Ht: 10 1⁄8"	Wd: 8"



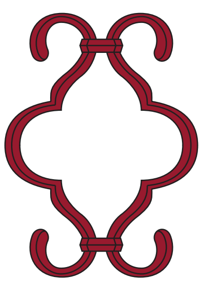
EMPIRE

For 1⁄2″ square bar

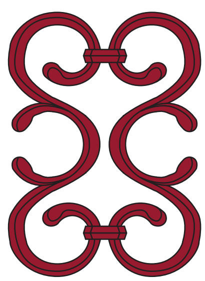
Diamond-shaped cross section gives these panels a distinctive style.



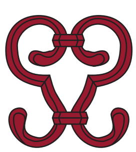
963	1.76 lbs
Ht: 11"	Wd: 8"



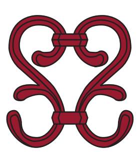
964	2.03 lbs
Ht: 11"	Wd: 8"



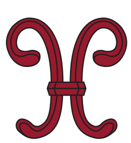
965	2.72 lbs
Ht: 11"	Wd: 8"



967	1.04 lbs
Ht: 5 1⁄2"	Wd: 5 1⁄4"

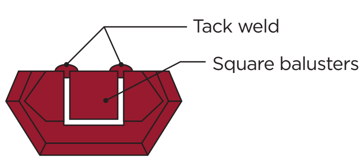


968	1.14 lbs
Ht: 5 1⁄2"	Wd: 5 1⁄4"



969	.82 lbs
Ht: 5"	Wd: 5"

TYPICAL SECTION THROUGH COLLARS



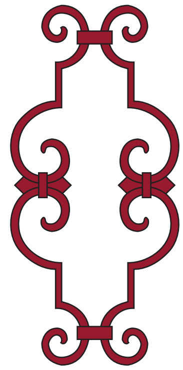
Empire and Florentine collars are open on the reverse to fit over square bar. Cambridge and Ornamental Collars are cored to slide over square bar.

FLORENTINE

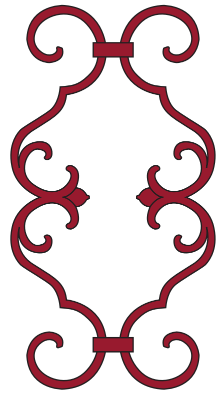
Railing Panels

For 1⁄2″ square bar, except as noted

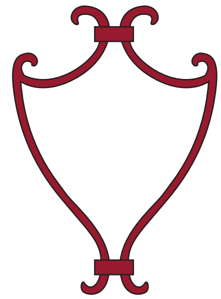
Florentine collars are open on one side for easy installation over square bar by tack welding.



559	3.0 lbs
Ht: 15"	Wd: 7"
562*	3.8 lbs
Ht: 15"	Wd: 7"

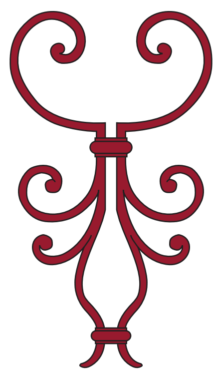


560	3.6 lbs
Ht: 16"	Wd: 8 1⁄2"
563*	3.9 lbs
Ht: 16"	Wd: 8 1⁄2"

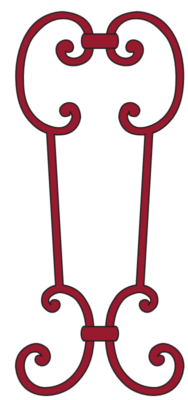


561	1.9 lbs
Ht: 12"	Wd: 8 1⁄2"
564*	2.6 lbs
Ht: 12"	Wd: 8 1⁄2"

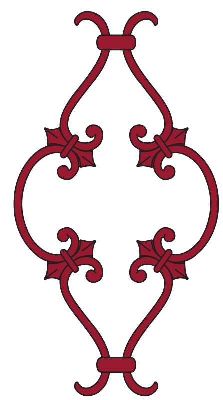
* For 5⁄8" square bar



565	3.3 lbs
Ht: 15"	Wd: 8 1⁄2"



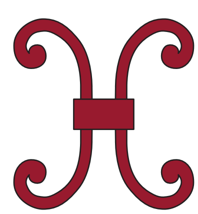
566	2.9 lbs
Ht: 16"	Wd: 7"



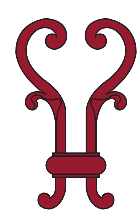
567	3.3 lbs
Ht: 16"	Wd: 8 1⁄2"

ORNAMENTAL COLLARS†

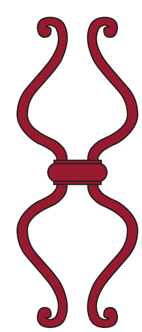
These collars are cored to slide over 1⁄2″ square bar except as noted. Collars are easily applied and can be fastened by screws or by tack welding.



543	.870 lbs
Ht: 4 3⁄4"	Wd: 4 1⁄2"
535*	1.160 lbs
Ht: 4 7⁄8"	Wd: 4 1⁄2"



544	.685 lbs
Ht: 4 3⁄4"	Wd: 3"
545*	.686 lbs
Ht: 4 3⁄4"	Wd: 3"



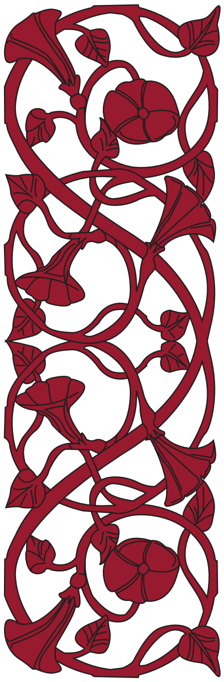
546	.767 lbs
Ht: 7 3⁄4"	Wd: 3"
547*	.865 lbs
Ht: 7 3⁄4"	Wd: 3"

† Scale: 2 1⁄2″ = 1″- 0″ * For 5⁄8″ square bar

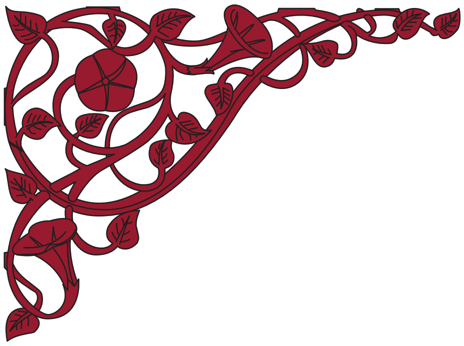
MALLEABLE IRON

All castings are double faced. Scale: 1 ½″ = 1′-0″

SOMERSET



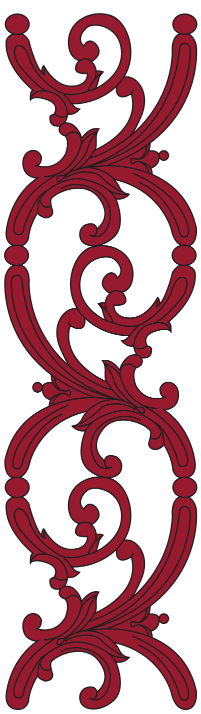
580 13.0 lbs
Ht: 28" Wd: 9"
Railing Panel



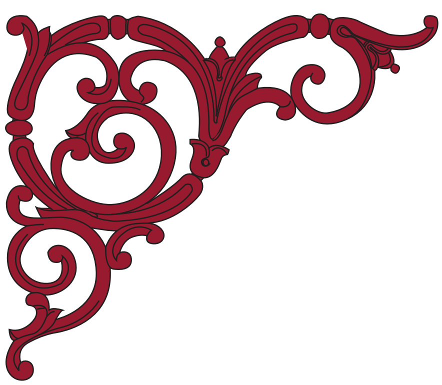
582 6.5 lbs
Ht: 14" Wd: 19"
Corner Bracket

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

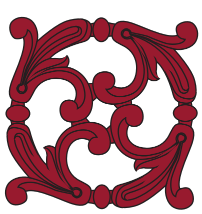
REGENCE



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



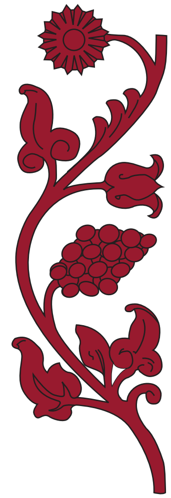
577 8.2 lbs Ht: 15¼" Wd: 18"
Corner Bracket



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

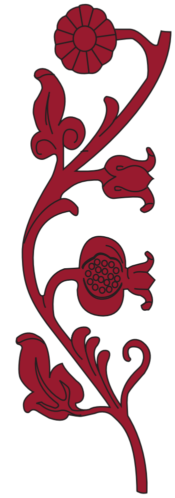
SIENA

520 10.5 lbs
Ht: 24⅞" Wd: 6 7/16"
Railing Panel

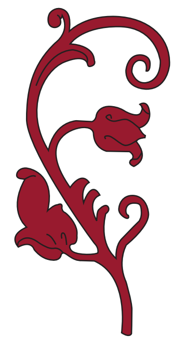


522 8.4 lbs
Ht: 20⅜" Wd: 6 7/16"
Continuous design

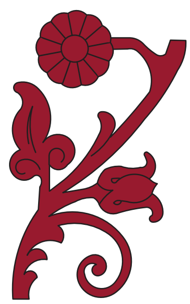
Repeat or alternate **522** and **523** for continuous runs in columns or friezes.



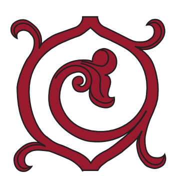
523 6.9 lbs
Ht: 20¼" Wd: 6 7/16"
Continuous design



525 4.2 lbs
Ht: 13⅝" Wd: 6 7/16"
End Panel

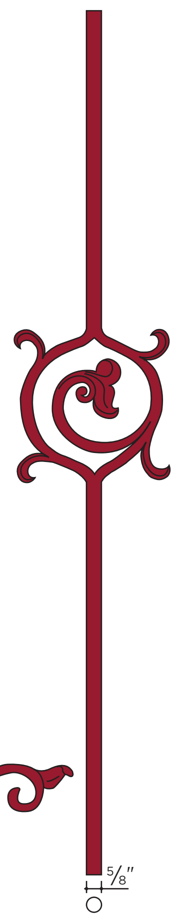


524 4.3 lbs
Ht: 12" Wd: 6 7/16"
Starting Panel

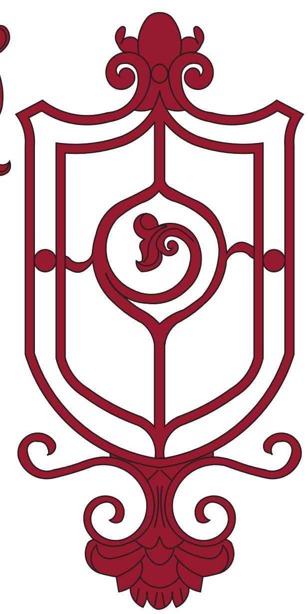


526 2.6 lbs
Ht: 6 7/16" Wd: 6 7/16"
Corner Rosette

527 3.7 lbs
Ht: 7" Wd: 13⅜"
Corner Bracket



532 5.0 lbs
Ht: 36"
Baluster Bar

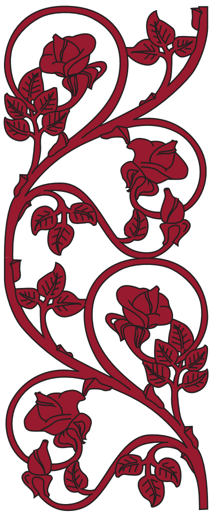


521 16.0 lbs
Ht: 24⅞" Wd: 12"
Railing Panel

■ MALLEABLE IRON

All castings are double faced. Scale: 1½″ = 1′-0″

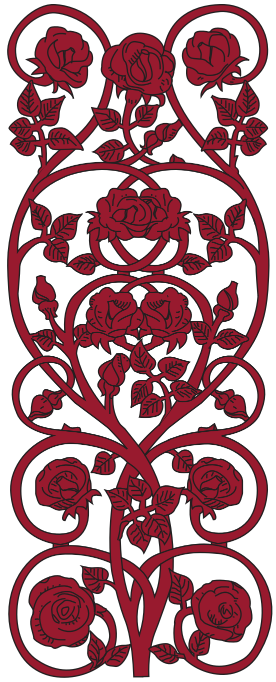
DRESDEN



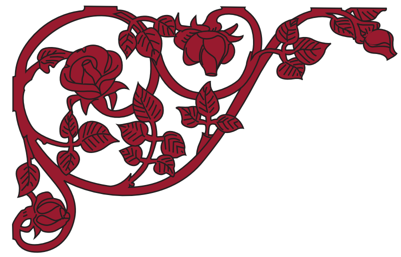
569 6.5 lbs
Ht: 21" Wd: 8½"
Continuous design

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

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

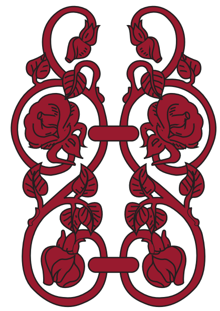


571 14.0 lbs
Ht: 28" Wd: 11"
Railing Panel



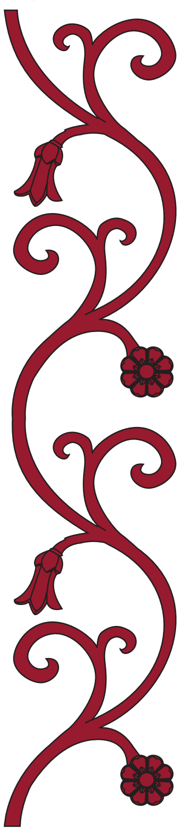
574 5.0 lbs
Ht: 10¼" Wd: 16"
Corner Bracket

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



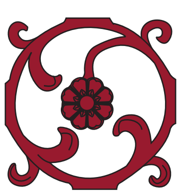
570 4.1 lbs
Ht: 12½" Wd: 8½"
Collar
Collar is open on one side to fit over ½" square bar

CORINTHIAN



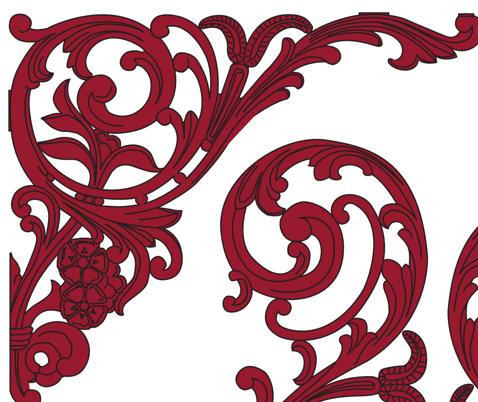
550 6.7 lbs
Ht: 34" Wd: 7⅛"
Continuous design

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

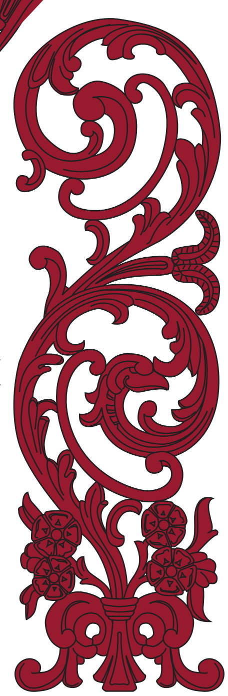


551 2.4 lbs
Ht: 7⅛" Wd: 7⅛"
Corner Rosette

ROCOCO



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



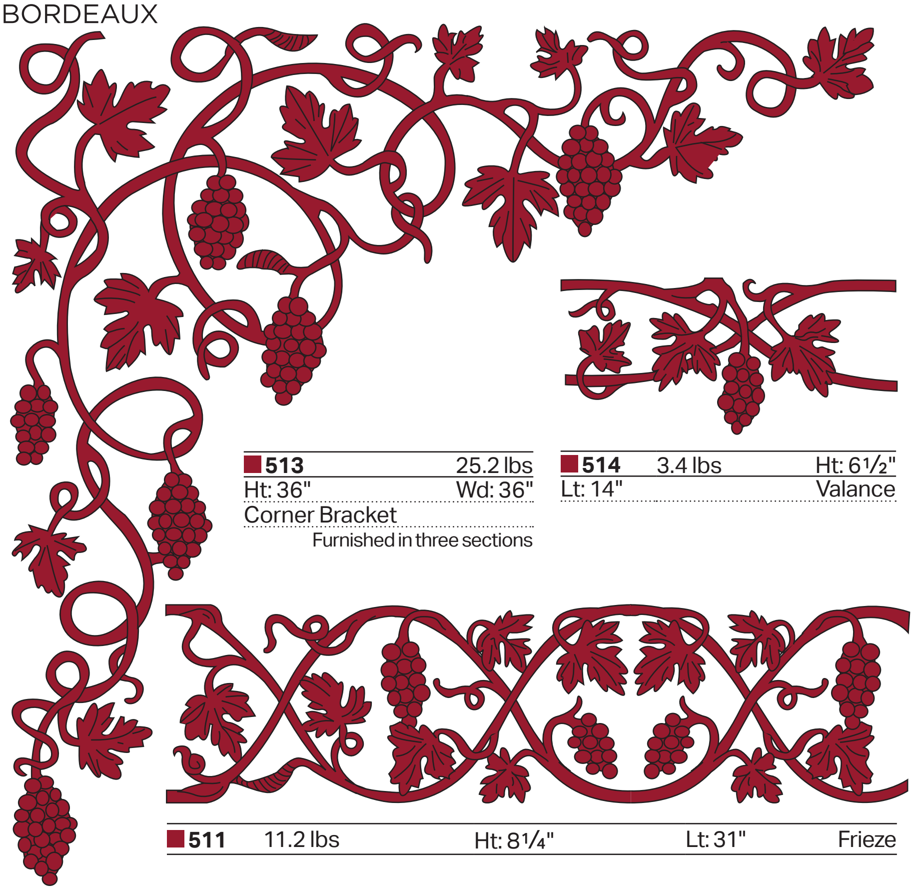
586 14.9 lbs
Ht: 28" Wd: 8¾"
Railing Panel

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

MALLEABLE IRON

All castings are double faced. Scale: 1 ½″ = 1′-0″

BORDEAUX

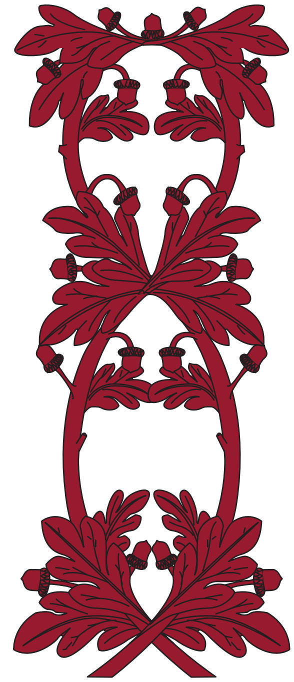


513 25.2 lbs
Ht: 36" Wd: 36"
Corner Bracket
Furnished in three sections

514 3.4 lbs Ht: 6½"
Lt: 14" Valance

511 11.2 lbs Ht: 8¼" Lt: 31" Frieze

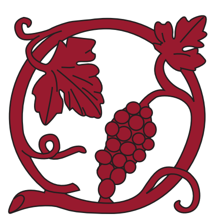
CHARNWOOD



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

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

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



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

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

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

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

MALLEABLE IRON

PRIMAVERA
Ornamental Panels

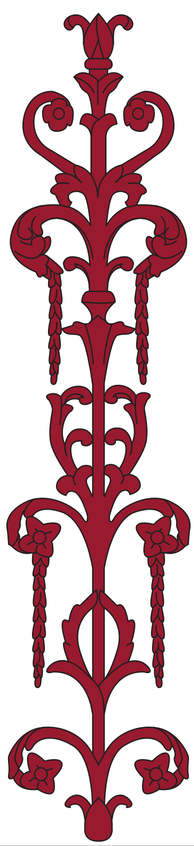
584 9.9 lbs
Ht: 29" Wd: $6\frac{1}{2}$"
Railing Panel

The Hotel Broz and Brewery, New Prague, MN | Fabricator: Linder Enterprises, Mankato, MN

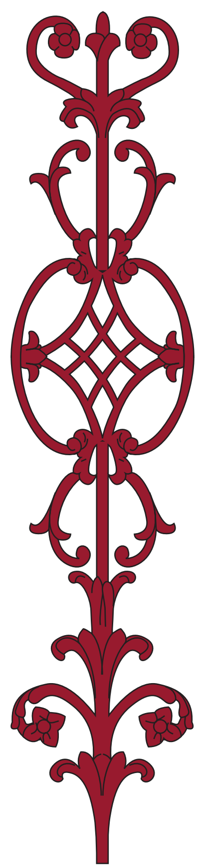
MILAN
Being of equal width, Milan panels may be stacked vertically.

516 3.7 lbs
Ht: $8\frac{1}{4}$" Wd: $13\frac{1}{4}$"
Corner Bracket

All castings are double faced.
Scale: $1\frac{1}{2}$″=1′-0″ except as noted



517 12.0 lbs
Ht: $34\frac{1}{2}$" Wd: $7\frac{5}{8}$"
Railing Panel



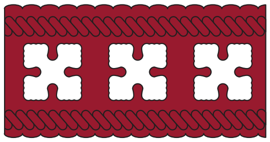
518 11.3 lbs
Ht: $35\frac{1}{2}$" Wd: $7\frac{5}{8}$"
Railing Panel

519 12.5 lbs
Ht: 32" Wd: $7\frac{5}{8}$"
Railing Panel

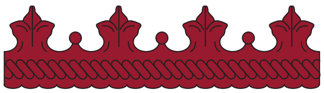
MALLEABLE IRON / PRESSED STEEL

PRESSED STEEL MOULDINGS

10′ lengths, 100′ minimum order

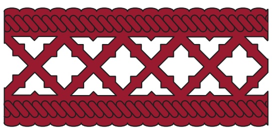


2855	Pressed Steel	Wd: 3 1/4"

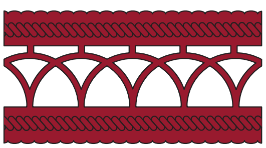


2859	Pressed Steel	Wd: 2"

2861	Pressed Steel	Wd: 15/16"



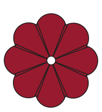
2866	Pressed Steel	Wd: 3 1/4"



2870	Pressed Steel	Wd: 3 1/4"

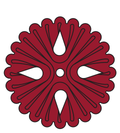
PRESSED STEEL ROSETTES**

Malleable Iron



	OD
2515	1 1/2"
2528	2"
2538	3"

2524 Wd: 1 3/8"

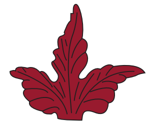


	OD
2611	2 3/8"
2616	3 5/8"

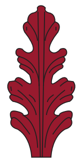
** 100 piece packages

PRESSED STEEL LEAVES**

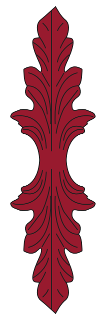
2003 Lt: 3 1/2"



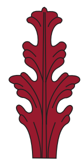
2962 Wd: 4"



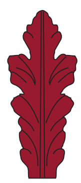
2016 Lt: 4 1/2"



2982 Lt: 9 1/4"

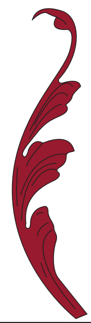


2017 Lt: 4 1/2"



2023 Lt: 5"

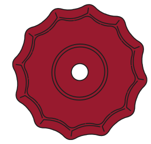
2932 Wd: 2 1/2"



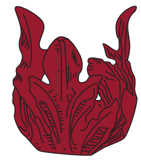
	Length
2012	6"
2014	10 1/4"
2015	11"

PRESSED STEEL CANDLE PANS AND HUSKS**

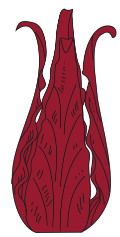
Malleable Iron



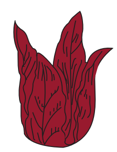
2640 OD: 3 3/4"



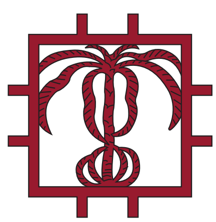
2717
Ht: 3 1/4" Wd: 3 1/4"



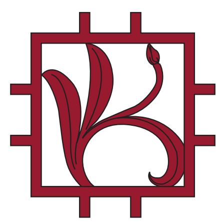
2719
Ht: 5 1/2" Wd: 2 1/4"



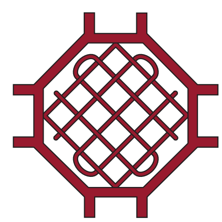
2726
Ht: 5 1/2" Wd: 2 1/4"



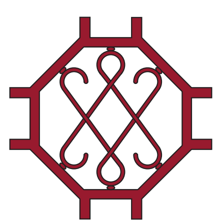
591 3.9 lbs
Ht: 10" Wd: 10"
(Without legs: 8" x 8")



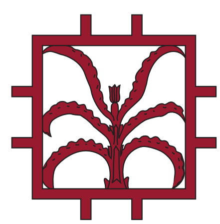
592 3.4 lbs
Ht: 10" Wd: 10"
(Without legs: 8" x 8")



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")



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

CARLSTADT® RAILING SYSTEMS

O'Connor-Johnson Hall Binghamton University, Binghamton, NY | Architect: Bearsch Compeau Knudson Architects & Engineers, Binghamton, NY
General Contractor: Welliver, Mountour Falls, NY | Fabricator: Homer Iron Works, Homer, NY

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 uses self-aligning Carlstadt® handrail brackets.

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.

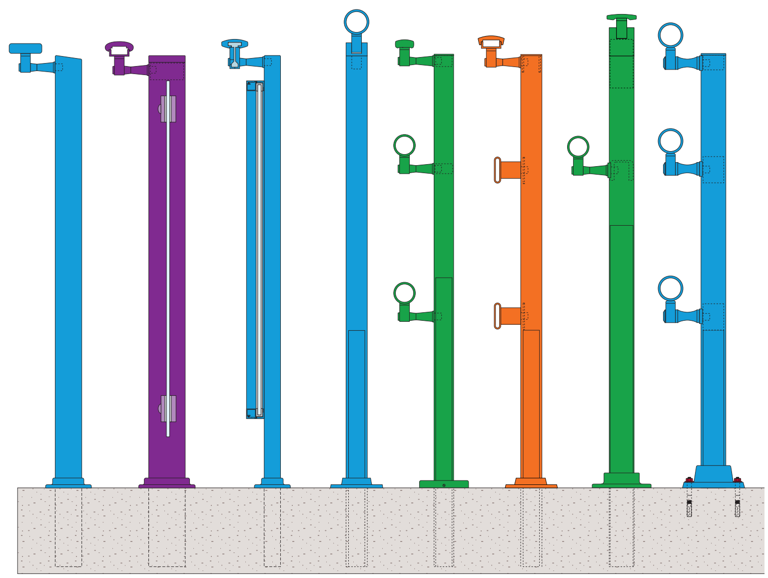
Americans with Disabilities Act (ADA): *The Americans with Disabilities Act* adopted by Congress in 1992 required circular handrails to be 1¼" minimum and 1½" maximum. However, the *Guidance on the 2010 ADA Standards for Accessible Design - September 2010*, published by the *US Department of Justice*, has now properly 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. ANSI117.1-09 defines this alternative: *equivalent gripping surfaces are permitted provided they have a perimeter dimension of 4" (100mm) minimum and 6¼" (160mm) maximum and provided their largest cross-section dimension is 2¼" (57mm) maximum.*

EXAMPLES OF CARLSTADT® RAILING CONFIGURATIONS

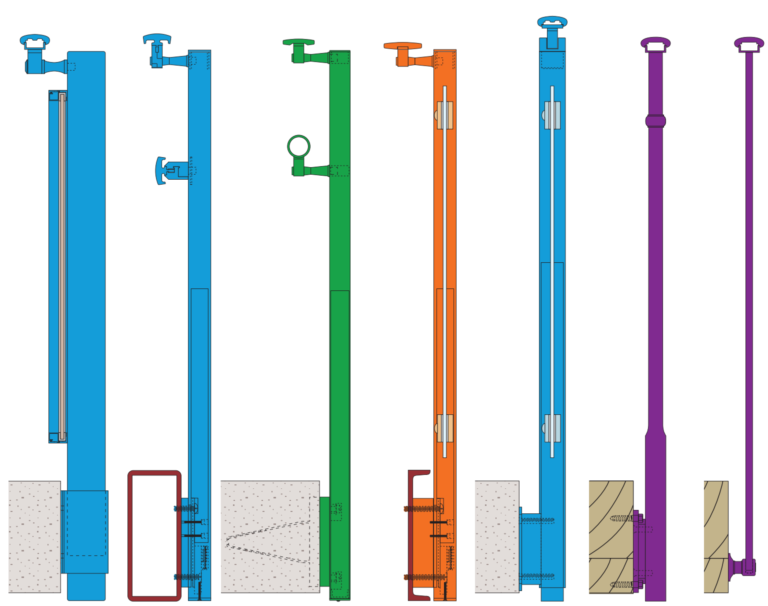
SURFACE-MOUNTED DETAILS

The illustrations are intended to be examples of the varied ways in which **Connectorail®**, **Carlstadt®** and Traditional Railing components may be combined.



FASCIA-MOUNTED DETAILS

The illustrations are intended to be examples of the varied ways in which **Connectorail®**, **Carlstadt®** and Traditional Railing components may be combined.

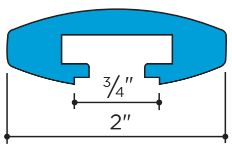


See juliusblum.com for part numbers and details.

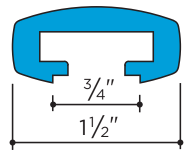
ALUMINUM

CARLSRAIL® HANDRAIL

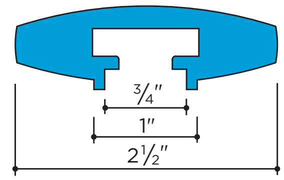
20′ lengths



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



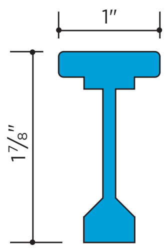
6531 Aluminum .600 lb/ft
Fittings: C-N



6532 Aluminum 1.440 lb/ft
Fittings: C-N

SUPPORT BAR

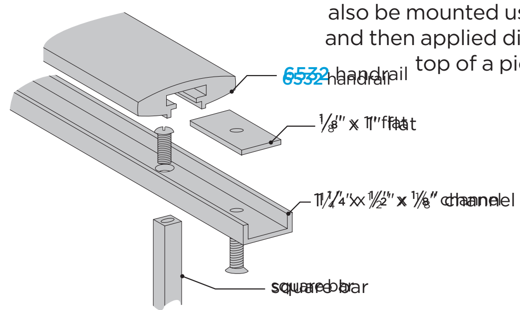
6063-T6



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

6540 Aluminum .753 lb/ft

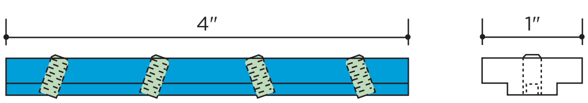
Carlsrail® handrail sections may also be mounted using channel and then applied directly to the top of a picket or post.



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.

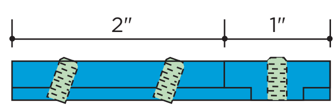
SPLICE INSERT



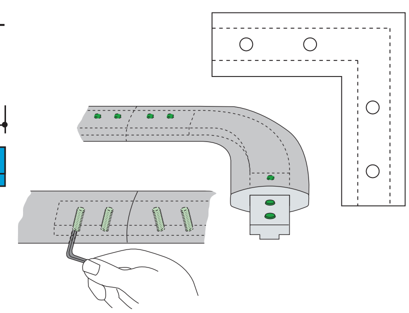
104 Aluminum
Also available in 16' lengths without holes or set screws **104-16**

CORNER SPLICE INSERT

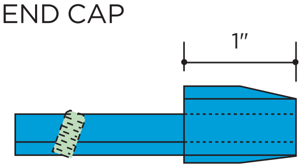
Cast, Almag 35

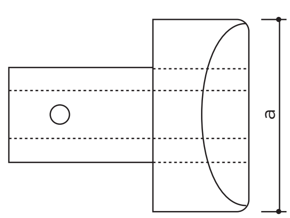


105 Aluminum



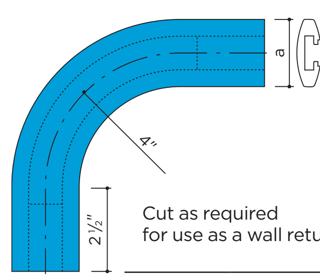
END CAP



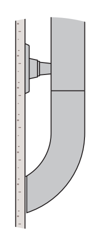


		a
6531N	Aluminum	1 1/2"
6530N	Aluminum	2"
6532N	Aluminum	2 1/2"

CORNER BEND



Cut as required for use as a wall return.

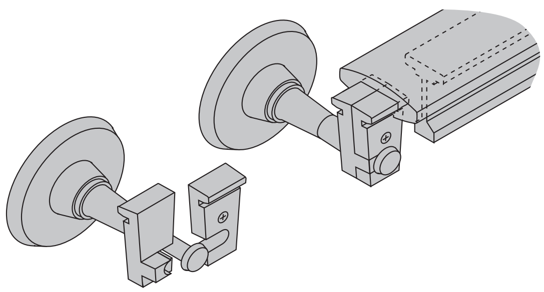


		a
6531C	Aluminum	1 1/2"
6530C	Aluminum	2"
6532C	Aluminum	2 1/2"

ALUMINUM BRONZE NICKEL-SILVER STAINLESS PVC

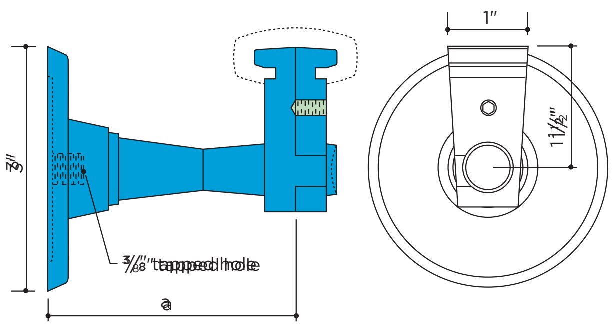
CARLSRAIL® BRACKET ASSEMBLY

The Carlsrail® bracket assembly has a two-part clamp which, in slipping together, engages the bracket arm and the handrail simultaneously, without drilling or tapping. It aligns itself on the handrail and tilts to the required stair or ramp angle.



CARLSTADT® SELF-ALIGNING WALL BRACKETS

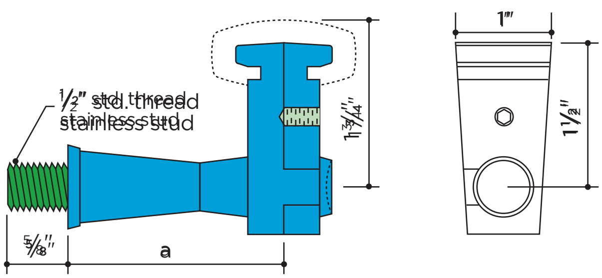
Satin Finish



For use with Carlsrail® handrail moulding		a
173	Aluminum	3"
174	Aluminum	3½"
175	Aluminum	2¼"

CARLSTADT® SELF-ALIGNING POST BRACKETS

Satin Finish

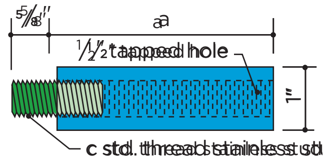


For use with Carlsrail® handrail moulding		a
171	Aluminum	2¼"
172	Aluminum	2¾"

CARLSTADT® WALL & POST BRACKET EXTENSIONS

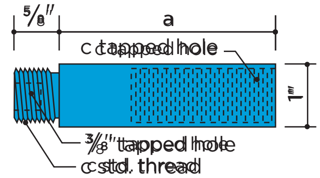
Satin Finish

For Post Brackets



		a	c
462*	Aluminum	1¾"	½"
463*	Aluminum	3"	½"

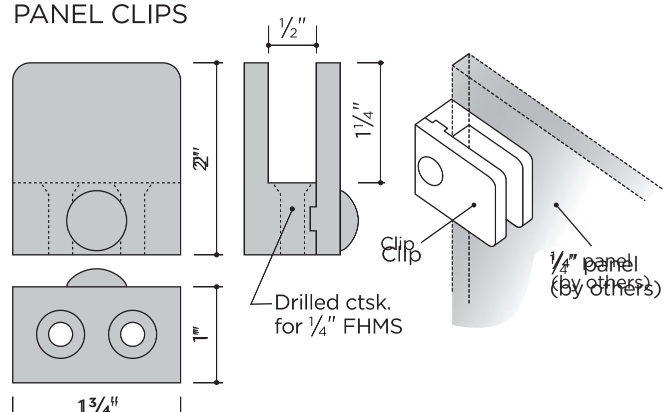
For Wall Brackets



		a	c
464	Aluminum	1¾"	¾"
465	Aluminum	3"	¾"

Note: Extensions may be cut to length to suit individual conditions. Trim wall bracket extensions to no shorter than 1⅝". Designers should note that extending a bracket increases stress at its base and reduces allowable load.

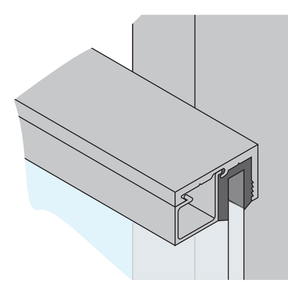
PANEL CLIPS



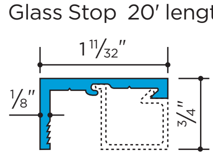
113 Aluminum		**413** Nickel-Silver	
813 Bronze		**213** Stainless	

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.

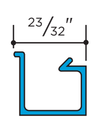


Glass Stop 20′ lengths



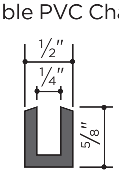
8106 Aluminum		.276 lb/ft
8206 Aluminum Anodized		.276 lb/ft

Snap-in 20′ lengths



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

Flexible PVC Channel 50′ coils

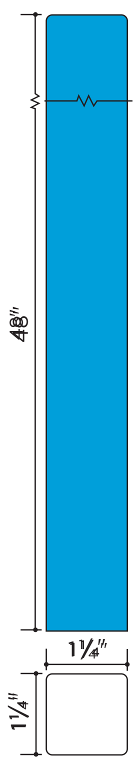


8708 Flexible PVC		90 durometer

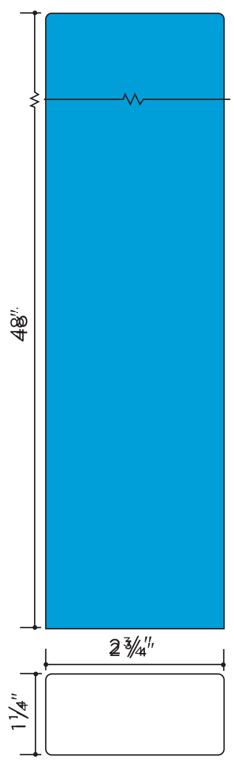
ALUMINUM

PRECUT SOLID ALUMINUM POSTS & FITTINGS

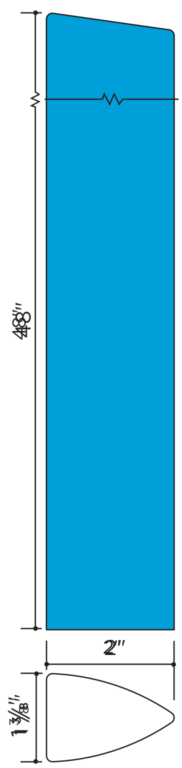
Aluminum 6063-T52, Mill Finish, 48″ lengths
Upper end has been trimmed as shown – no post cap is required. Lower end may be cut to achieve required post height. Drill and tap to receive **Carlstadt**® post brackets.



423 Aluminum



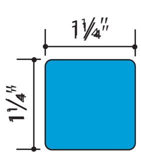
424 Aluminum



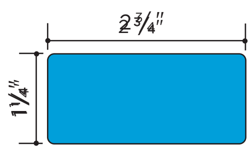
427 Aluminum

BAR STOCK FOR RAILING POSTS

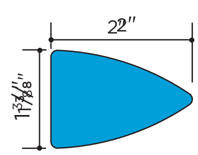
Aluminum 6063-T52, 20′ lengths. Mill Finish.



6423 Aluminum
1.876 lb/ft



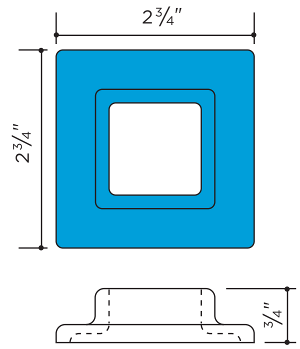
6424 Aluminum
4.124 lb/ft



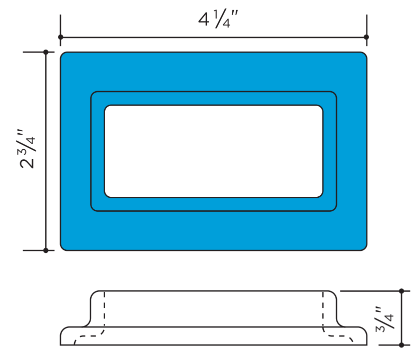
6427 Aluminum
2.256 lb/ft

COVER FLANGES

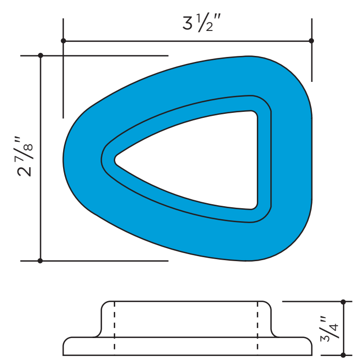
Satin Finish



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



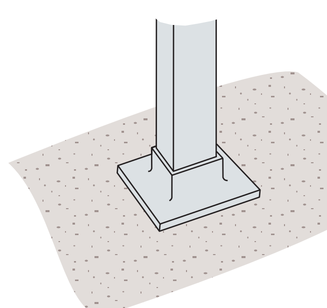
774 Aluminum — Fits aluminum posts **424**, **6424** and **6434**

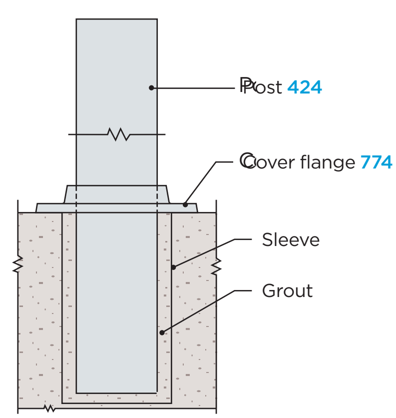


777 Aluminum — Fits aluminum posts **427** and **6427**

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.

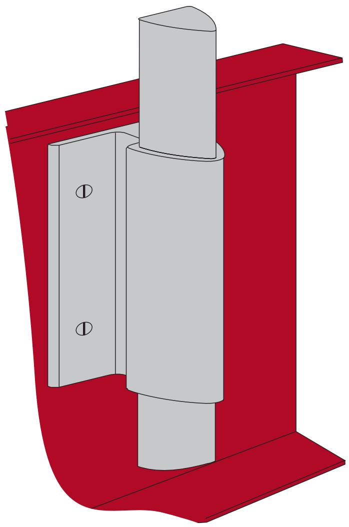


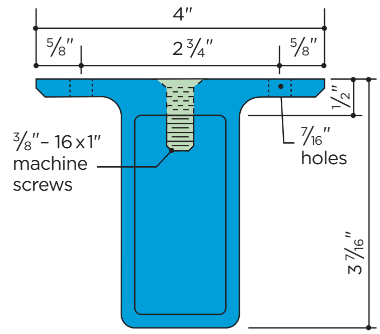


ALUMINUM

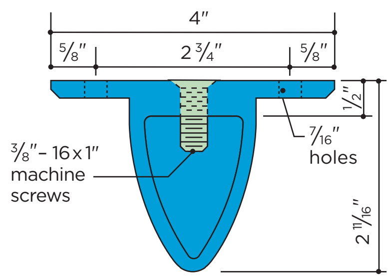
FASCIA FLANGES

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.

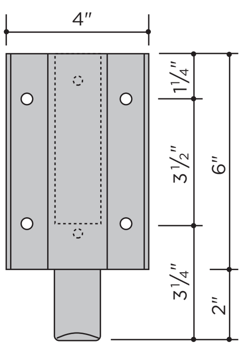




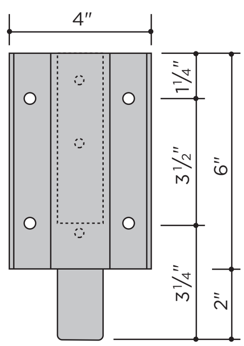
408 Aluminum
Fits aluminum posts
424, **6424**, **6434**



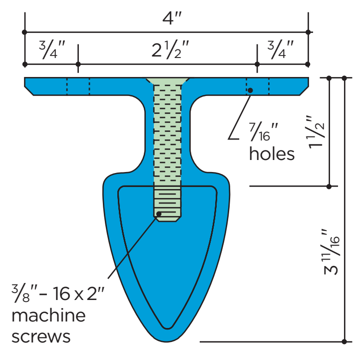
425 Aluminum
Fits aluminum posts
427 and **6427**



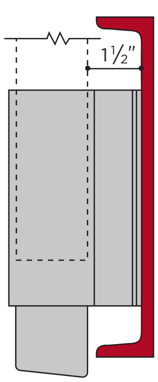
Elevation of **425** and **426**



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

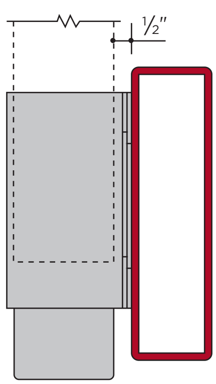


426 Aluminum
Fits aluminum posts
427 and **6427**



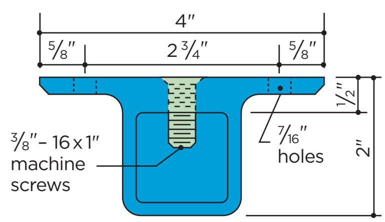
Fascia flange **426** used with channel stringer.

Fascia flange **422** is similar.

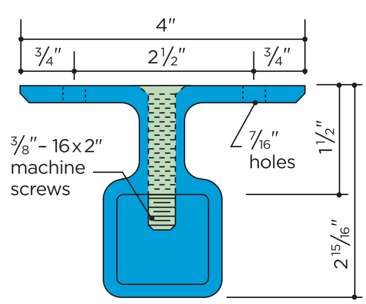


Fascia flange **408** used with box stringer.

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



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



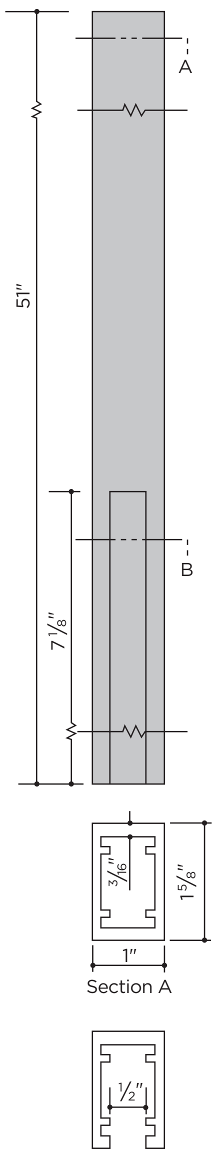
422 Aluminum
Fits aluminum posts
423 and **6423**

ALUMINUM BRONZE

PRECUT POST

For fascia mounting,
51″ lengths, Mill Finish

- Aluminum 6063-T6
- Bronze C38500

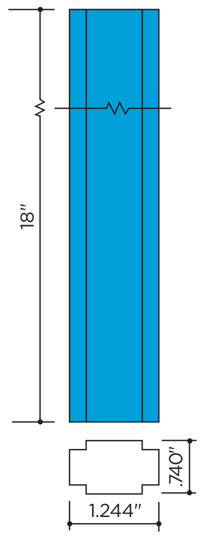


430*	Aluminum	
830*	Bronze	

* Cut and machined for use with fascia brackets

REINFORCING BARS

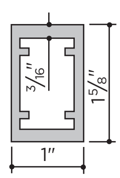
Aluminum 6063-T6



436E Aluminum
Fits posts 430 or 830

TUBING FOR FLOOR-MOUNTED POSTS

20′ lengths, Mill Finish

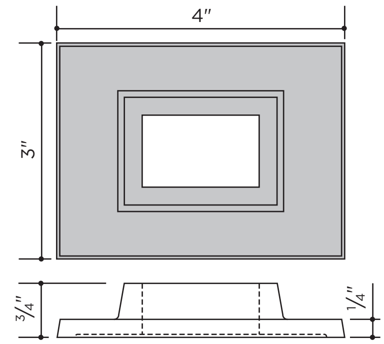


		lb/ft
6430	Aluminum	.899
4830	Bronze	2.950

Aluminum items are suitable for anodizing, including most of the hardcoat color finishes. Properties of sections for handrail posts are listed on page 125. Refer to pages 124-129 for detailed information on the structural design of handrail installations.

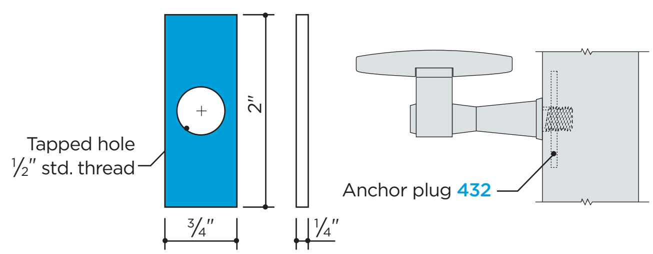
COVER FLANGES

Satin Finish



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

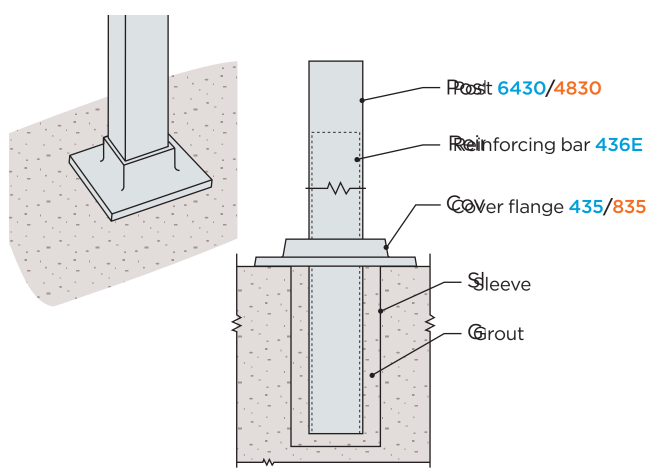
POST BRACKET ANCHOR PLUGS



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.

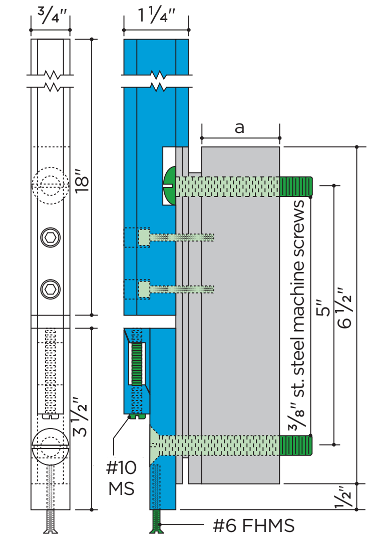


ALUMINUM BRONZE STAINLESS

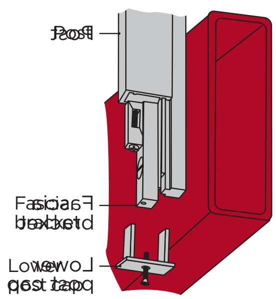
FASCIA BRACKETS

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

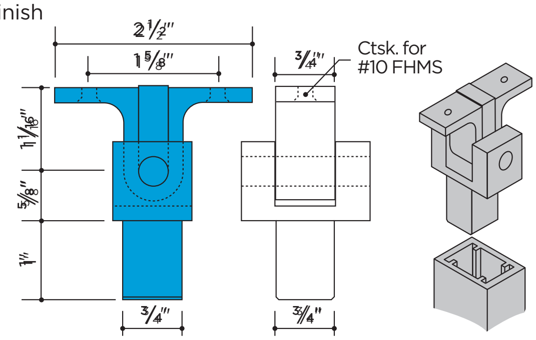


Fascia bracket is bolted to fascia. Slotted post slides into grooves on fascia bracket and is positioned for proper height. Wedge is then tightened to secure post in position. Lower post cap is then attached, completing assembly.

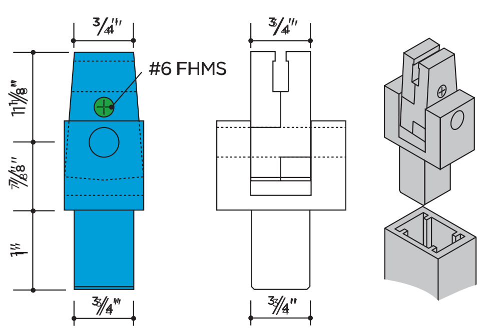
		a	
428	Aluminum	1/2"	For box stringers, fits aluminum post 430
429	Aluminum	1 1/2"	For channel stringers, fits aluminum post 430
838	Bronze	1/2"	For box stringers, fits bronze post 830
839	Bronze	1 1/2"	For channel stringers, fits bronze post 830

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



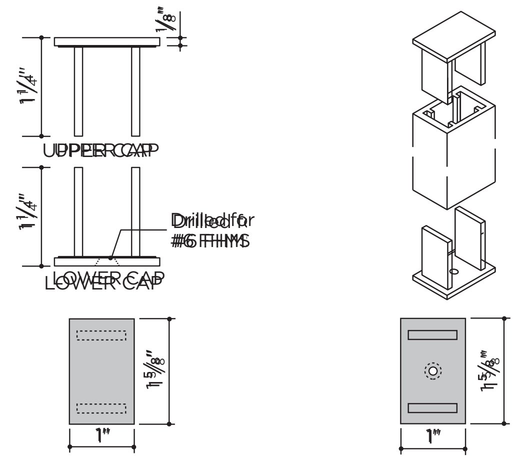
152	Alum. For **Carlstadt**® T-handrail, fits aluminum posts 430 and 6430

Note: 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

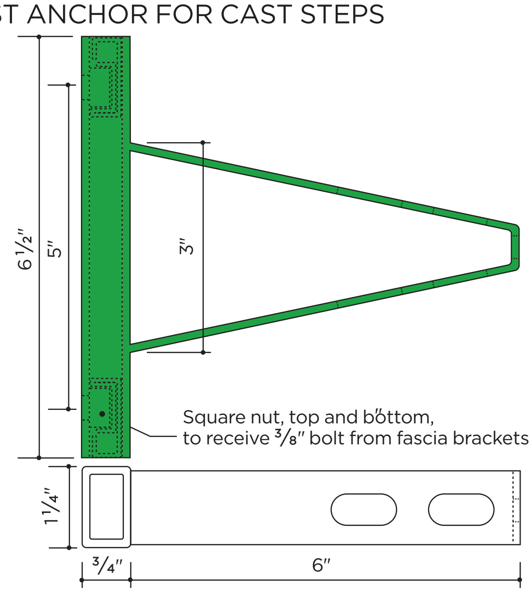
Caps for hollow **Carlstadt**® posts have a flange extending inside to receive and support the thread of the bracket arm.



Upper Cap		Lower Cap	
431	Aluminum	433	Aluminum
831	Bronze	833	Bronze

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

POST ANCHOR FOR CAST STEPS

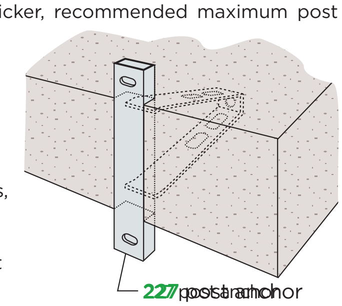


227	Stainless	For use with aluminum and bronze railings

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

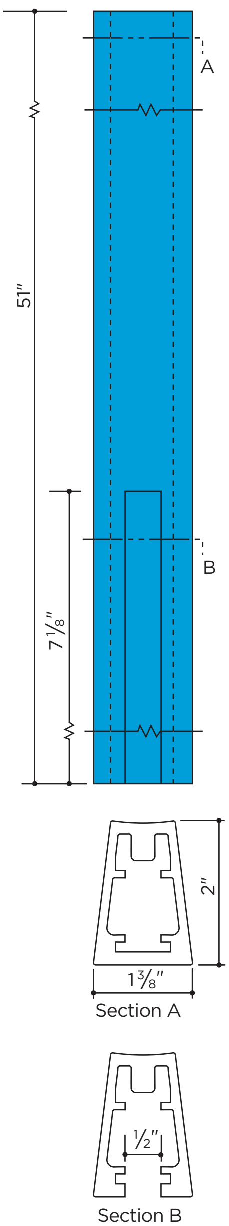
Anchor is embedded in slab with anchor centered vertically in slab thickness. Front face of anchor should be flush with edge of slab. Square nuts move freely in pockets, receive 3/8" mounting bolts of Carlstadt® fascia brackets. Wide slots provide for lateral adjustment and vertical alignment.



ALUMINUM

PRECUT POST

For fascia mounting,
51″ lengths, Mill Finish
Aluminum 6063-T6

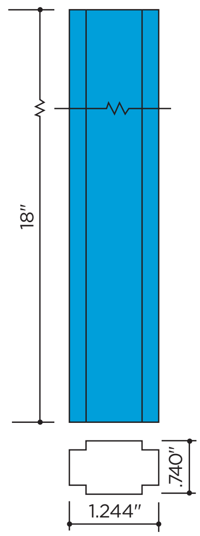


458* Aluminum

* Cut and machined for use with fascia brackets

REINFORCING BARS

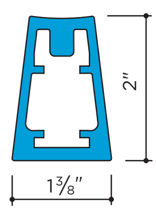
Aluminum 6063-T6



436E Aluminum
Fits aluminum post **458**

TUBING FOR FLOOR-MOUNTED POSTS

20′ lengths, Mill Finish

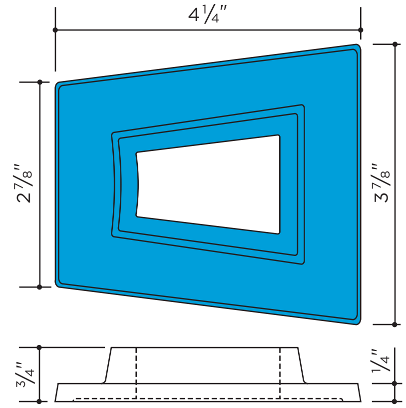


		lb/ft
6458	Aluminum	1.326

Aluminum items are suitable for anodizing, including most of the hardcoat color finishes. Properties of sections for handrail posts are listed on page 125. Refer to pages 124-129 for detailed information on the structural design of handrail installations.

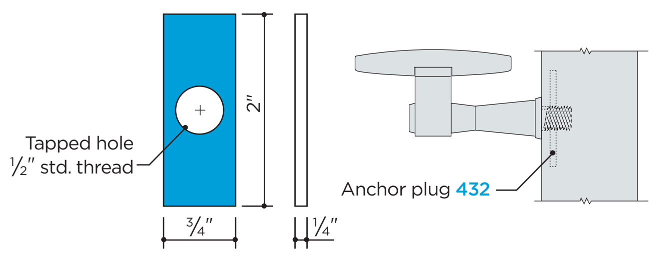
COVER FLANGES

Satin Finish



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

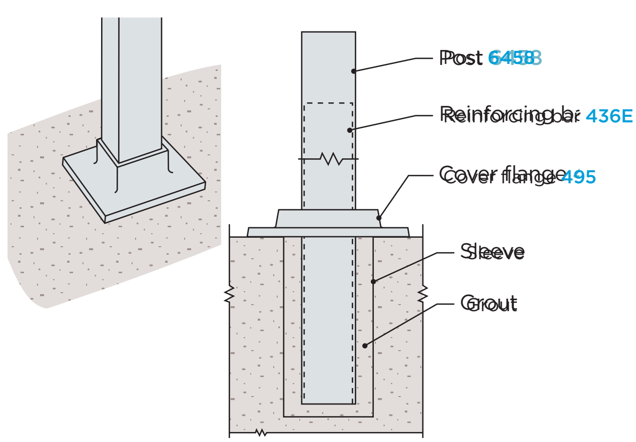
POST BRACKET ANCHOR PLUGS



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.

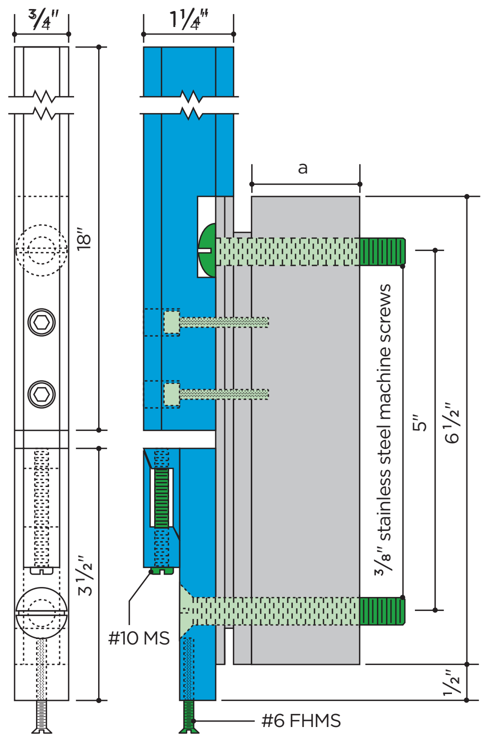


ALUMINUM STAINLESS

FASCIA BRACKETS

Mill Finish

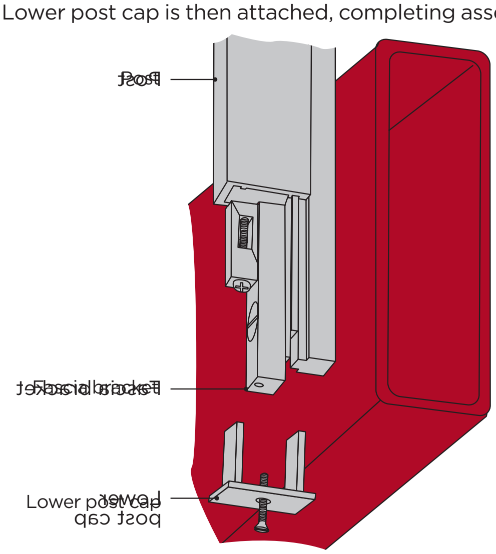
Fascia brackets are available for concealed fastening of hollow posts of aluminum, bronze, and stainless steel—both for solid and channel fascias. The fastening mechanism provides for vertical field adjustment.



	a	
428 Aluminum	1/2"	For box stringers, fits aluminum post **458**
429 Aluminum	1 1/2"	For channel stringers, fits aluminum post **458**

FASCIA BRACKET ASSEMBLY DETAIL

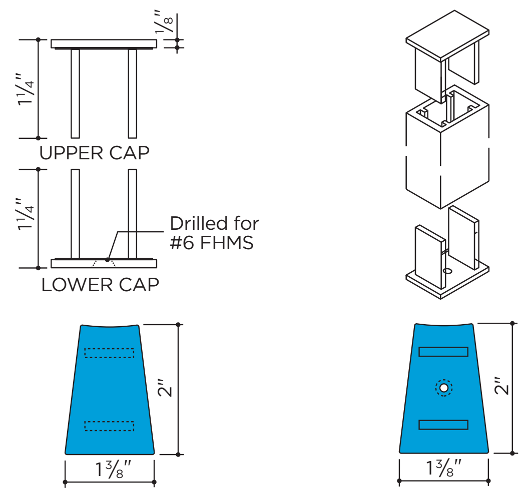
Fascia bracket is bolted to fascia. Slotted post slides into grooves on fascia bracket and is positioned for proper height. Wedge is then tightened to secure post in position. Lower post cap is then attached, completing assembly.



POST CAPS

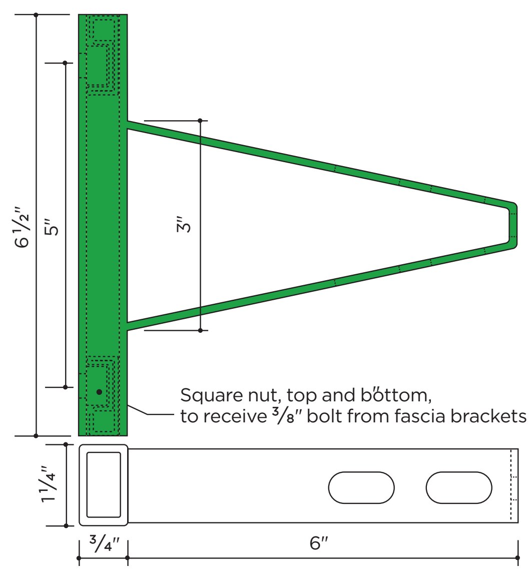
Satin Finish

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



Upper Cap	Lower Cap
468 Aluminum	**469** Aluminum
Fits aluminum posts **458** and **6458**	Fits aluminum posts **458** and **6458**

POST ANCHOR FOR CAST STEPS

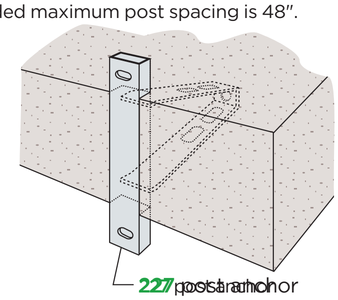


227 Stainless	For use with aluminum and bronze railings

Post anchor 227 can be used with fascia brackets 428, 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

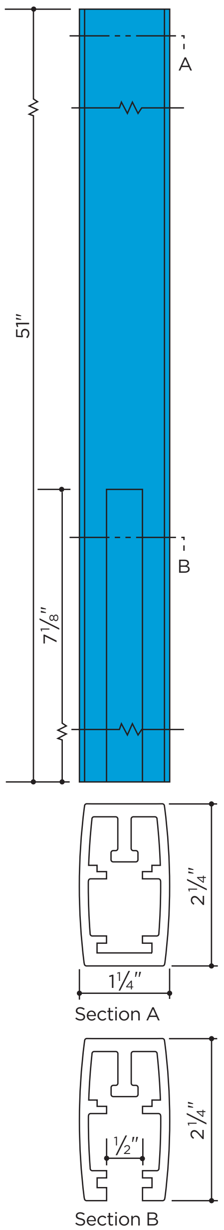
Anchor is embedded in slab with anchor centered vertically in slab thickness. Front face of anchor should be flush with edge of slab. Square nuts move freely in pockets, receive 3/8" mounting bolts of **Carlstadt®** fascia brackets. Wide slots provide for lateral adjustment and vertical alignment.



ALUMINUM

PRECUT POST

For fascia mounting,
51″ lengths, Mill Finish
Aluminum 6063-T6

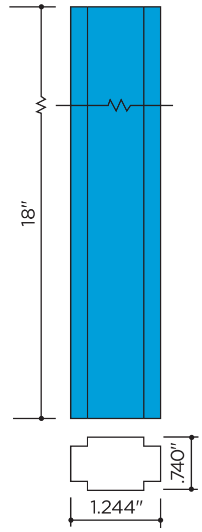


459* Aluminum

* Cut and machined for use with fascia brackets

REINFORCING BARS

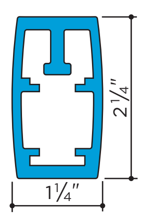
Aluminum 6063-T6



436E Aluminum
Fits aluminum post **459**

TUBING FOR FLOOR-MOUNTED POSTS

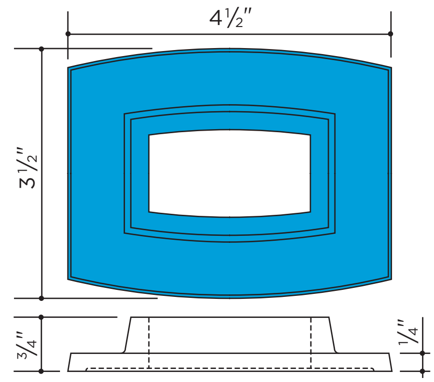
20′ lengths, Mill Finish



		lb/ft
6459	Aluminum	1.240

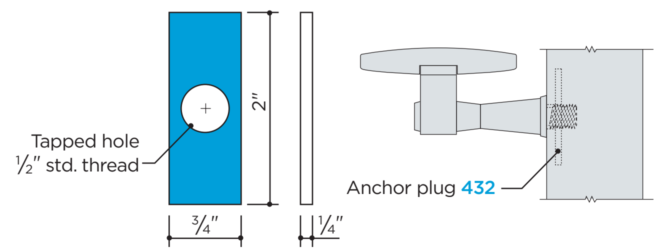
COVER FLANGES

Satin Finish



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

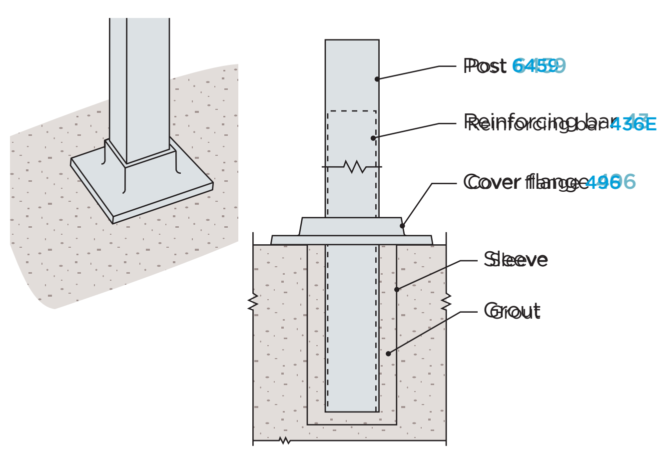
POST BRACKET ANCHOR PLUGS

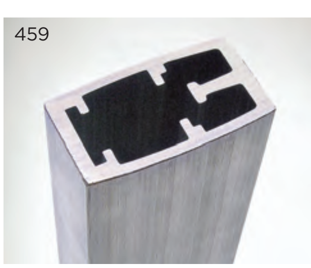


432 Aluminum — Fits aluminum post **459**

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.





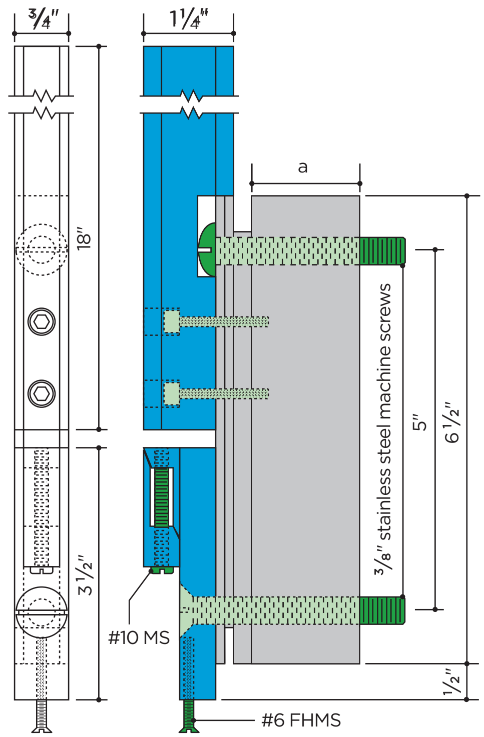
Aluminum items are suitable for anodizing, including most of the hardcoat color finishes. Properties of sections for handrail posts are listed on page 125. Refer to pages 124-129 for detailed information on the structural design of handrail installations.

ALUMINUM STAINLESS

FASCIA BRACKETS

Mill Finish

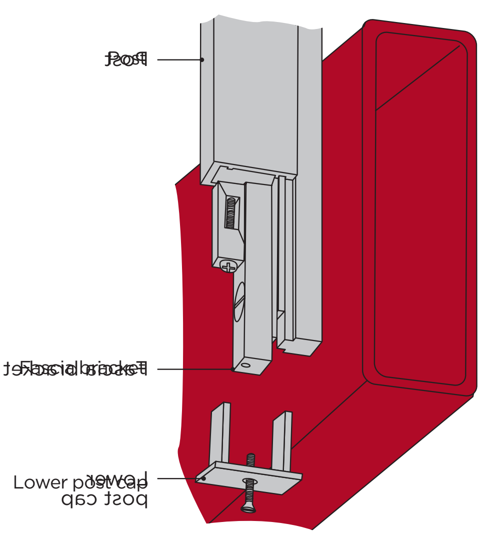
Fascia brackets are available for concealed fastening of hollow posts of aluminum, bronze, and stainless steel—both for solid and channel fascias. The fastening mechanism provides for vertical field adjustment.



		a	
428	Aluminum	½"	For box stringers, fits aluminum post **459**
429	Aluminum	1½"	For channel stringers, fits aluminum post **459**

FASCIA BRACKET ASSEMBLY DETAIL

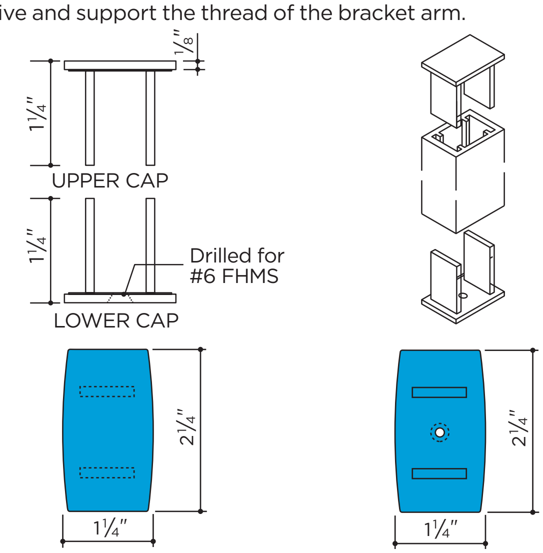
Fascia bracket is bolted to fascia. Slotted post slides into grooves on fascia bracket and is positioned for proper height. Wedge is then tightened to secure post in position. Lower post cap is then attached, completing assembly.



POST CAPS

Satin Finish

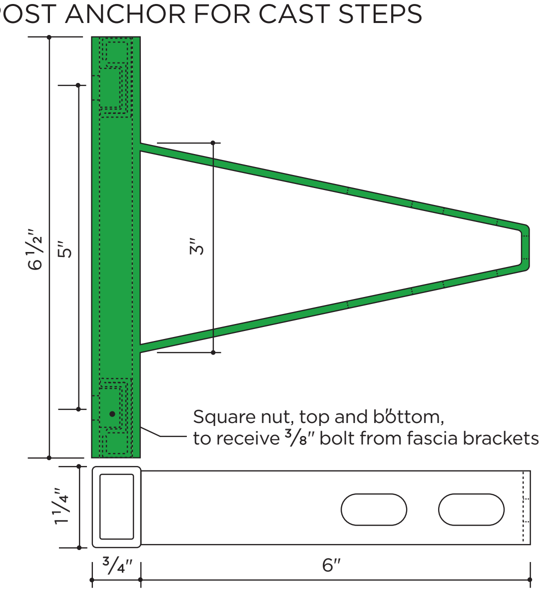
Caps for hollow **Carlstadt**® posts have a flange extending inside to receive and support the thread of the bracket arm.



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

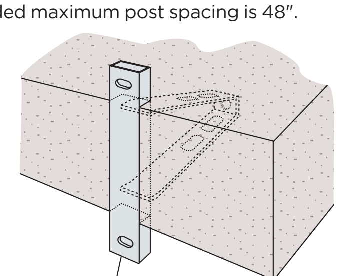


227	Stainless	For use with aluminum and bronze railings

Post anchor **227** can be used with fascia brackets **428**, **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

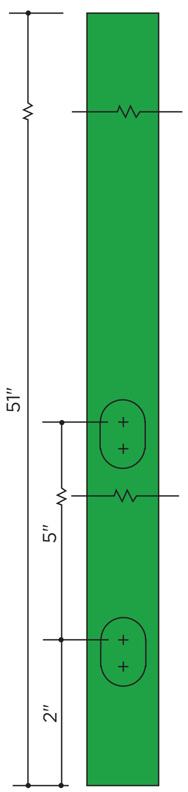
Anchor is embedded in slab with anchor centered vertically in slab thickness. Front face of anchor should be flush with edge of slab. Square nuts move freely in pockets, receive ⅜" mounting bolts of **Carlstadt**® fascia brackets. Wide slots provide for lateral adjustment and vertical alignment.

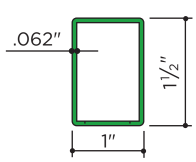


ALUMINUM STAINLESS

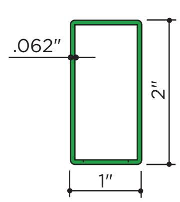
PRECUT POST

For fascia mounting,
51″ lengths, 2B Mill Finish
Stainless Type 304





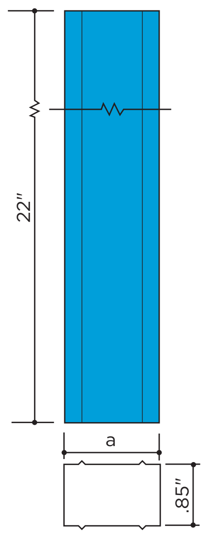
230*	Stainless



280*	Stainless

* Cut and punched for fascia block

REINFORCING BARS



		a
294	Aluminum	1.34"

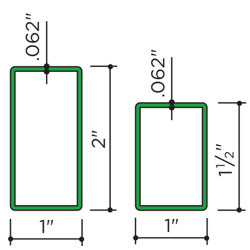
Fits stainless post 230

		a
295	Aluminum	1.84"

Fits stainless post 280

TUBING FOR FLOOR-MOUNTED POSTS

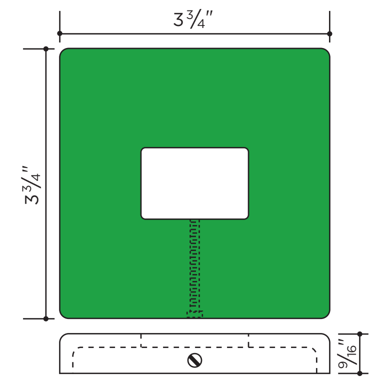
20′ lengths, 2B Mill Finish



Stainless Tubing

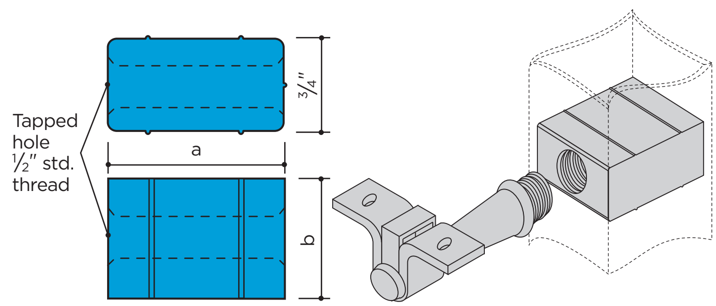
COVER FLANGES

Satin Finish



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

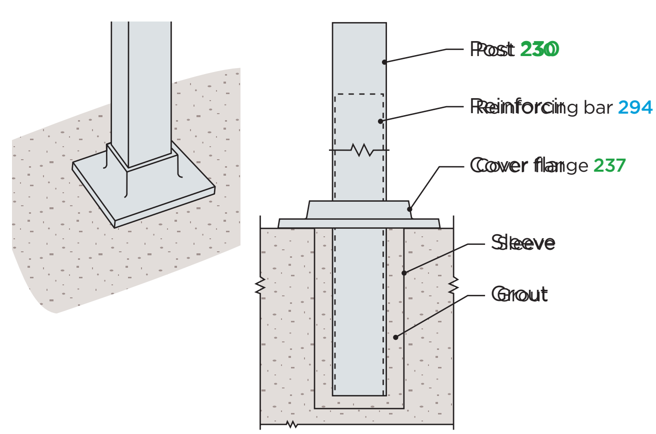
POST BRACKET ANCHOR PLUGS



		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.

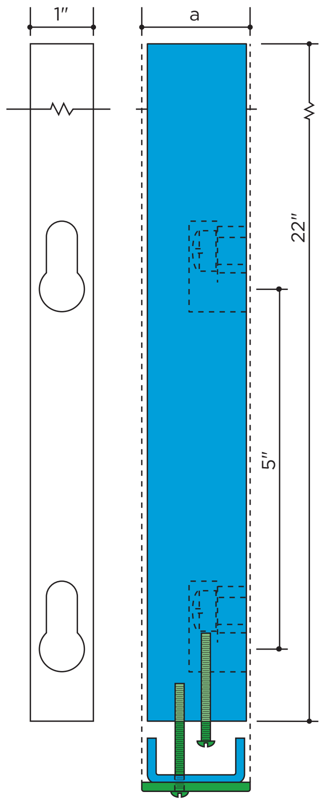


Properties of sections for handrail posts are listed on page 125. Refer to pages 124-129 for detailed information on the structural design of handrail installations.

ALUMINUM STAINLESS

ANCHOR BAR WITH LOWER POST CAP

Mill Finish

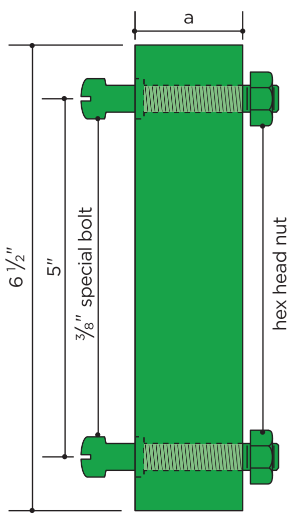


	a	post
233B Aluminum	1½"	230
With stainless steel lower post cap*		
283 Aluminum	2"	280
With stainless steel lower post cap*		

* Satin Finish

FASCIA SPACER BLOCK

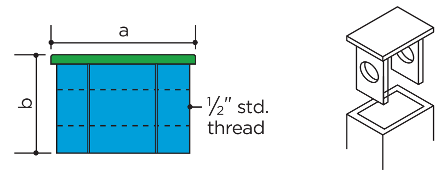
Satin Finish



		a
228	Stainless	½"
Use with box stringers		
229	Stainless	1½"
Use with channel stringers		

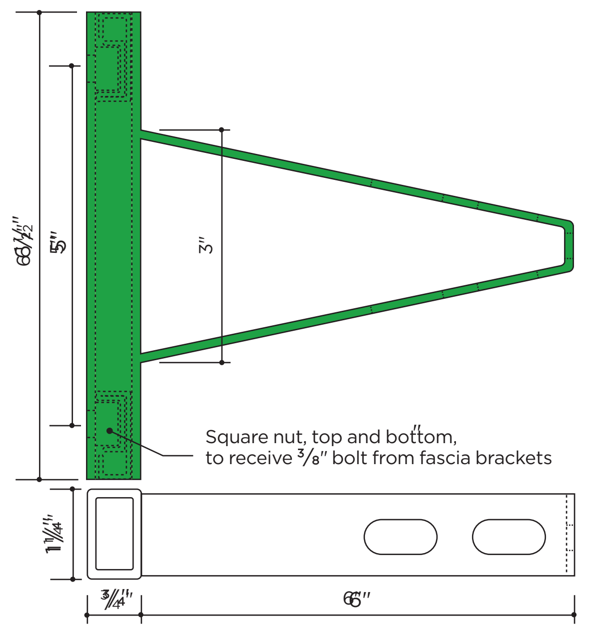
UPPER POST CAP

Satin Finish



Upper Cap		a	b	
231	Stainless	1½"	1¼"	Fits stainless post 230
284	Stainless	2"	1$^{7}/_{16}$"	Fits stainless post 280

POST ANCHOR FOR CAST STEPS

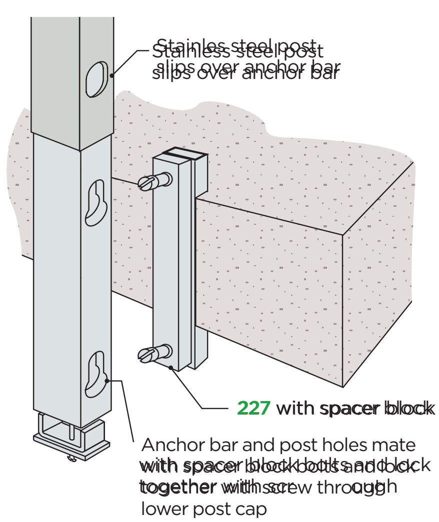


227	Stainless	For use with aluminum and bronze railings

Post anchor 227 can be used with fascia brackets 228, 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".

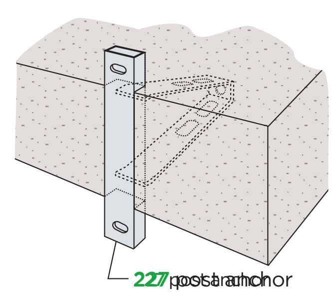
FASCIA SPACER BLOCK ASSEMBLY

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.



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.

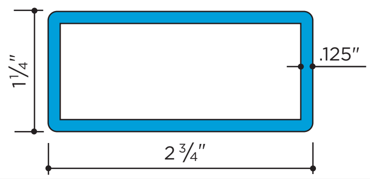


ALUMINUM NICKEL-SILVER STAINLESS

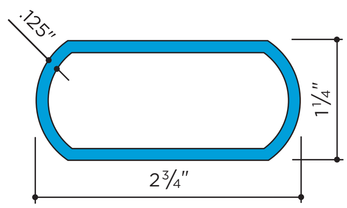
TUBING FOR RAILING POSTS

Mill Finish

Aluminum
6063-T6
20′ lengths

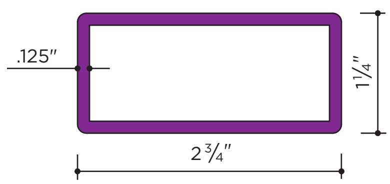


6434	Aluminum	1.123 lb/ft	Fittings: N



6435	Aluminum	1.075 lb/ft	Fittings: N

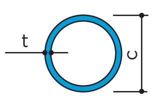
Nickel-Silver
C79800
16′ lengths



1334	Nickel-Silver	3.40 lb/ft	Fittings: N

HIGH STRENGTH CONNECTORAIL® POSTS

Aluminum only, Alloy 6063-T832

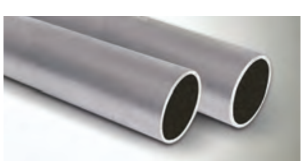


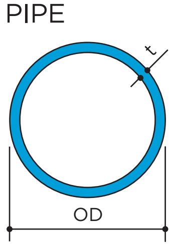
Drawn pipe precut to post lengths.
Clear anodized or mill finish

		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

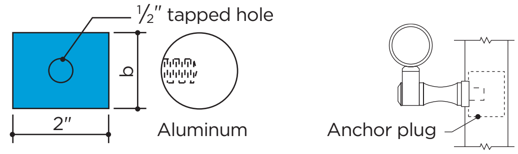




Nominal Size	Sched.	OD	ID	t	lb/ft
1¼"	10	1.660"	1.442"	.109"	.625
1¼"	40	1.660"	1.380"	.140"	.785
1½"	10	1.900"	1.682"	.109"	.721
1½"	40	1.900"	1.610"	.145"	.940

This premium quality drawn pipe has an extra smooth surface. Its harder temper gives it high strength. See pages 20-31 for stock pipe fittings. Available in clear anodized or mill finish.

PIPE ANCHOR PLUGS

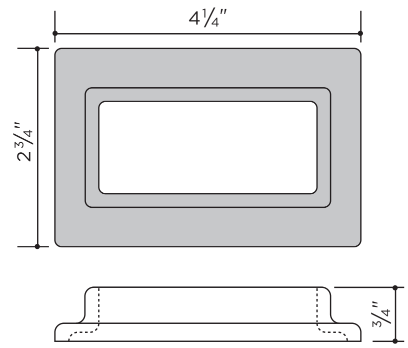


		Pipe	Sched.	b
7162	Aluminum	1¼"	10	1.427"
7462	Aluminum	1¼"	40	1.360"
7262	Aluminum	1½"	10	1.667"
7562	Aluminum	1½"	40	1.585"
9362	Stainless	1½"	5	1.750"

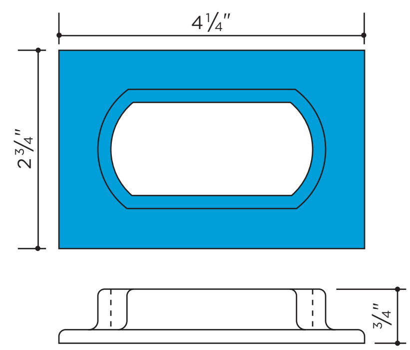
Anchor plugs provide secure mounting for brackets supporting second or third rails. Aluminum anchor plugs are machined from solid extruded stock; the stainless steel anchor plug is fabricated from heavy metal.

COVER FLANGES

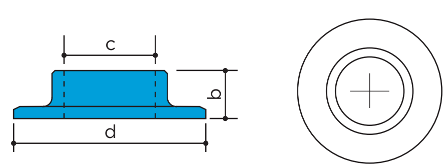
Satin Finish



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"

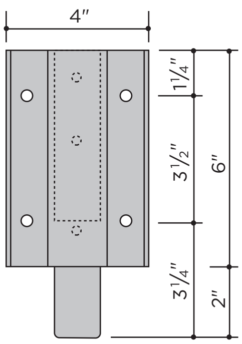
* Also available in clear anodized AA-M32-C22-A31 (204R1)

ALUMINUM NICKEL-SILVER

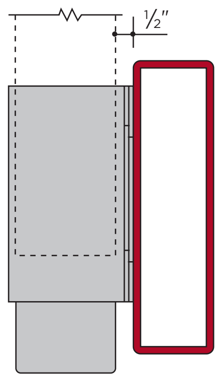
FASCIA FLANGES

Mill Finish

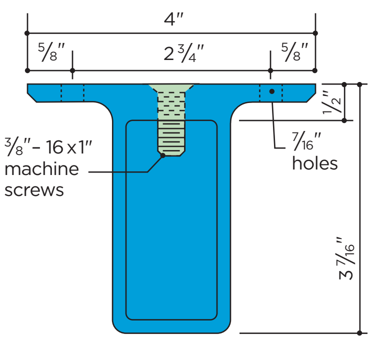
Sleeve type fascia flanges are provided for mounting on solid or channel fascias and stringers. The post slips into the pocket of the fascia flange and is anchored with concealed set screws. The bottom extension of each fascia flange matches the profile of the post and is trimmed to match its top.



Elevation of **408**



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



408 Aluminum

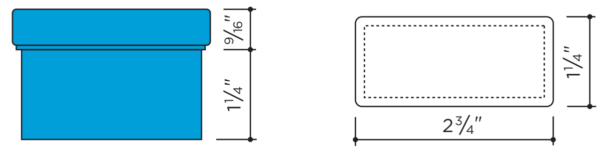
Fits aluminum post **6434**

> **Note:** See page 73 for a complete range of Carlstadt® fascia flanges.

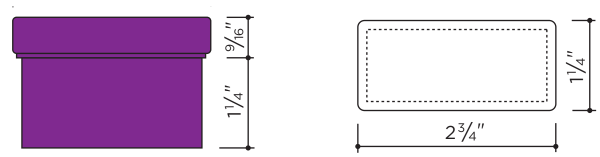
POST CAPS

Satin Finish, except as noted

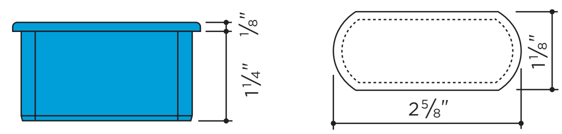
Caps for hollow **Carlstadt®** posts have a flange extending inside to receive and support the thread of the bracket arm.



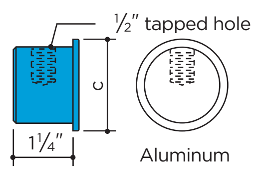
6434N Aluminum



1334N Nickel-Silver



6435N Aluminum



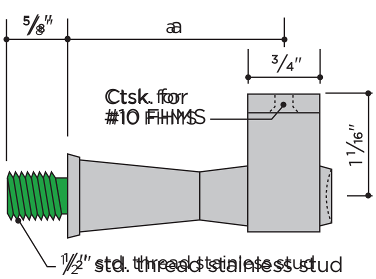
		Pipe	Sched.	c
7180*	Aluminum	1 1/4"	10	1.660"
7480*	Aluminum	1 1/4"	40	1.660"
7280*	Aluminum	1 1/2"	10	1.900"
7580*	Aluminum	1 1/2"	40	1.900"

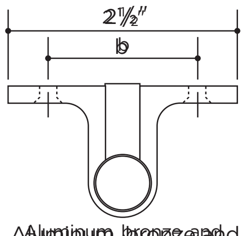
*Clear anodized AA-M32-C22-A31 (204R1)

Brentwood Civic Center, Brentwood, CA | Fabricator: MetalSet, Inc., Richmond, CA

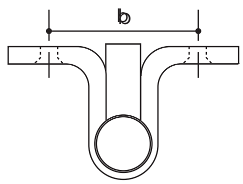
ALUMINUM BRONZE NICKEL-SILVER STAINLESS

SELF-ALIGNING
Satin Finish



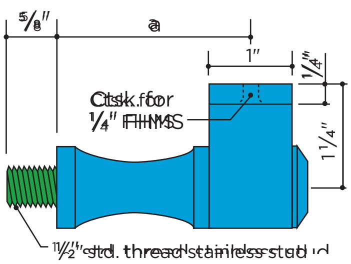


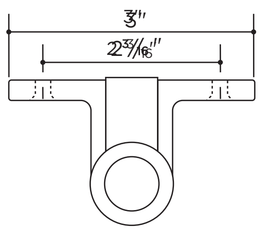
Aluminum, bronze and nickel-silver detail



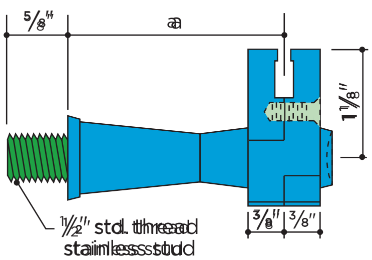
Stainless detail

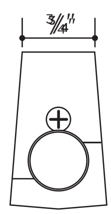
		a	b
441	Aluminum	2 1/4"	1 5/8"
442	Aluminum	2 3/4"	1 5/8"
841	Bronze	2 1/4"	1 5/8"
1341	Nickel-Silver	2 1/4"	1 5/8"
241	Stainless	2 1/4"	1 13/16"



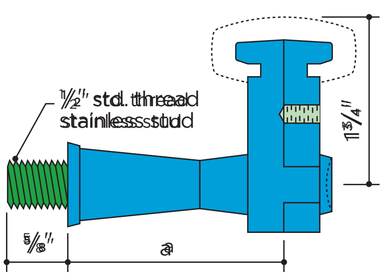


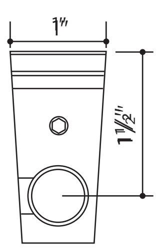
For use with **Carlstadt**® handrail moulding		a
309	Aluminum	3 1/4"
312	Aluminum	2 3/8"





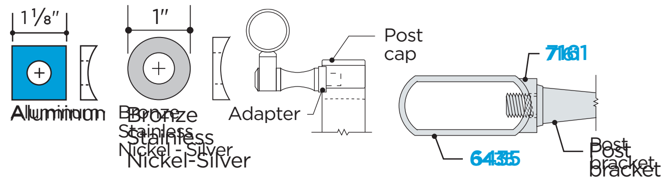
For use with **Carlstadt**® T-handrail moulding		a
439	Aluminum	2 1/4"
440	Aluminum	2 3/4"





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

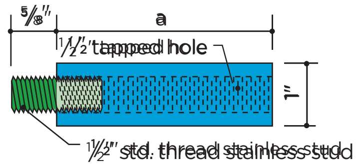
POST BRACKET ADAPTER
Satin Finish



		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

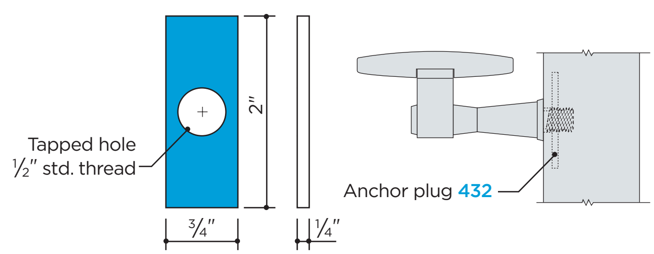


Designers should note that extending a bracket increases stress at its base and reduces its allowable load.

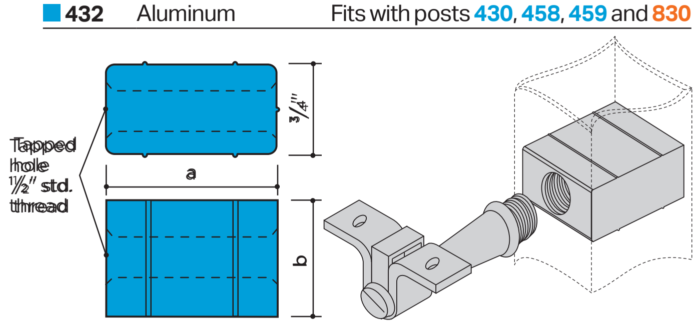
Post		a
462*	Aluminum	1 3/4"
463*	Aluminum	3"
862	Bronze	1 3/4"
863	Bronze	3"
1362	Nickel-Silver	1 3/4"
1366	Nickel-Silver	3"
245	Stainless	1 3/4"
246	Stainless	3"

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



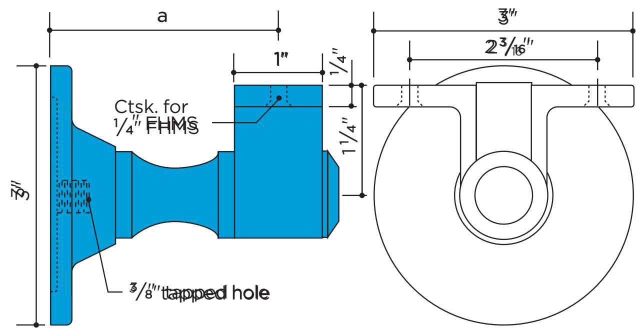
		a	b	
238	Aluminum	1.34"	1 1/8"	Fits with stainless post 230
279	Aluminum	1.84"	1 1/4"	Fits with stainless post 280

For Pipe Post Anchor Plugs, see page 26.

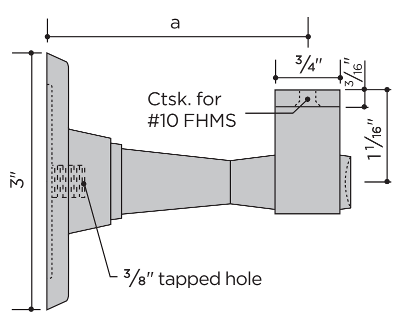
ALUMINUM BRONZE NICKEL-SILVER STAINLESS

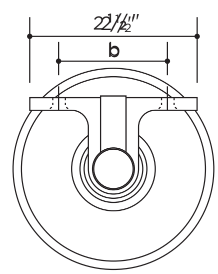
SELF-ALIGNING WALL BRACKETS

Satin Finish

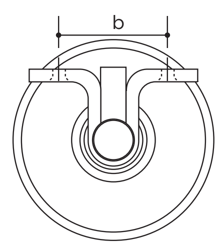


For use with **Carlstadt**® handrail moulding		a
313	Aluminum	2 5/8"
314	Aluminum	3 1/8"



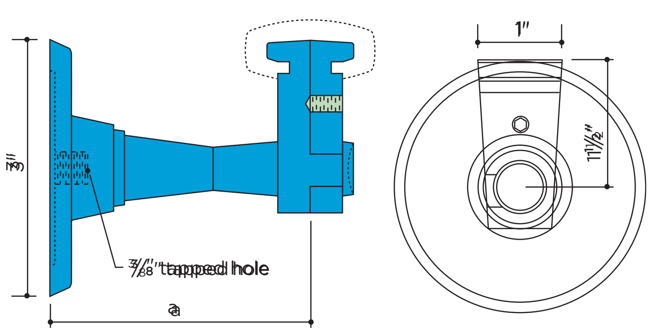


Aluminum, bronze and nickel-silver detail

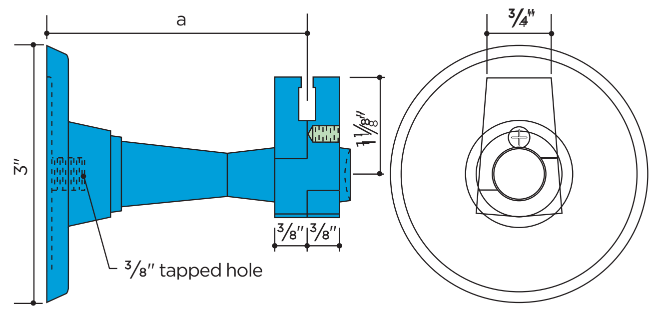


Stainless detail

		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"



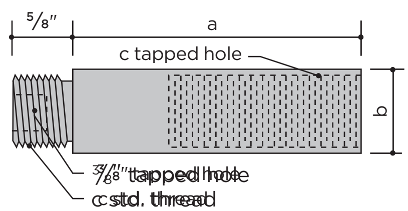
For use with **Carlsrail**® handrail moulding		a
175	Aluminum	2 1/4"
173	Aluminum	3"
174	Aluminum	3 1/2"



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

WALL BRACKET EXTENSIONS

Satin Finish



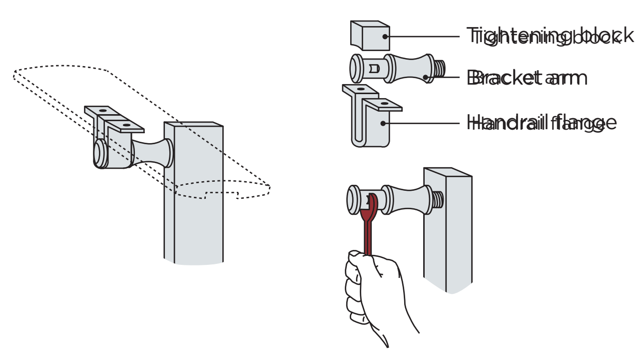
Designers should note that extending a bracket increases stress at its base and reduces its allowable load.

		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

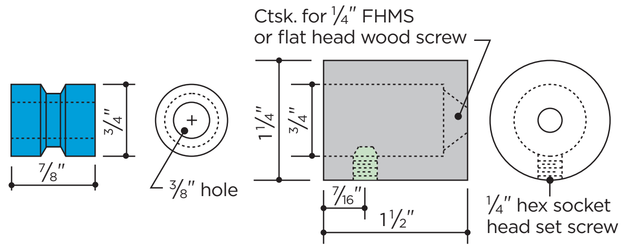
Post and upper post caps must be drilled and tapped to accept bracket arm. Recess of bracket arm has flat sides to accommodate wrench, which permits tightening without marring exposed surfaces. Handrail flange tilts to adjust to stair angle and is attached to handrail with machine screws. Pressure on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



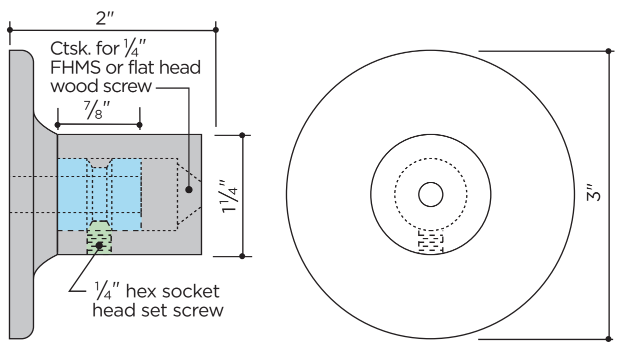
ALUMINUM BRONZE NICKEL-SILVER STAINLESS

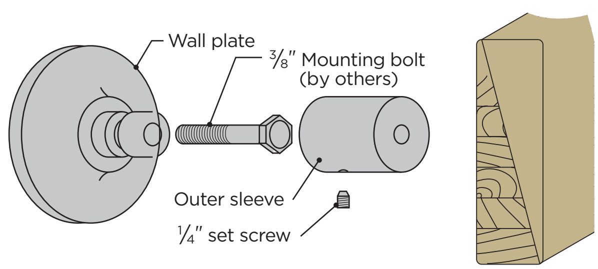
TWO-PIECE MOUNTING BRACKETS

Satin Finish

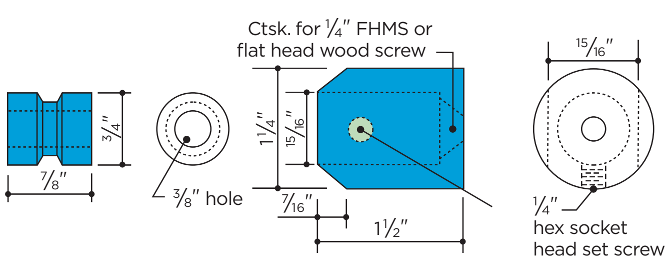


166*	Aluminum	
896	Bronze	
196	Nickel-Silver	
296	Stainless	





168*	Aluminum	
898	Bronze	
298	Stainless	

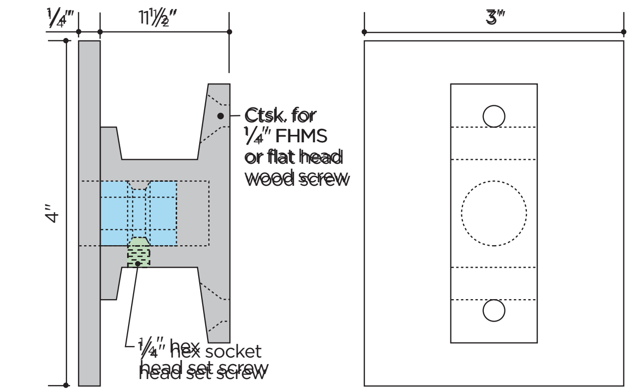


167	Aluminum	Tapered

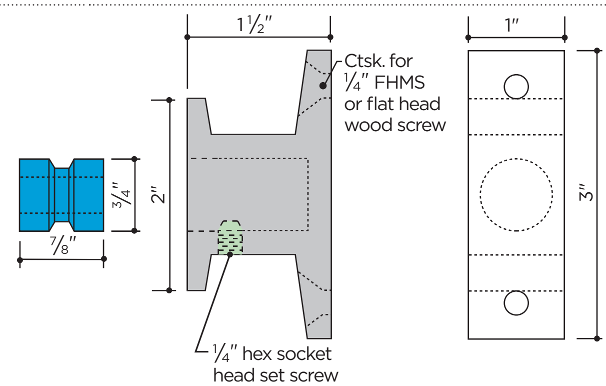
TWO-PIECE MOUNTING BRACKETS

Satin Finish

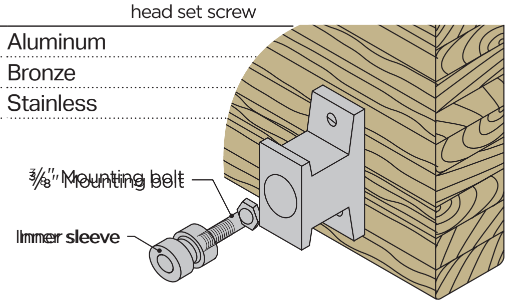
For wide wood handrails or metal handrails



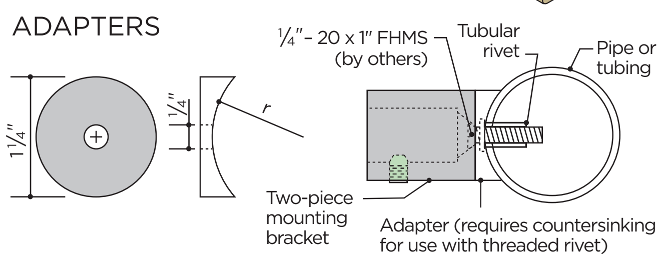
160*	Aluminum
890	Bronze
290	Stainless



169*	Aluminum
899	Bronze
299	Stainless



ADAPTERS



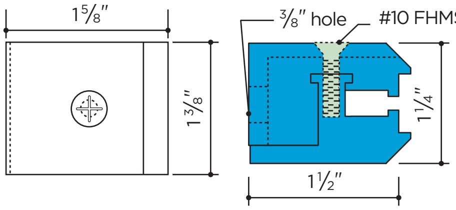
		r	Use With
7164*	Aluminum	.830"	1.660" OD
7264*	Aluminum	.950"	1.900" OD
8864	Bronze	.950"	1.900" OD
8964	Bronze	.750"	1.500" OD
5264	Nickel-Silver	.750"	1.500" OD
5364	Nickel-Silver	.950"	1.900" OD
9164	Stainless	.830"	1.660" OD
9364	Stainless	.950"	1.900" OD

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

ALUMINUM BRONZE NICKEL-SILVER STAINLESS STEEL

VERTICAL MOUNTING BRACKET

Satin Finish

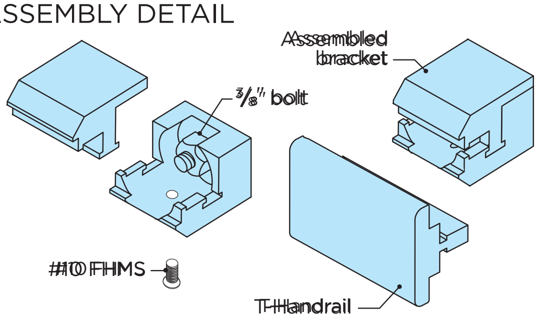


151*	Aluminum

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

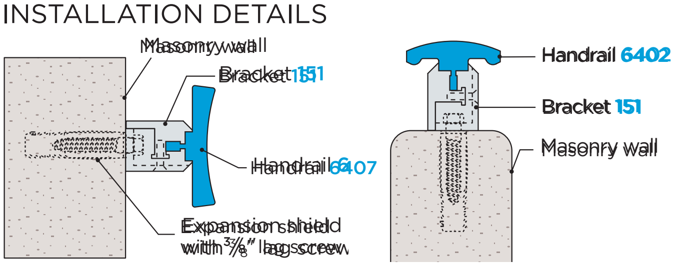
Vertical mounting bracket 151 is designed for mounting handrail on edge to provide a wall guard or bumper. **Carlstadt**® T-handrail mouldings 6402, 6405 or 6407 can be mounted without drilling and tapping. Bracket is also suitable for mounting handrail on top of a parapet or wall.

ASSEMBLY DETAIL



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

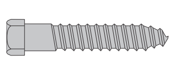
INSTALLATION DETAILS



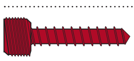
BOLTS AND ANCHORS

for handrail wall brackets

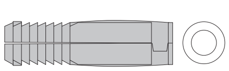
Hanger Bolt — Steel ⅜″ × 3″



Hex Head Lag Screw
- Aluminum ⅜″ x 2″
- Brass ⅜″ x 2″ (Plain or Finished)
- Nickel-Silver ⅜″ x 2″ (Finished)
- Stainless ⅜″ x 2″

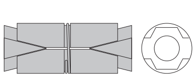


Post Bracket Hanger Bolt
- Steel 5/16″ x 1½″ / ½″–13 x ⅜″



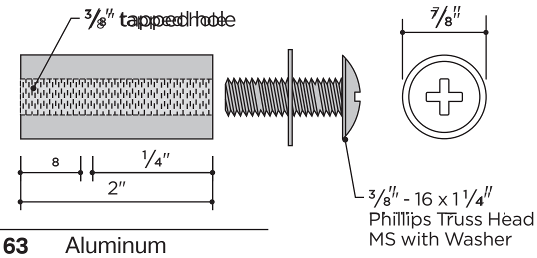
Expansion Shield (Lead) For setting ⅜″ lag screws and hanger bolts in concrete, brick or stone. Drill hole size of ⅜″ diameter by 2½″ deep.

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 2¼″ deep.

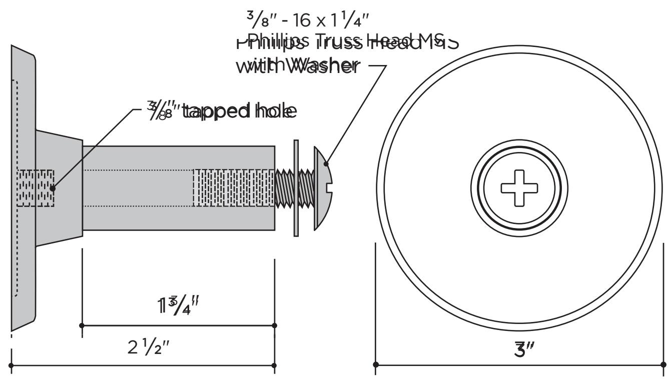


THREADED BUSHING BRACKETS

Satin Finish

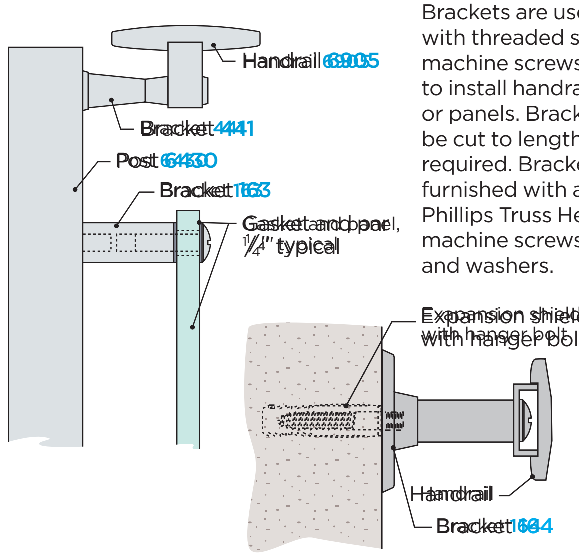


163	Aluminum
63	Stainless



164	Aluminum
64	Stainless

INSTALLATION DETAILS

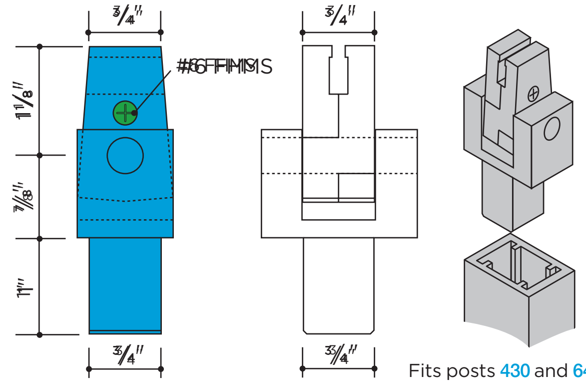


Threaded Bushing Brackets are used with threaded studs, machine screws or bolts to install handrails or panels. Brackets may be cut to length as required. Brackets are furnished with aluminum Phillips Truss Head machine screws and washers.

ALUMINUM STAINLESS

CENTER POST BRACKETS

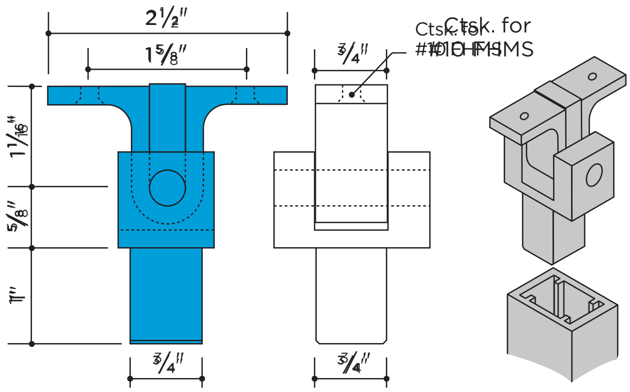
Satin Finish, except as noted



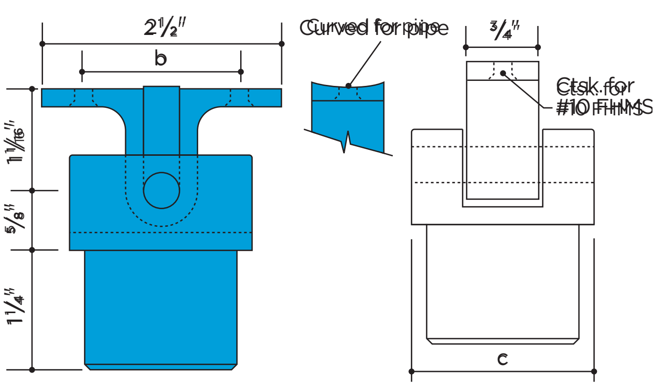
Fits posts 430 and 6430

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



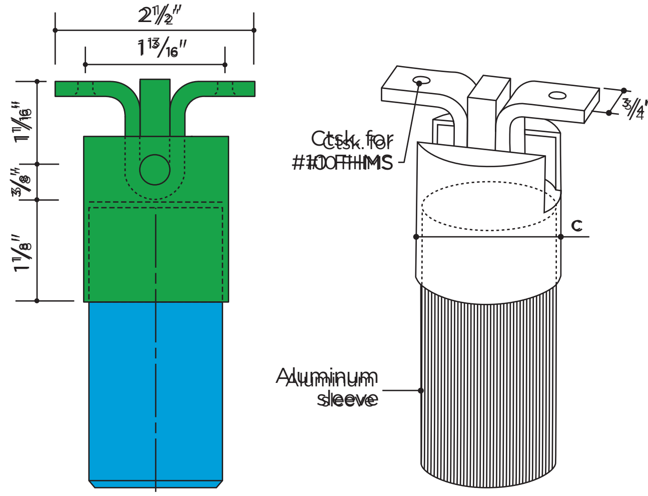
For center mounting of flat-bottomed handrail onto aluminum **Connectorail®** posts

Flat		Pipe	Sched.	c	b
144	Aluminum	1 1/4"	40	1.660"	1 5/8"
145	Aluminum	1 1/2"	40	1.900"	1 5/8"

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

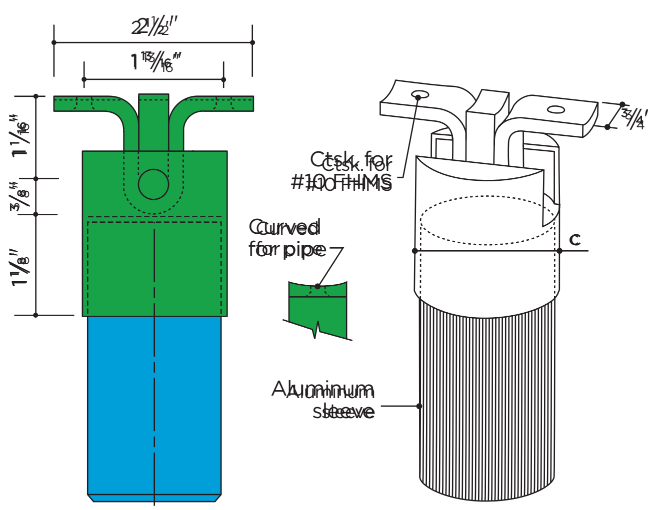
Curved		Pipe	Sched.	c	b
142*	Aluminum	1 1/4"	40	1.660"	1 5/8"
143*	Aluminum	1 1/2"	40	1.900"	1 5/8"

* 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	1 1/2"	5	1.900"



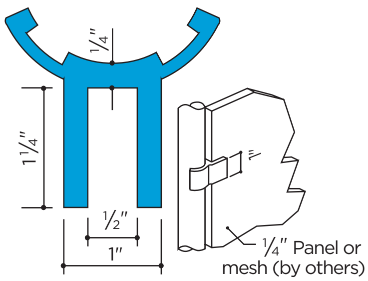
For center mounting of handrail pipe or rounded handrail onto stainless **Connectorail®** posts

Curved		Pipe	Sched.	c
208	Stainless Steel	1 1/2"	5	1.900"

ALUMINUM BRONZE NICKEL-SILVER STAINLESS

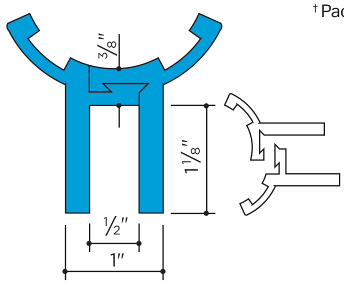
PANEL CLIPS

For aluminum pipe only, Mill Finish or Clear Anodized



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

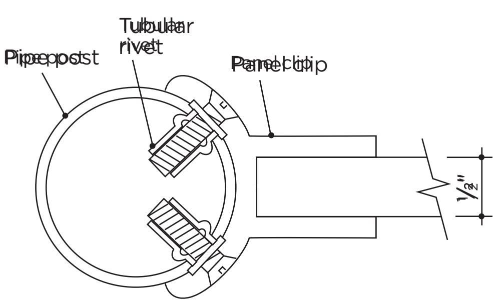
* 5' Length
† Packages of 4 pieces

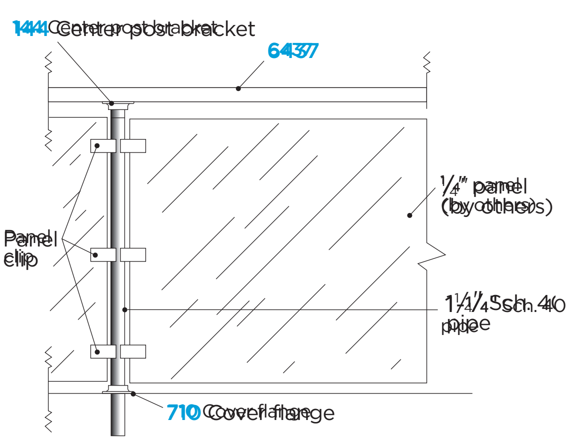


		Pipe
7260**	Aluminum	1½"

Packages of 4 sets.
** Two-piece assembly

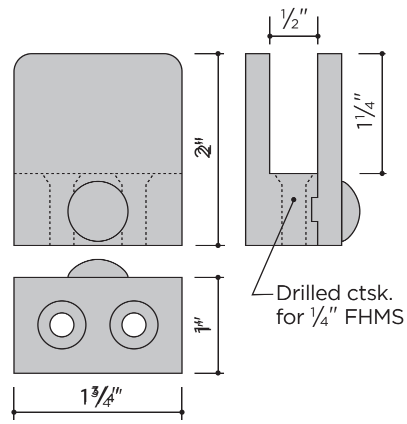
INSTALLATION DETAIL





PANEL CLIPS

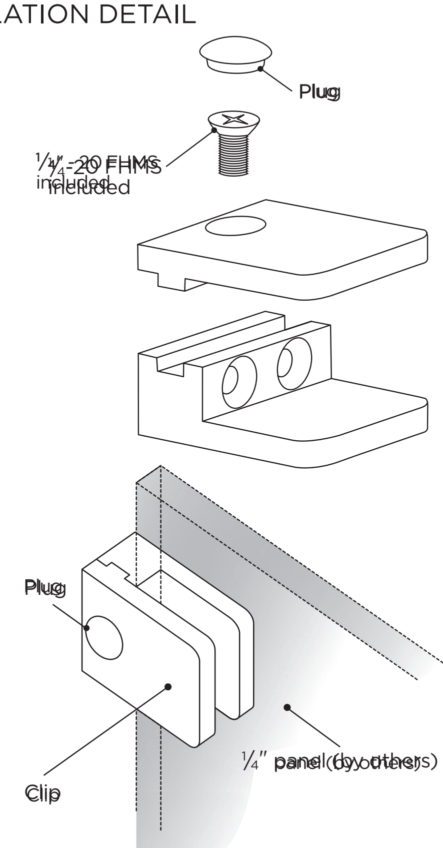
For mounting to flat surface, Satin Finish



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.

INSTALLATION DETAIL



HANDRAIL BRACKETS

Office Tavern Grill, Morristown, NJ | Fabricator: AR Fabricators, East Hanover, NJ | Architect: Frank J Rawding, AIA, Morristown, NJ | General Contractor: Dover Commercial Construction, Barnegat, NJ | Interior Designer: Jackson Creative Group, Middletown,RI

For convenience and ease of reference, all of the handrail brackets which 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.

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



843


321

CAST, STAMPED AND EXTRUDED WALL BRACKETS

These wall brackets are more traditional in style and may be used in a multitude of applications. The various styles allow for concealed fastening or by attachment with a single 3/8″ mounting bolt through the wall flange center.

370


1622



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



222


309

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.

163


290

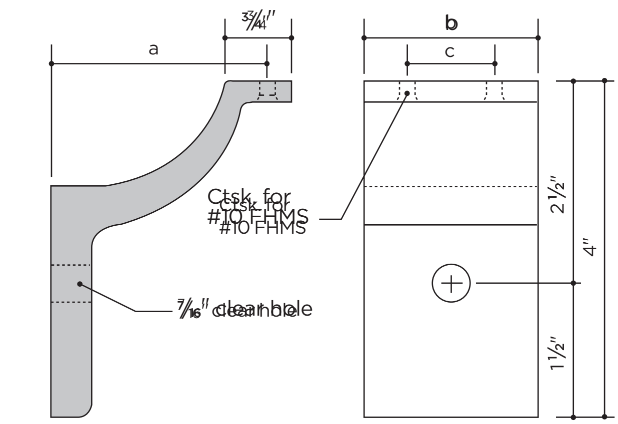


896


151

ALUMINUM BRONZE NICKEL-SILVER STAINLESS MALLEABLE IRON/STEEL TITANIUM

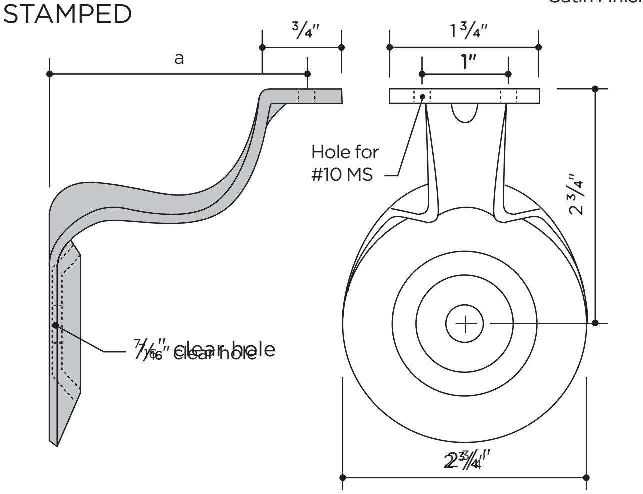
EXTRUDED – UNPOLISHED



		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

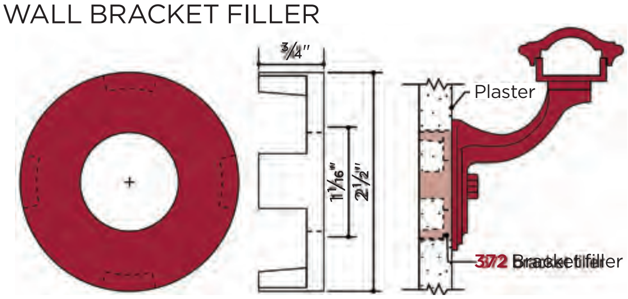
STAMPED



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

†† Burnished

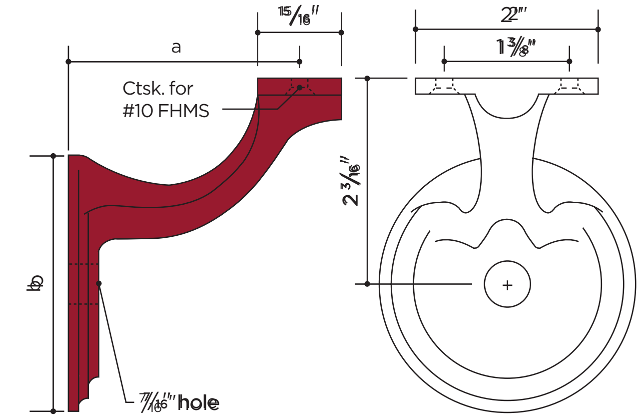
WALL BRACKET FILLER



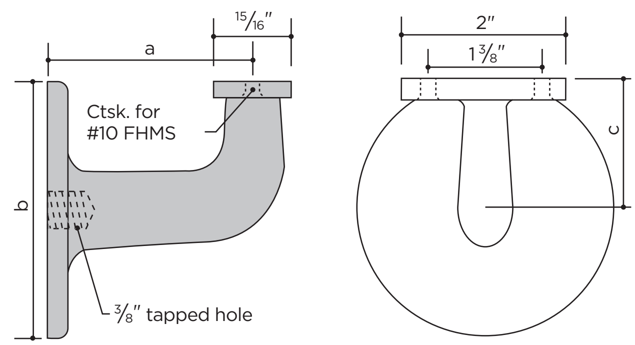
372	Malleable Iron

Set bracket filler in plaster wall before mounting handrail bracket.

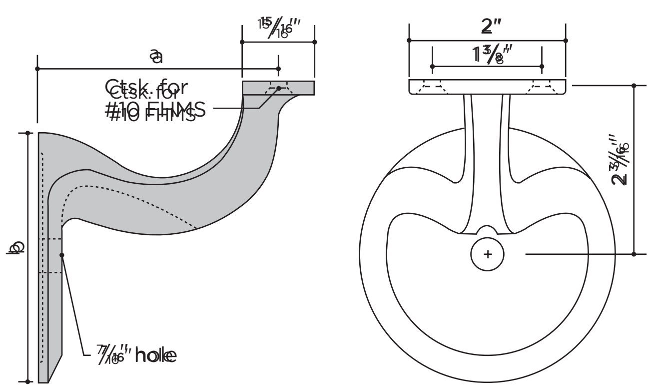
CAST



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



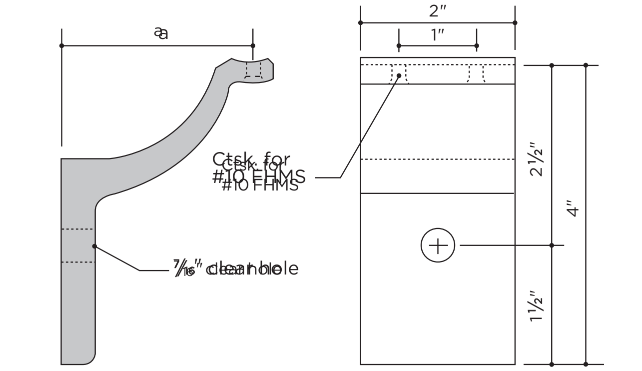
		a	b	c
371	Aluminum	2 1/2"	3 1/8"	1 9/16"
302	Aluminum	3 1/8"	3 3/4"	1 7/8"
370	Bronze	2 1/2"	3 1/8"	1 9/16"
304	Bronze	3 1/8"	3 3/4"	1 7/8"
170	Nickel-Silver	2 1/2"	3 1/8"	1 9/16"
270	Stainless	2 1/2"	3 1/8"	1 9/16"
377	Malleable Iron	2 1/2"	3 1/8"	1 9/16"
385	Malleable Iron	3"	3 1/8"	1 9/16"



		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"

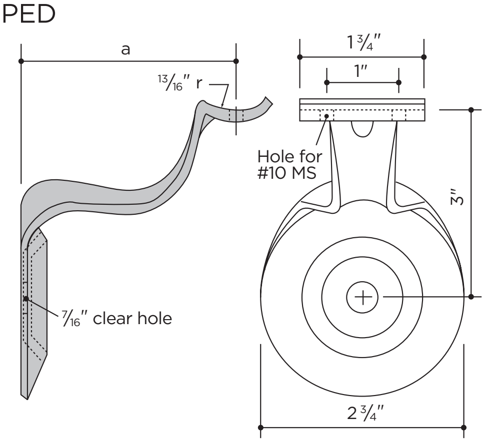
ALUMINUM · BRONZE · NICKEL-SILVER · STAINLESS · MALLEABLE IRON/STEEL

EXTRUDED – UNPOLISHED



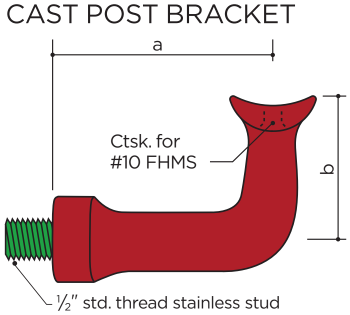
		a
478*	Aluminum	2 1/2"
498*	Aluminum	3"
892	Bronze	2 1/2"
894	Bronze	3"
192	Nickel-Silver	2 1/2"
218†	Stainless	2 1/2"
220†	Stainless	3"

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"

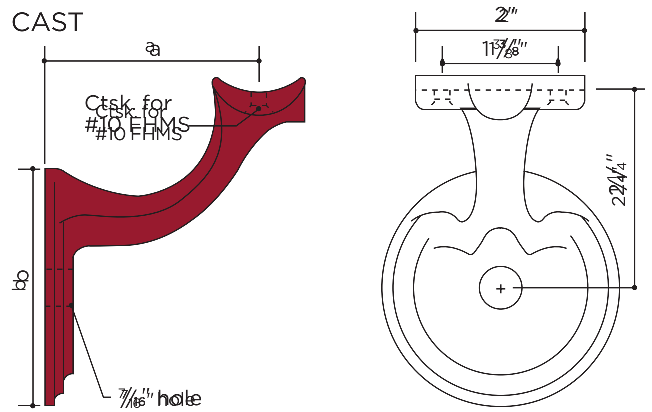
CAST POST BRACKET



		a	b
374	Malleable Iron	2 1/2"	1 9/16"

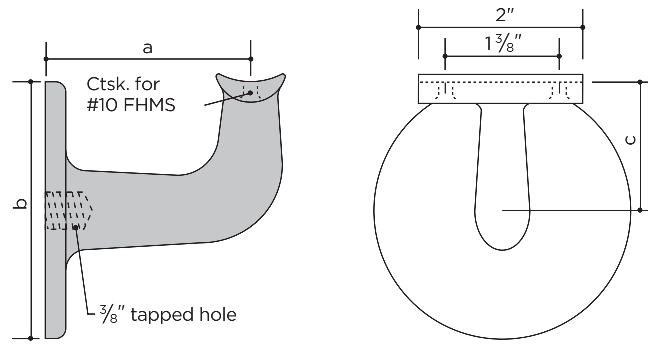
•Post bracket adapter, pg. 96

CAST

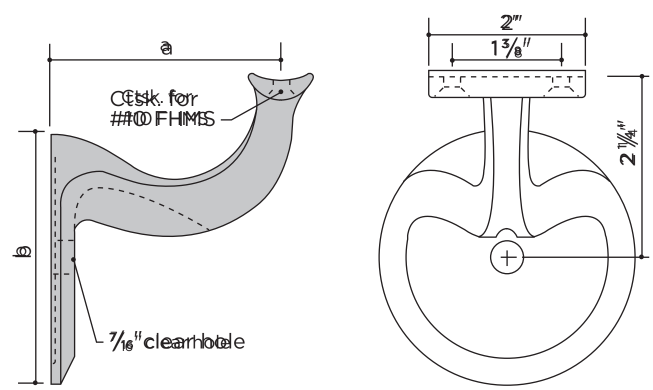


		a	b
382	Malleable Iron	2 1/2"	2 3/4"
382 White, Black^	Malleable Iron	2 1/2"	2 3/4"
1382**	Malleable Iron (Galvanized)	2 1/2"	2 3/4"
306	Malleable Iron	3"	3 1/4"
1306**	Malleable Iron (Galvanized)	3"	3 1/4"

^ 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"

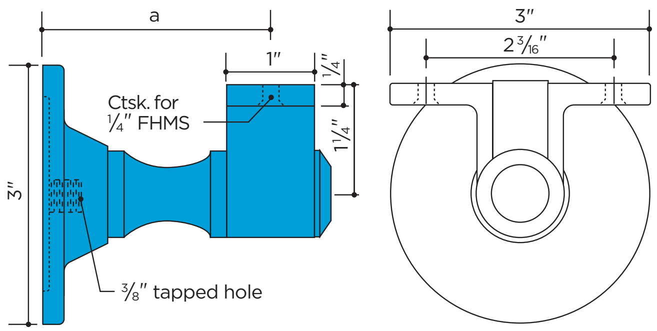


		a	b
384*	Aluminum	2 1/2"	2 3/4"
316*	Aluminum	3"	3 1/4"
388	Bronze	2 1/2"	2 3/4"
318	Bronze	3"	3 1/4"
1088	Stainless	2 1/2"	2 3/4"

* 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

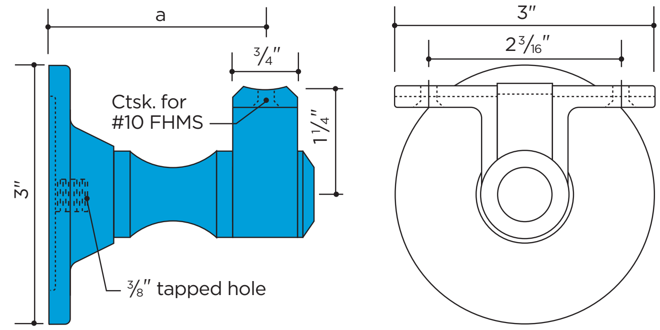
ALUMINUM BRONZE NICKEL-SILVER STAINLESS

SELF-ALIGNING
Satin Finish

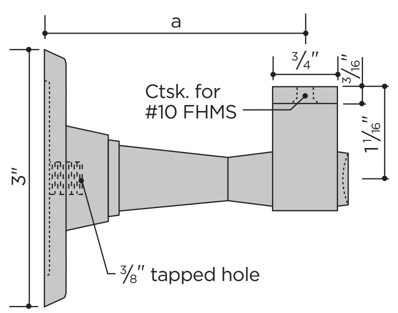


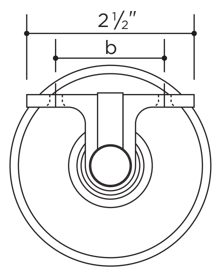
For use with **Carlstadt**® handrail moulding		a
313	Aluminum	2 5/8"
314	Aluminum	3 1/8"

For use with pipe railings

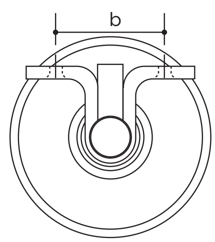


		a
307*	Aluminum	2 1/2"
308*	Aluminum	3"



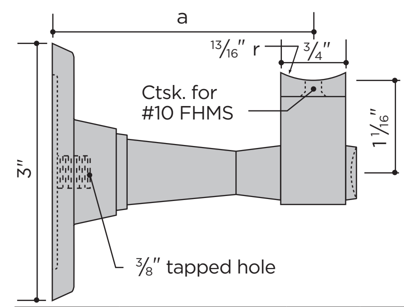


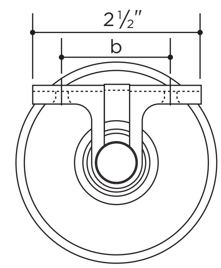
Aluminum, bronze and nickel-silver detail



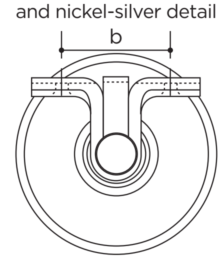
Stainless detail

		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"



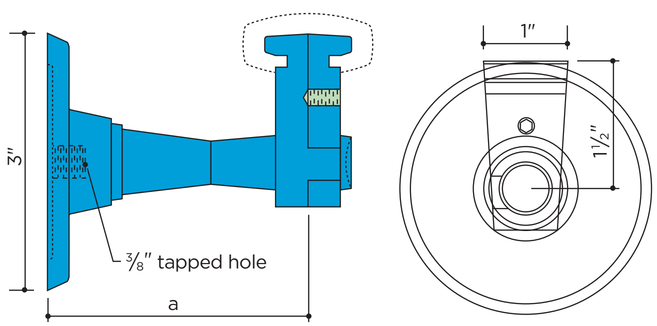


Aluminum, bronze and nickel-silver detail

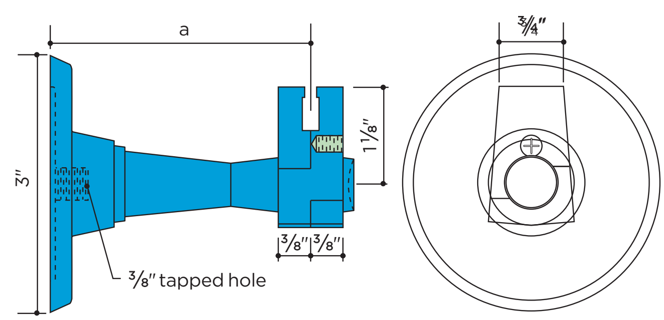


Stainless detail

		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"



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



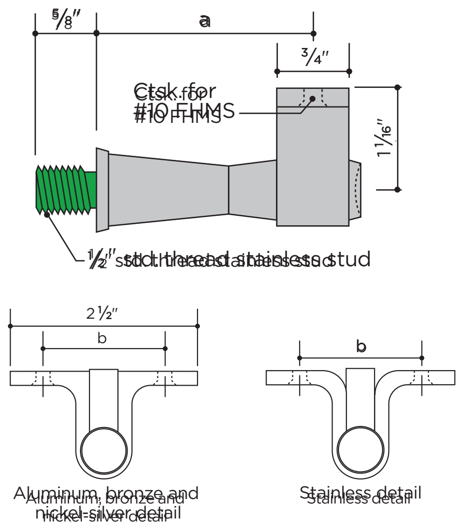
For use with **Carlstadt**® T-handrail moulding		a
418	Aluminum	3"
419	Aluminum	3 1/2"

* Also available in clear anodized AA-M32-C22-A31 (204R1) Wall bracket extensions, pg. 96

ALUMINUM BRONZE NICKEL-SILVER STAINLESS MALLEABLE IRON

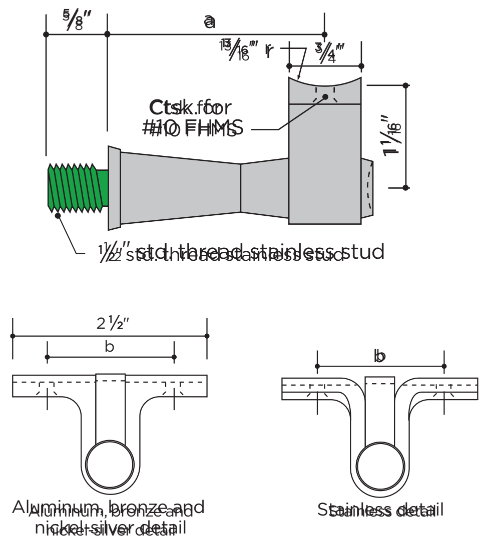
SELF-ALIGNING

Carlstadt® Post Brackets are supplied with ½" stainless steel studs for attachment to metal posts. To mount **Carlstadt® Post Brackets** onto wood, use the Post Bracket Hanger Bolt shown on page 96.

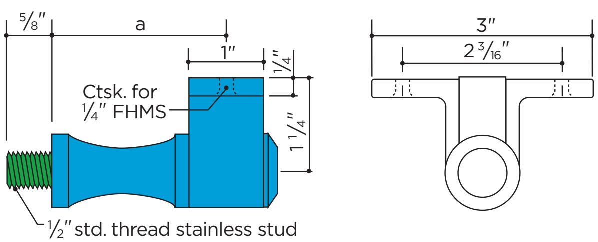


		a	b
441	Aluminum	$2\frac{1}{4}$"	$1\frac{5}{8}$"
442	Aluminum	$2\frac{3}{4}$"	$1\frac{5}{8}$"
841	Bronze	$2\frac{1}{4}$"	$1\frac{5}{8}$"
1341	Nickel-Silver	$2\frac{1}{4}$"	$1\frac{5}{8}$"
241	Stainless	$2\frac{1}{4}$"	$1\frac{13}{16}$"

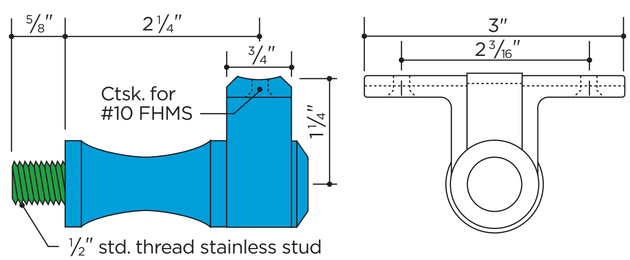
For use with pipe railings



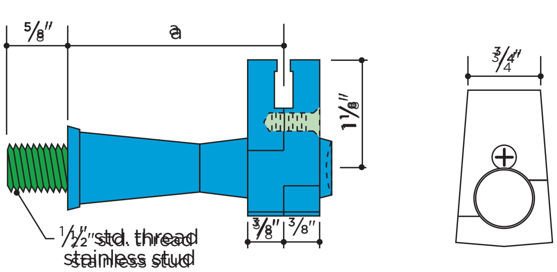
		a	b
402*	Aluminum	$2\frac{1}{4}$"	$1\frac{5}{8}$"
402L*	Aluminum	$2\frac{1}{2}$"	$1\frac{5}{8}$"
404*	Aluminum	$2\frac{3}{4}$"	$1\frac{5}{8}$"
802	Bronze	$2\frac{1}{4}$"	$1\frac{5}{8}$"
1302	Nickel-Silver	$2\frac{1}{4}$"	$1\frac{5}{8}$"
222	Stainless	$2\frac{1}{4}$"	$1\frac{13}{16}$"
222L	Stainless	$2\frac{1}{2}$"	$1\frac{5}{8}$"



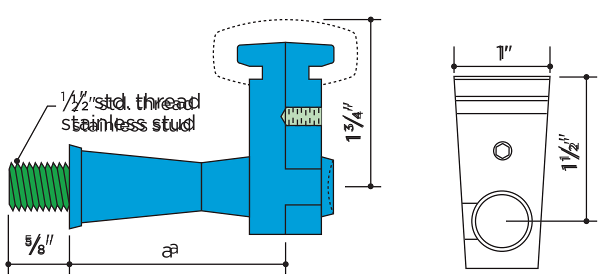
For use with **Carlstadt®** handrail moulding		a
309	Aluminum	$3\frac{1}{4}$"
312	Aluminum	$2\frac{3}{8}$"



322*	Aluminum



For use with **Carlstadt®** T-handrail moulding		a
439	Aluminum	$2\frac{1}{4}$"
440	Aluminum	$2\frac{3}{4}$"

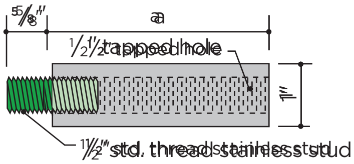


For use with **Carlsrail®** handrail moulding		a
171	Aluminum	$2\frac{1}{4}$"
172	Aluminum	$2\frac{3}{4}$"

* Also available in clear anodized AA-M32-C22-A31 (204R1) Post bracket extensions, pg. 96

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

POST BRACKET EXTENSIONS



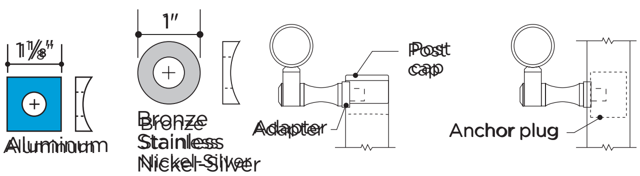
		a
462*	Aluminum	1¾"
463*	Aluminum	3"
862	Bronze	1¾"
863	Bronze	3"
1362	Nickel-Silver	1¾"
1366	Nickel-Silver	3"
245	Stainless	1¾"
246	Stainless	3"

Extensions may be cut to length to suit individual conditions.

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

POST BRACKET ADAPTER

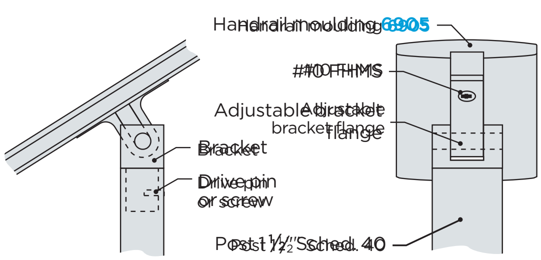
Satin Finish



		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"

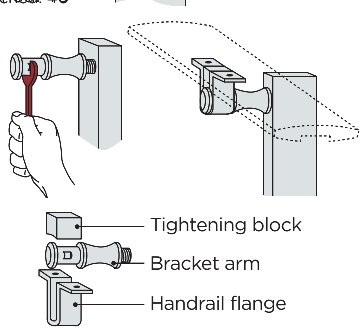
POST BRACKET ASSEMBLY DETAILS

Angle may be adjusted as required.

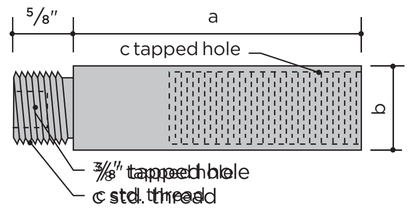


ADJUSTABLE BRACKET DETAIL

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"

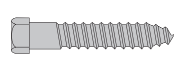
Extensions may be cut to length to suit individual conditions but not shorter than 1⅝".

Note: 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.

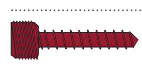
BOLTS AND ANCHORS

For handrail wall brackets

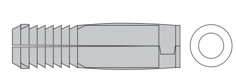
Hanger Bolt Steel ⅜" x 3"



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"

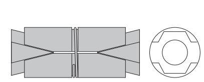


Post Bracket Hanger Bolt
- Steel 5/16" x 1½" / ½"–13 x ⅜"



Expansion Shield (Lead) For setting ⅜" lag screws and hanger bolts in concrete, brick or stone. Drill hole size of ⅜" diameter by 2½" deep.

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 2¼" deep.

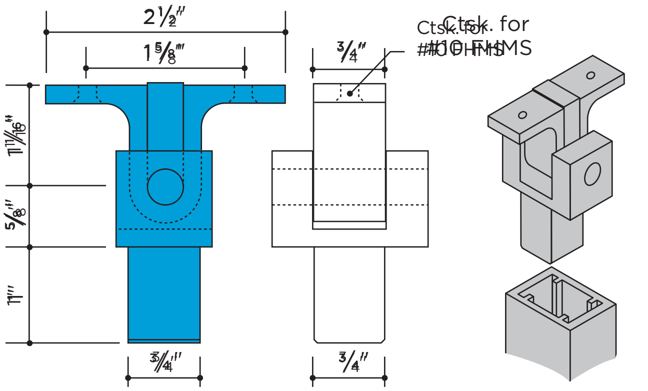


* Also available in clear anodized AA-M10-C22-A31 (204R1)

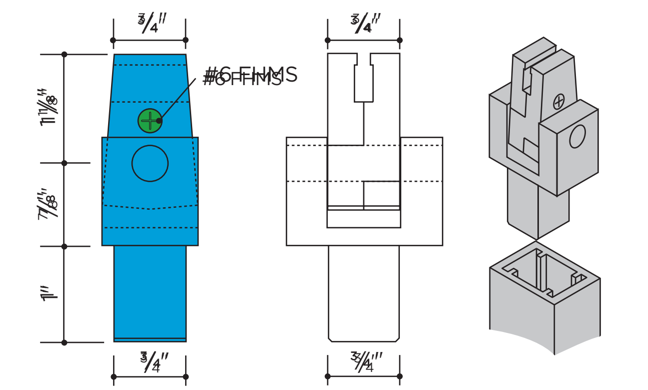
ALUMINUM STAINLESS

CENTER POST BRACKETS

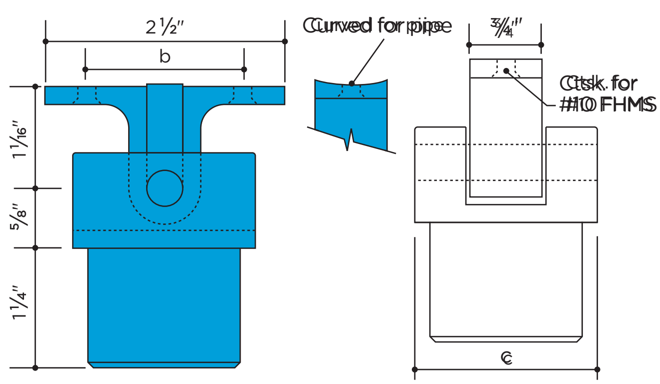
Center post brackets permit handrail to be centered directly over post, yet allow it to tilt to conform to stair incline. Bracket is secured to post with pin or screw.



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

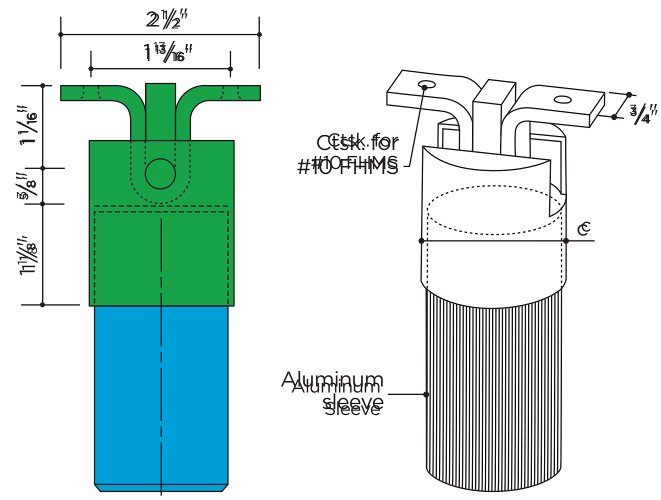


For center mounting of flat-bottomed handrail onto aluminum **Connectorail**® posts

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

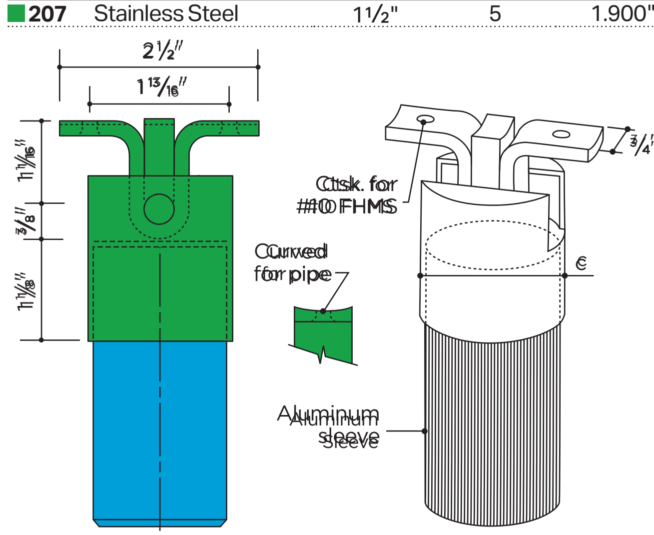
For center mounting of pipe or rounded handrail onto aluminum **Connectorail**® posts

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"



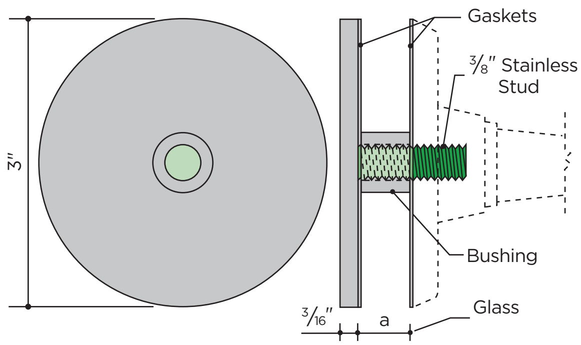
For center mounting of handrail pipe or rounded handrail onto stainless **Connectorail**® posts

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

ALUMINUM BRONZE NICKEL-SILVER STAINLESS

GLASS-MOUNTED HANDRAIL ADAPTER KIT

For ½″ and ¾″ 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"

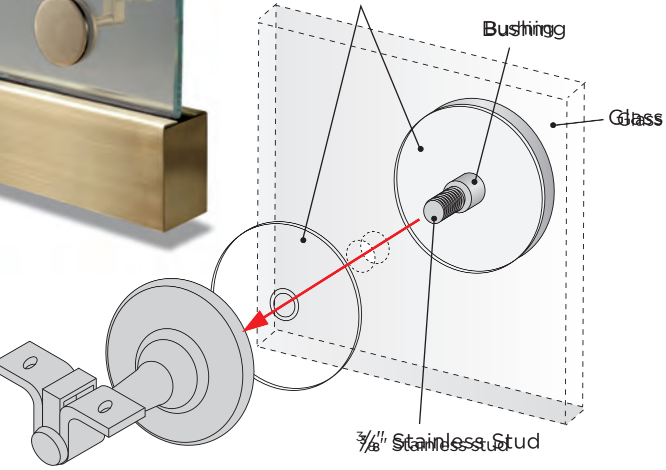
* For use with aluminum and stainless brackets

GLASS-MOUNTED HANDRAIL

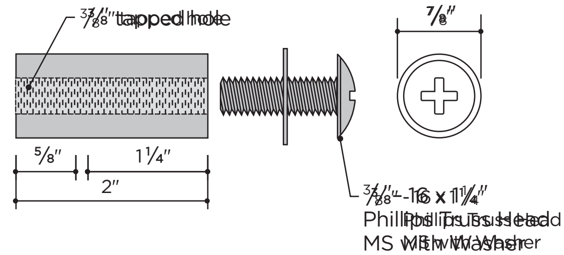
Handrail may be mounted to the face of the tempered glass balustrade using a combination of **Carlstadt**® wall brackets and our glass mounting adapter kit. The kit contains a disc with a ⅜″ stud weld, a bushing and two gaskets.

TO ASSEMBLE:

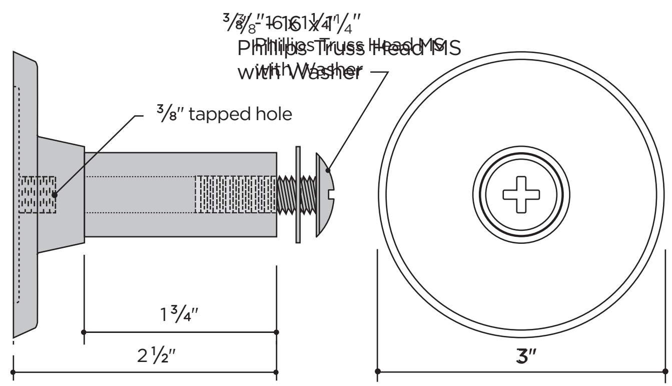
1. Prior to tempering, for ½″ glass drill a ⅝″ clear hole; for ¾″ glass drill a ⅞″ clear hole **(Do not attempt to drill a hole in tempered glass — it will most likely break)**
2. Insert the bushing into the hole
3. Insert the stud welded disc with gasket through the bushing; place the gasket on the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



THREADED BUSHING BRACKETS

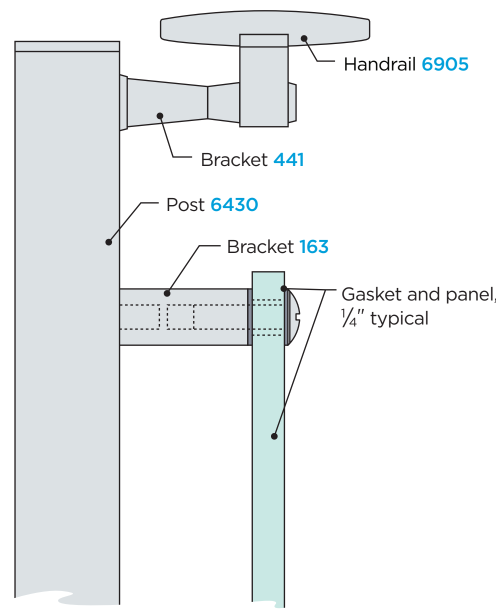


163	Aluminum
63	Stainless



164	Aluminum
64	Stainless

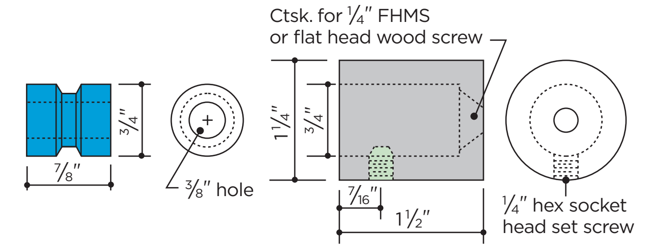
Installation Details



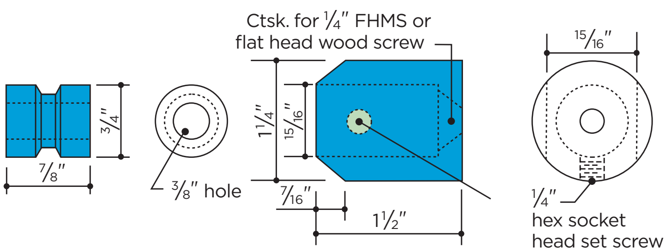
Threaded Bushing Brackets are used with threaded studs, machine screws or bolts to install handrails or panels. Brackets may be cut to length as required. Brackets are furnished with aluminum Phillips Truss Head machine screws and washers.

ALUMINUM BRONZE NICKEL-SILVER STAINLESS

TWO-PIECE MOUNTING BRACKETS
Satin Finish

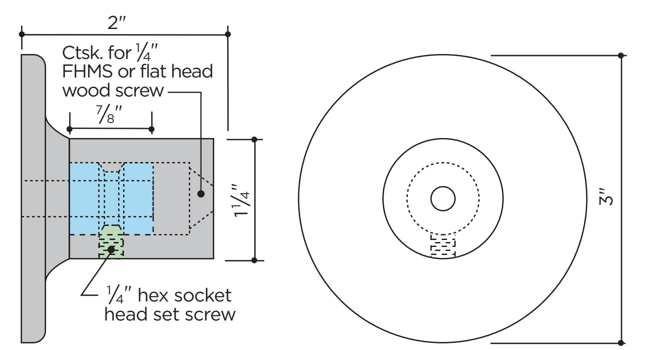


For elevator car handrails	
166*	Aluminum
896	Bronze
196	Nickel-Silver
296	Stainless



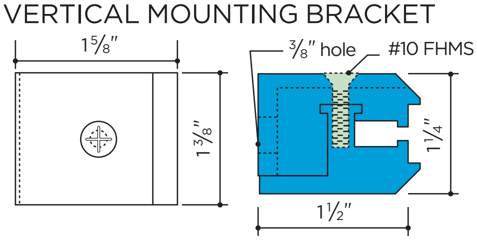
167	Aluminum	For narrow posts

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

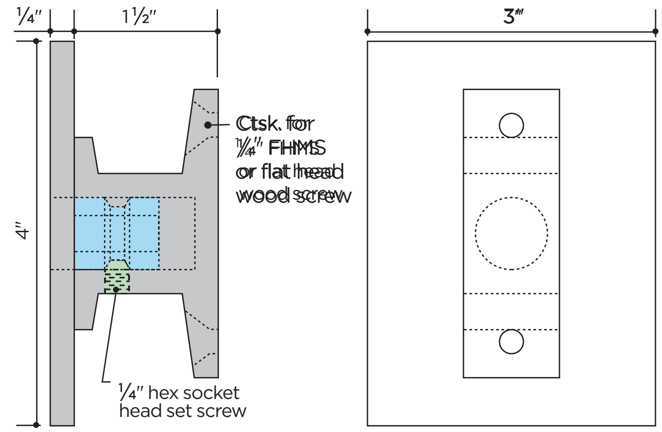
VERTICAL MOUNTING BRACKET



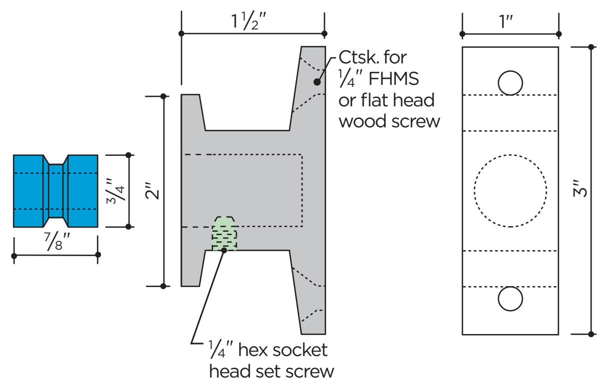
151	Aluminum

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

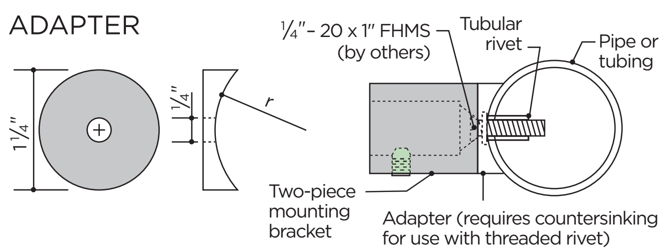


160*	Aluminum
890	Bronze
290	Stainless



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)

ELEVATOR SADDLES, THRESHOLDS AND MOULDINGS

Product rendering using Stainless Steel Elevator Cab Components

This section details the Julius Blum & Co., Inc. 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 & Brackets suitable for vertical mounting.

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.

All brackets are satin finished.

Refer to pages 109-123 for our full range of tubing, bars and shapes in aluminum, bronze, nickel-silver, steel and stainless steel.

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.

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.

SADDLES

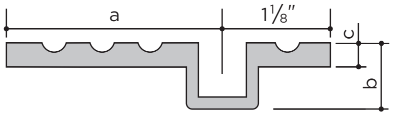
Elevator and Door Saddles are available in aluminum, bronze, nickel-silver, stainless steel and steel. To extend width, flat fluted sections may be combined with single or double speed saddles. Saddle alloy matches handrail alloy. Components sold mill finish.

TUBING, BARS AND SHAPES

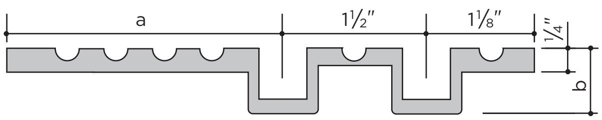
A large selection of tubing, bars and shapes is available from stock in aluminum, bronze, steel, nickel-silver and stainless steel. Shapes are extruded to high tolerances and have the sharp corners required for architectural work. Angles and tees are frequently used in dropped ceilings as well as in other areas of elevator cabs.

ALUMINUM BRONZE NICKEL-SILVER STAINLESS

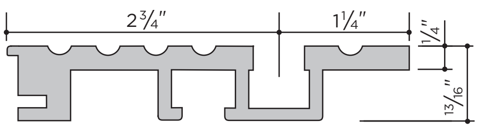
ELEVATOR DOOR SADDLES



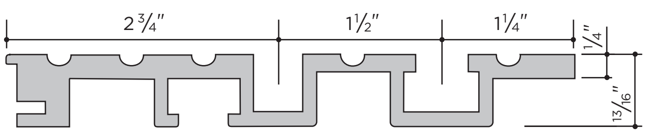
		a	b	c	lb/ft	Lengths
6963	Aluminum	2 1/4"	11/16"	1/4"	.85	20'
6969	Aluminum	2 7/8"	11/16"	1/4"	1.08	20'
4563	Bronze	2 1/4"	11/16"	1/4"	2.96	6', 8', 10', 16'
4569	Bronze	2 7/8"	11/16"	1/4"	3.93	6', 8', 10', 16'
5563	Nickel-Silver	2 1/4"	3/4"	1/4"	3.58	6', 8', 10'
5569	Nickel-Silver	2 7/8"	11/16"	1/4"	4.16	6', 8', 10'
5569X	Nickel-Silver	2 7/8"	11/16"	3/8"	5.40	6', 8'



		a	b	lb/ft	Lengths
6964	Aluminum	2 1/4"	11/16"	1.25	20'
6979	Aluminum	2 7/8"	11/16"	1.44	20'
4564	Bronze	2 1/4"	11/16"	4.25	6', 8', 10', 16'
4579	Bronze	2 7/8"	11/16"	5.09	6', 8', 10', 12'
5564	Nickel-Silver	2 1/4"	3/4"	5.42	6', 8', 10'
5579	Nickel-Silver	2 7/8"	11/16"	6.35	6', 8', 10'



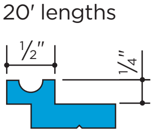
		lb/ft	Lengths
6989	Aluminum	1.54	20'
4589	Bronze	4.79	8', 10'
5589	Nickel-Silver	5.05	8', 10'



		lb/ft	Lengths
6999	Aluminum	2.10	20'
4599	Bronze	6.55	8', 10'
5599	Nickel-Silver	7.00	8', 10'

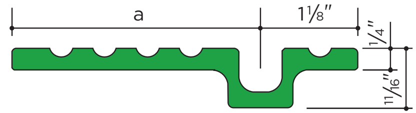
EXTENSIONS

20' lengths

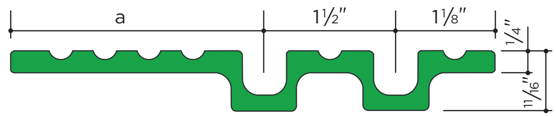


		lb/ft
6967	Aluminum	.314

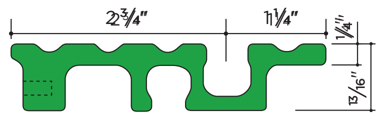
ELEVATOR DOOR SADDLES



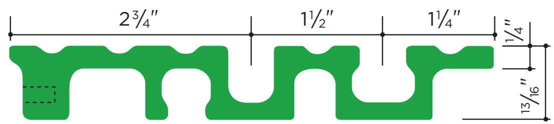
		a	lb/ft	Lengths
6569	Stainless	2 7/8"	3.71	8'
6571	Stainless	2 1/4"	3.32	8'



		a	lb/ft	Lengths
6579	Stainless	2 7/8"	5.53	8'
6572	Stainless	2 1/4"	5.18	8'



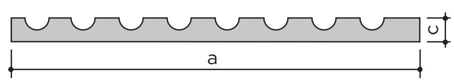
6589	Stainless
5.35 lb/ft	8' lengths



6599	Stainless	7.52 lb/ft	8' lengths

FLAT FLUTED SECTIONS

20' lengths, except as noted. For assembled saddles.



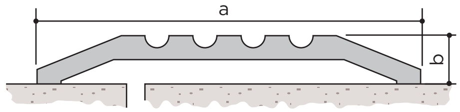
		a	c	lb/ft
6980***	Aluminum	1"	1/4"	.234
6970	Aluminum	1 1/2"	1/4"	.361
6971	Aluminum	2"	1/4"	.482
6973	Aluminum	3"	1/4"	.723
6975	Aluminum	4"	1/4"	.964
4566	Bronze	1"	1/4"	.720
4558	Bronze	1 1/2"	1/4"	1.150
4557	Bronze	2"	1/4"	1.480
4557X*	Bronze	2"	3/8"	2.390
4556	Bronze	2 1/2"	1/4"	1.840
4555	Bronze	3"	1/4"	2.230
4554* **	Bronze	3 1/2"	1/4"	2.550
4553	Bronze	4"	1/4"	2.890
4553Q	Bronze	4 1/4"	1/4"	3.260
4552	Bronze	4 1/2"	1/4"	3.290
4551	Bronze	5"	1/4"	3.670
4550*	Bronze	5 1/2"	1/4"	4.050
4559	Bronze	6 1/8"	1/4"	4.550
5558***	Nickel-Silver	1 1/2"	1/4"	1.150
5553***	Nickel-Silver	4"	1/4"	3.040
5553X*	Nickel-Silver	4"	3/8"	4.420
6573**	Stainless	2 3/8"	1/4"	1.780
6575**	Stainless	4"	1/4"	3.050

* 16' lengths ** 8' lengths *** 10' lengths

ALUMINUM BRONZE STEEL

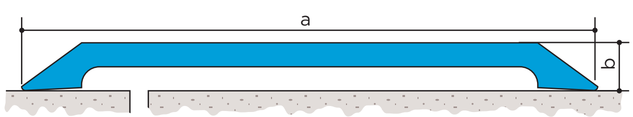
DOOR SADDLES

FLUTED



		lb/ft	a	b	Lengths
6924	Aluminum	.72	3"	1/2"	16'-3"
6923	Aluminum	1.05	4"	1/2"	20'
6926	Aluminum	.83	4"	1/2"	16'-3"
6922	Aluminum	1.27	5"	1/2"	20'
6921	Aluminum	1.23	6"	1/2"	16'-3"
6925	Aluminum	1.76	7"	1/2"	20'
4524	Bronze	2.11	3"	3/8"	20'
4523	Bronze	3.05	4"	1/2"	20'
4522	Bronze	3.79	5"	1/2"	20'
4520	Bronze	4.64	6"	5/8"	20'
4519	Bronze	5.14	7"	1/2"	12'

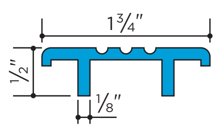
SMOOTH



		lb/ft	a	b	Lengths
6910	Aluminum	.365	2 1/2"	1/4"	20'
6914	Aluminum	.476	3"	1/4"	16'-3"

BUTT SADDLE

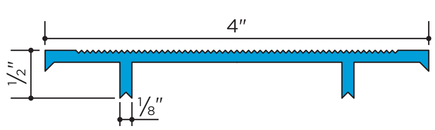
21'-1" lengths



6915	Aluminum	.398 lb/ft

CARPET SADDLE

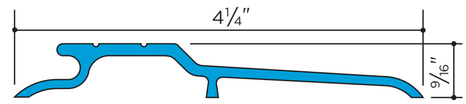
21'-1" lengths



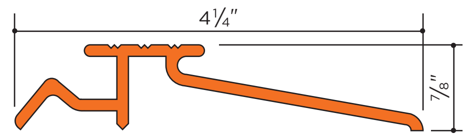
6916	Aluminum	.653 lb/ft

WEATHER STRIP DOOR SADDLES

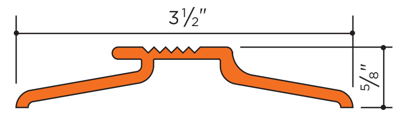
20' lengths, except as noted



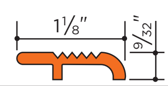
6991	Aluminum 16'-3" lengths	.689 lb/ft



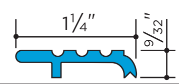
4596	Bronze	2.21 lb/ft



4590	Bronze	1.92 lb/ft



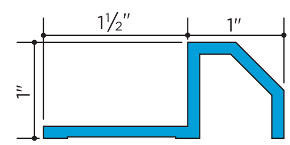
4598	Bronze	.62 lb/ft



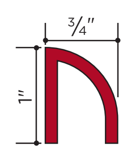
6998	Aluminum 16'-3" lengths	.18 lb/ft

BATHROOM DOOR SADDLES

20' lengths

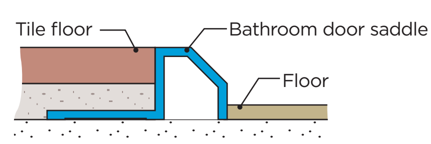


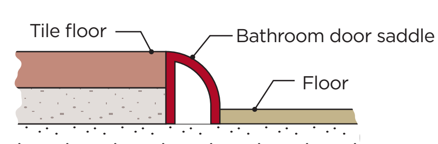
6948	Aluminum	.576 lb/ft



4487	Steel	.93 lb/ft

Typical Details

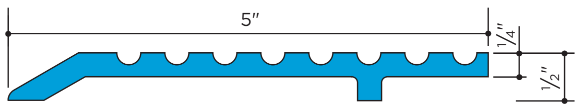




ALUMINUM BRONZE

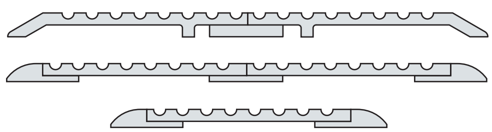
DOOR SADDLE SECTION

21′- 4″ lengths



6913	Aluminum	1.48 lb/ft

Typical Door Saddle Details



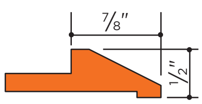
Cutouts for floor hinges can be made easily before assembly.

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.

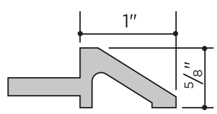
Saddles of extreme width can be constructed by using bevel end sections and two or more flat fluted sections with a plate underneath.

BEVEL END SECTIONS

20′ lengths



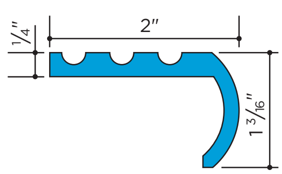
4526	Bronze	1.35 lb/ft



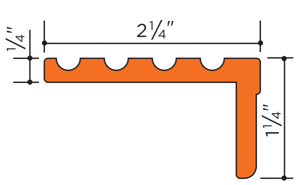
6927	Aluminum	.45 lb/ft
4527	Bronze	1.48 lb/ft

NOSINGS

20′ lengths, except as noted

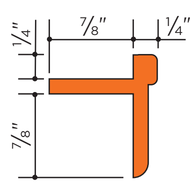


6961	Aluminum	.722 lb/ft



4560*	Bronze	2.45 lb/ft

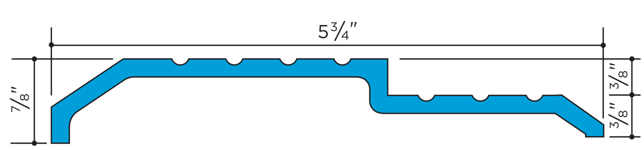
* 12′ lengths



4565	Bronze	1.31 lb/ft

ROOF DOOR SADDLE

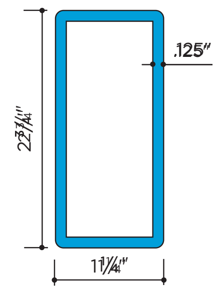
20′ lengths



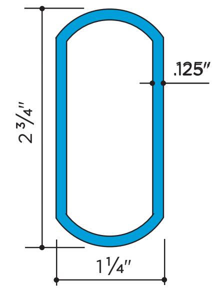
6997	Aluminum	1.45 lb/ft

HANDRAIL MOULDINGS

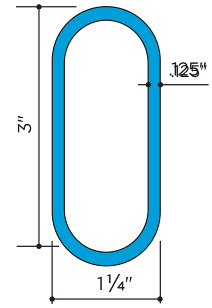
ALUMINUM 6063-T52, 20′ lengths, Mill Finish



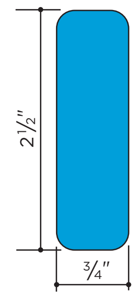
6434* 1.123 lb/ft
Fittings: end cap



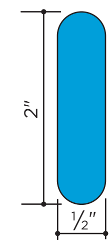
6435* 1.075 lb/ft
Fittings: end cap *6063-T6



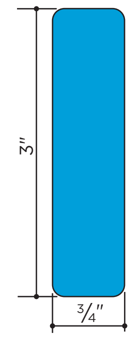
6437 1.057 lb/ft
Fittings: end cap



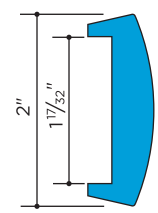
6939 2.214 lb/ft



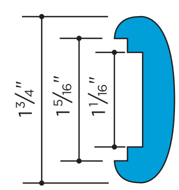
6988 1.138 lb/ft



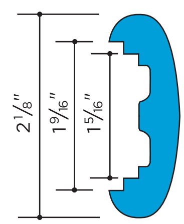
6986 2.684 lb/ft



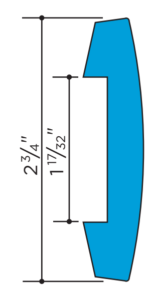
6985 .980 lb/ft
Fittings: end cap



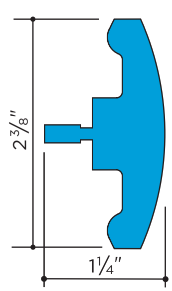
6933 .770 lb/ft
Fittings: end cap



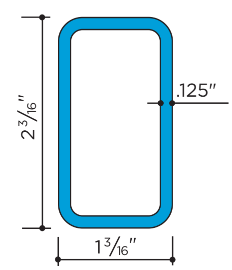
6935 .977 lb/ft
Fittings: end cap



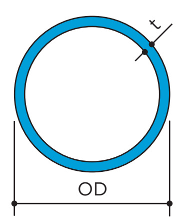
6984 1.301 lb/ft
Fittings: end cap



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

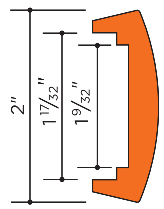
Fittings: end cap

Additional mouldings on pages 40-42

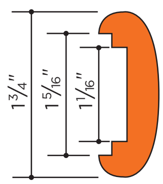
BRONZE NICKEL-SILVER STAINLESS

HANDRAIL MOULDINGS

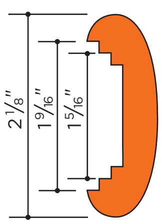
BRONZE C38500, 20′ lengths, except as noted
Mill Finish



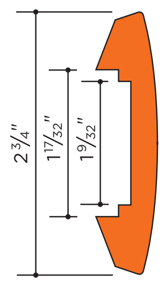
4575 2.37 lb/ft
Fittings: end cap



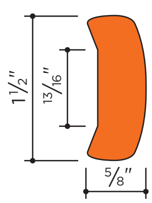
4539 2.66 lb/ft
Fittings: end cap



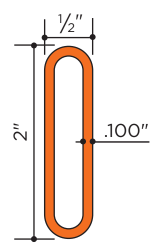
4535 3.35 lb/ft
Fittings: end cap



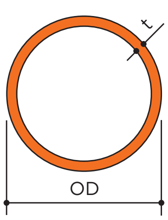
4574 3.71 lb/ft
Fittings: end cap



4503 Bronze 2.73 lb/ft
No fittings available

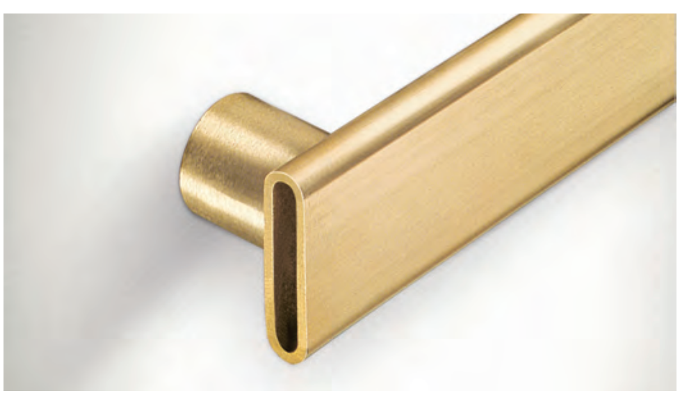


6488* 1.56 lb/ft
Fittings: end cap * 16' lengths

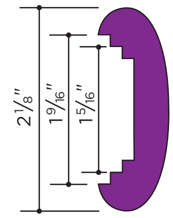


	OD	t	lb/ft
6489	1½"	.100"	1.75
	1.90"	.100"	2.07

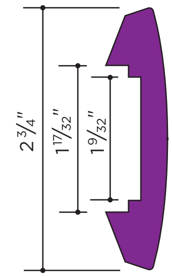
Fittings: end cap, elbow



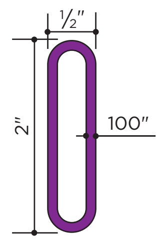
NICKEL-SILVER 79800, 20′ lengths,
Mill Finish



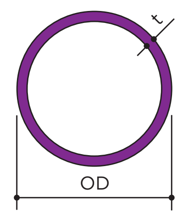
5235 3.16 lb/ft
Fittings: end cap



5274 3.71 lb/ft
Fittings: end cap



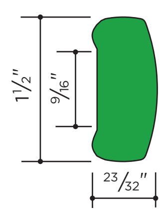
5288 1.56 lb/ft
Fittings: end cap



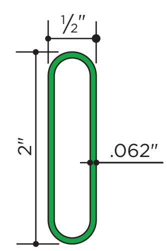
	OD	t	lb/ft
5289	1½"	.100"	1.75
	1.90"	.109"	2.25

Fittings: end cap

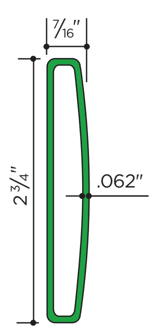
STAINLESS Type 302/304 (18-8), 20′ lengths, except as noted
Mill Finish



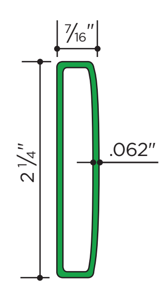
6503 2.54 lb/ft
16' lengths. No fittings available



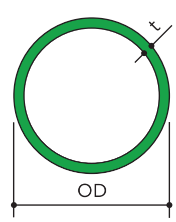
4488 .944 lb/ft
Fittings: end cap



6511 1.25 lb/ft
Fittings: end cap



6512 1.00 lb/ft
Fittings: end cap



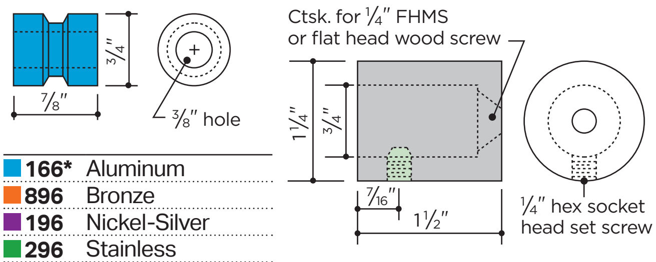
			Satin Finish
Pipe size	OD	t	lb/ft
¾"	1.06	.113"	1.20
1"	1.32	.120"	1.46
1¼"	1.66	.062"	1.11
1¼"	1.66	.148"	2.15
1½"	1.90	.062"	1.27
1½"	1.90	.148"	2.55

Fittings: end cap

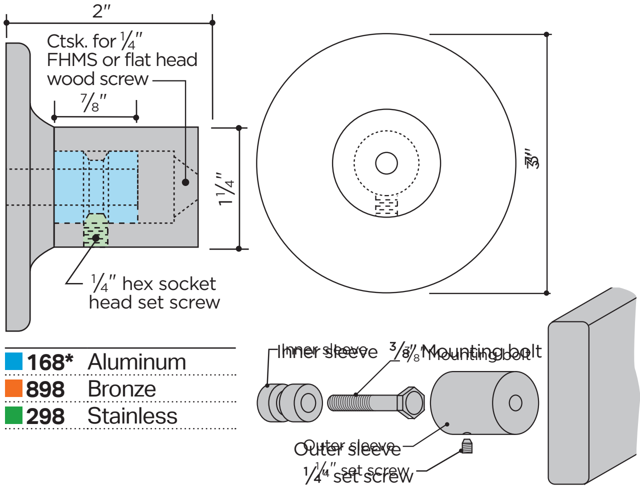
Additional mouldings on pages 40-42

ALUMINUM BRONZE NICKEL-SILVER STAINLESS

TWO-PIECE MOUNTING BRACKETS
Satin Finish

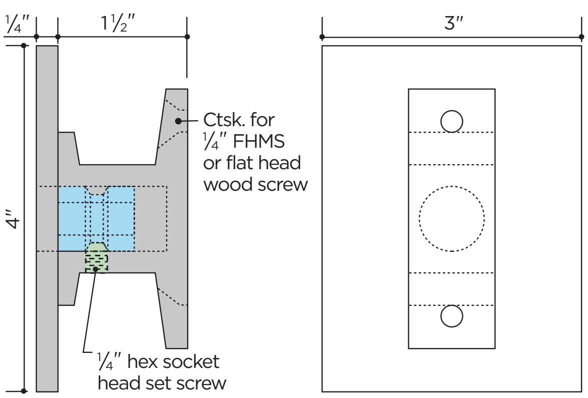


166*	Aluminum
896	Bronze
196	Nickel-Silver
296	Stainless

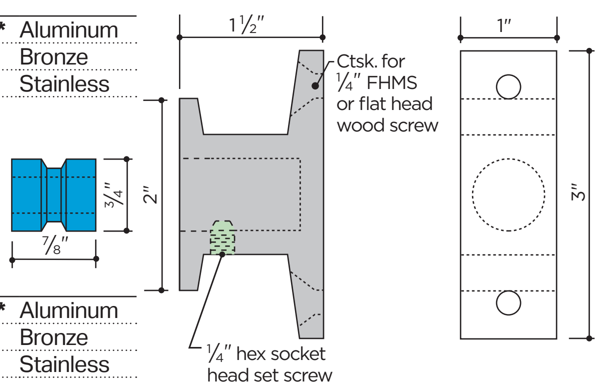


168*	Aluminum
898	Bronze
298	Stainless

For wide wood handrails

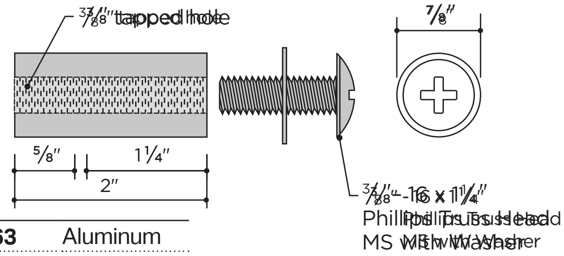


160*	Aluminum
890	Bronze
290	Stainless

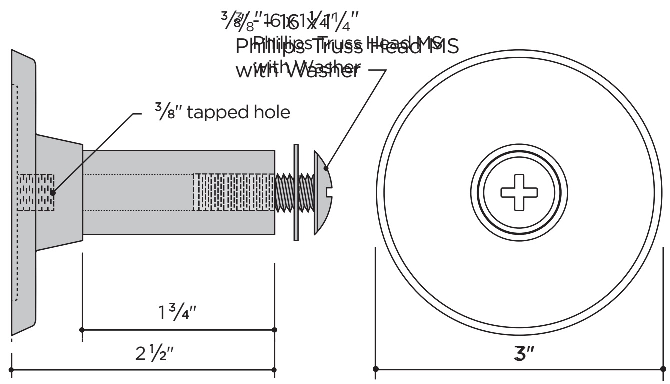


169*	Aluminum
899	Bronze
299	Stainless

THREADED BUSHING BRACKETS
Satin Finish

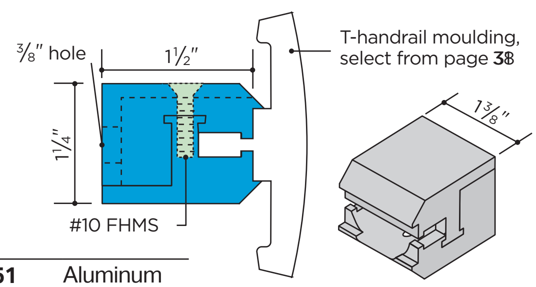


163	Aluminum
63	Stainless



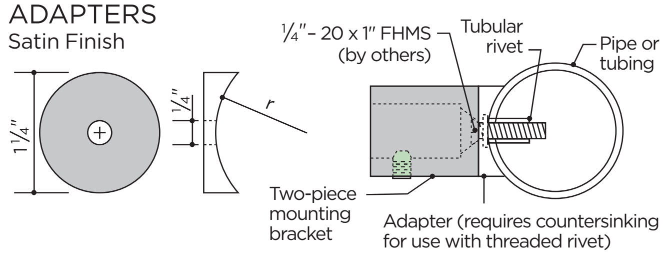
164	Aluminum
64	Stainless

VERTICAL MOUNTING BRACKET
Satin Finish



151	Aluminum

ADAPTERS
Satin Finish



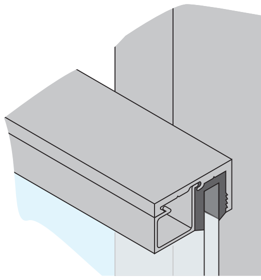
		r	Use With
7164*	Aluminum	.830"	1.660" OD
7264*	Aluminum	.950"	1.900" OD
8864	Bronze	.950"	1.900" OD
8964	Bronze	.750"	1.500" OD
5264	Nickel-Silver	.750"	1.500" OD
5364	Nickel-Silver	.950"	1.900" OD
9364	Stainless	.950"	1.900" OD

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

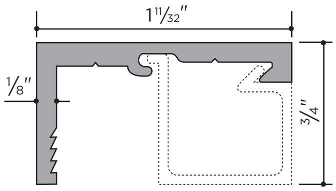
ALUMINUM BRONZE PLASTIC NICKEL-SILVER

Full Scale
GLAZING MEMBERS
20′ lengths, except as noted

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



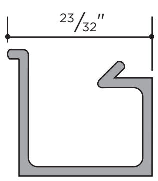
GLASS STOP



		lb/ft
8106	Aluminum Mill Finish	.276
8206	Aluminum Clear Anodized, AA-M10-C22-A31 (204R1)	.276
4506*	Bronze	.950

* 16′ lengths

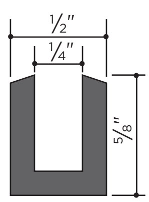
SNAP-IN



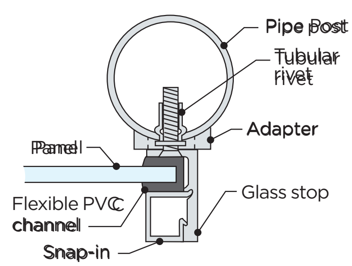
		lb/ft
8107	Aluminum Mill Finish	.138
8207	Aluminum Clear Anodized, AA-M10-C22-A31 (204R1)	.138
4507*	Bronze	.510

* 16′ lengths

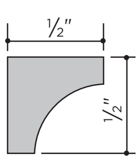
FLEXIBLE PVC CHANNEL
50′ coils

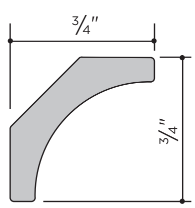


8708 Flexible PVC



COVE MOULDINGS AND GLASS STOPS
20′ lengths

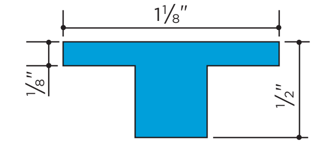




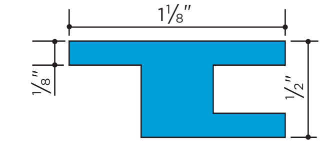
		lb/ft
6952	Aluminum	.166
6102	Bronze	.500

		lb/ft
6955	Aluminum	.260
6105	Bronze	.670

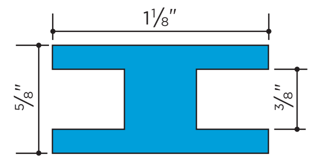
Full Scale
GLASS FRAMING SECTIONS
20′ lengths, except as noted



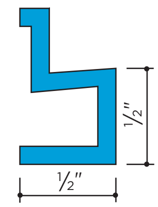
6958 Aluminum .338 lb/ft



6959 Aluminum .394 lb/ft



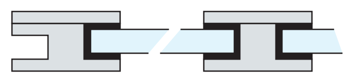
6960 Aluminum .507 lb/ft



6953* Aluminum .183 lb/ft

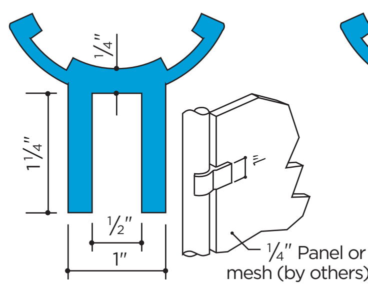
* 16′ lengths

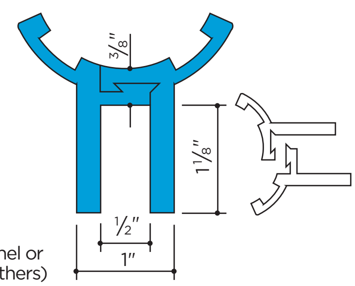
Framing Detail



Sections 6958 and 6959 with flat bars

PANEL CLIPS
For aluminum pipe only





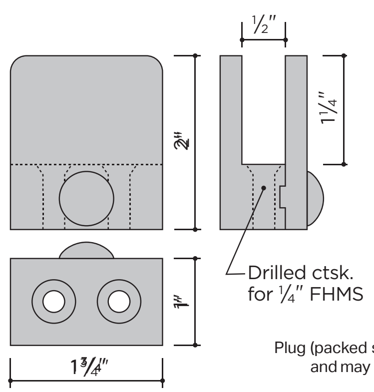
		Pipe
7460-5*	Aluminum	1¼″
7460†	Aluminum	1¼″
7560-5*	Aluminum	1½″
7560†	Aluminum	1½″

† Packages of 4 pieces

Packages of 4 sets		Pipe
7260**	Aluminum	1½″

* 5′ Length
** Two-piece assembly

For mounting to flat surface, Satin Finish

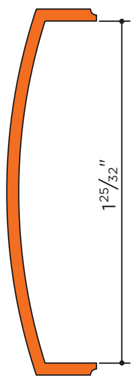


113	Aluminum
813	Bronze
413	Nickel-Silver
213	Stainless

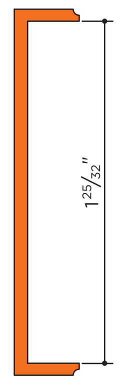
Plug (packed separately) is inserted following installation and may be held in place with epoxy or other sealant.
Installation detail page 89

ALUMINUM BRONZE

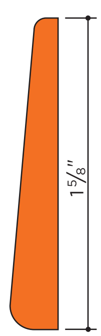
DOOR EDGINGS
16′ lengths, except as noted. Full Scale



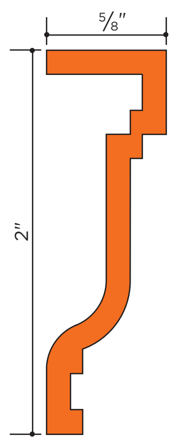
6642 Bronze .56 lb/ft



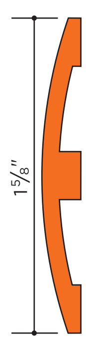
6643 Bronze .56 lb/ft



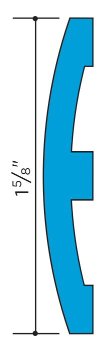
6648* Bronze 1.10 lb/ft



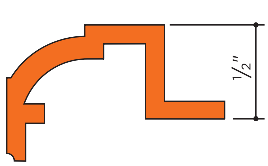
6138* Bronze 1.35 lb/ft



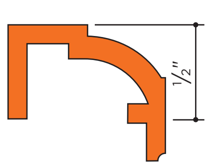
6647 Bronze .64 lb/ft



6947 Aluminum .384 lb/ft



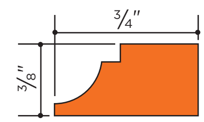
6645* Bronze .79 lb/ft



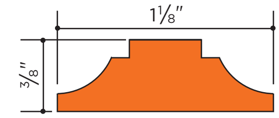
6646* Bronze .67 lb/ft

* 20′ lengths

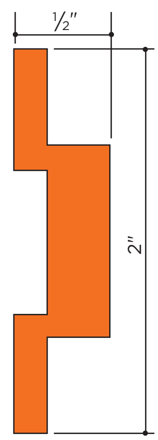
VARIOUS MOULDINGS
20′ lengths



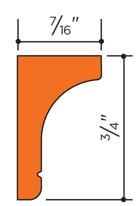
6473 Bronze .76 lb/ft



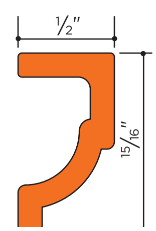
6474 Bronze 1.01 lb/ft



6140 Bronze 1.97 lb/ft

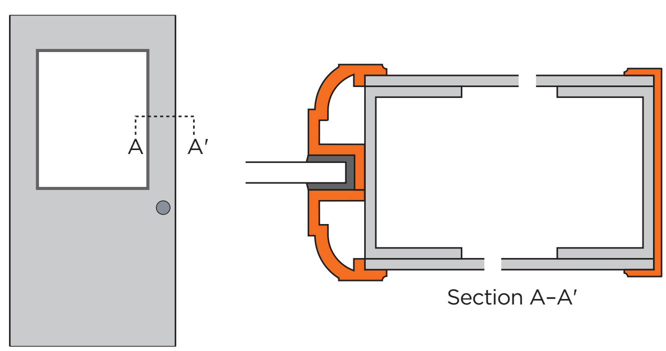


6121 Bronze .60 lb/ft



6130 Bronze .70 lb/ft

Typical Details



Elevation

Detail at A–A′ with 6643, 6645 and 6646

TUBING, BARS AND SHAPES

Take Two Interactive, New York, NY | Fabricator: Port Richmond Glass, Staten Island, NY | Architect: Design Republic, New York, NY
General Contractor: SPK Lewis Construction, New York, NY

Take Two Interactive, New York, NY | Fabricator: Port Richmond Glass, Staten Island, NY | Architect: Design Republic, New York, NY
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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 which is simple to polish.

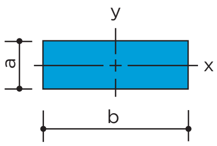
All extrusions are produced and handled with great care to assure a product is well suited for architectural finishing. Items are thoroughly protected for shipment by wrapping and/or crating, with the exception of aluminum structural and steel shapes, which are normally shipped in strapped bundles. Elements 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 124 to 131.

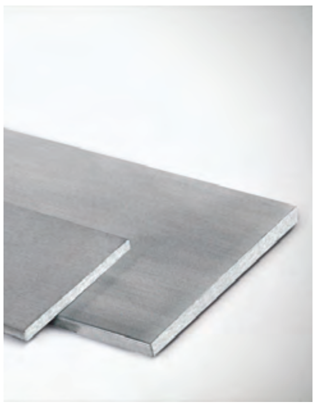
ALUMINUM Alloy 6063-T52

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

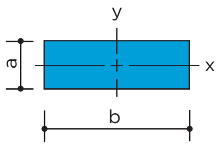
†Aluminum extrusions are pre-wrapped in 100-lb paper interleaved bundles to speed shipment and prevent damage. Quantities are subject to change without notice.

ALUMINUM Alloy 6063-T52

All dimensions in inches and weight in pounds per lineal foot

FLAT BARS (continued)

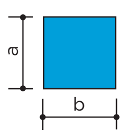
Sharp Corners
16′ lengths



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

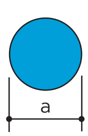


a	b	lb/ft	Bars per Bundle†	Area	I	S
5/16	5/16	.116	48	.097	.001	.005
3/8	3/8	.169	40	.141	.002	.009
1/2*	1/2	.300	20	.250	.005	.021
5/8*	5/8	.468	12	.391	.013	.041
3/4	3/4	.674	10	.563	.026	.070
1	1	1.200	5	1.000	.083	.167
1 1/4	1 1/4	1.875	3	1.563	.204	.326
1 1/2	1 1/2	2.700	2	2.250	.422	.563
1 3/4	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

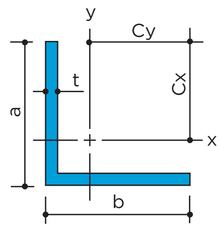
† Aluminum extrusions are pre-wrapped in 100-lb paper interleaved bundles to speed shipment and prevent damage. Quantities are subject to change without notice.

ALUMINUM Alloy 6063-T52

All dimensions in inches and weight in pounds per lineal foot

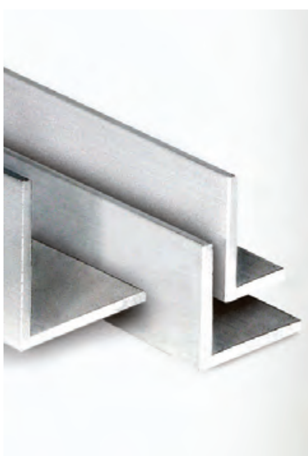
ANGLES

Sharp Corners
16′ lengths



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

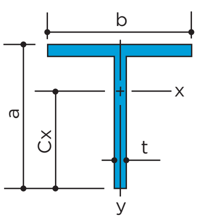
b	a	t	lb/ft	Bars per Bundle†	Area	Ix	Sx	Cx	Iy	Sy	Cy
3/8	3/4	3/32	.116	60	.096	.003	.007	.465	.001	.001	.277
1/2	1	1/8	.206	29	.172	.017	.027	.619	.003	.008	.369
1/2	1 1/4	1/8	.244	25	.203	.032	.042	.755	.003	.008	.380
1/2	1 1/2	1/8	.281	25	.234	.053	.060	.888	.003	.008	.388
1/2	2	1/8	.355	20	.297	.118	.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

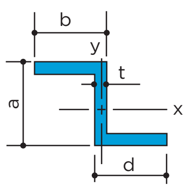
TEES
Sharp Corners
16′ lengths



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

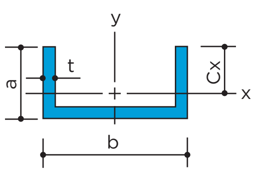
■ Item No. **6958** Table 1/8", Leg 3/8"

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

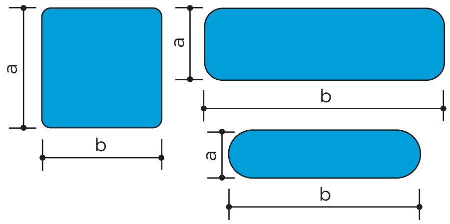
* 20′ lengths ** For glass block

†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

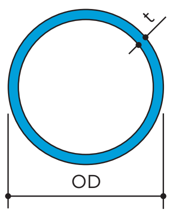
All dimensions in inches and weight in pounds per lineal foot

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

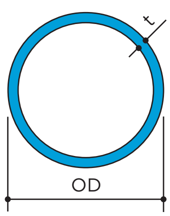


Nominal Size	Sched.	OD	ID	t	lb/ft	Bars per Bundle†	Area	I	S	r
3/4	40	1.050	.824	.113	.391	14	.333	.037	.071	.334
1	40	1.315	1.049	.133	.581	9	.494	.087	.133	.421
1 1/4*	10	1.660	1.442	.109	.625	6	.531	.161	.193	.550
1 1/4*	40	1.660	1.380	.140	.785	6	.669	.195	.235	.540
1 1/2*	10	1.900	1.682	.109	.721	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 20-35 for stock pipe fittings.

DRAWN HANDRAIL PIPE
Alloy 6063-T832
20′ lengths

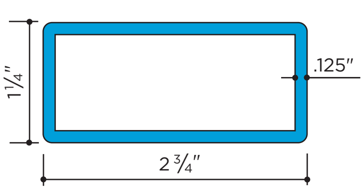


Nominal Size	Sched.	OD	ID	t	lb/ft	Area	I	S	r
1 1/4*	10	1.660	1.442	.109	.625	.531	.161	.193	.550
1 1/4*	40	1.660	1.380	.140	.785	.669	.195	.235	.540
1 1/2*	10	1.900	1.682	.109	.721	.614	.247	.260	.634
1 1/2*	40	1.900	1.610	.145	.940	.800	.310	.326	.623

* Carried in stock with mill finish and with a clear anodized – AA-M10-C22-A31 (204R1) – finish.

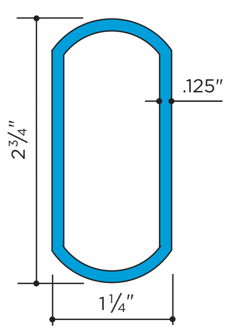
This premium quality drawn pipe has an extra smooth surface. Its harder temper gives it high strength. See pages 20-35 for stock pipe fittings.

TUBING
Round Corner
20′ lengths

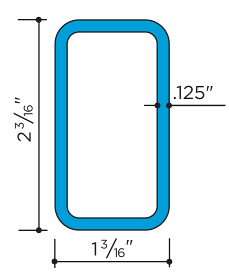


		lb/ft	Bars per Bundle†
6434*	Aluminum	1.123	5

* 6063-T6 For Elements of Section, see page 125.



		lb/ft	Bars per Bundle†
6435*	Aluminum	1.075	5



		lb/ft	Bars per Bundle†
6436*	Aluminum	.888	6

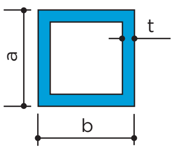
†Aluminum extrusions are pre-wrapped in 100-lb paper interleaved bundles to speed shipment and prevent damage. Quantities are subject to change without notice.

ALUMINUM Alloy 6063-T52

All dimensions in inches and weight in pounds per lineal foot

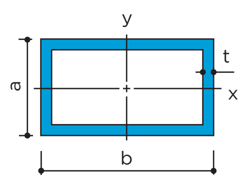
TUBING

Square
Sharp Corners
21'-1" lengths



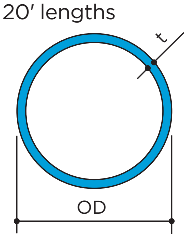
a	b	t	lb/ft	Bars per Bundle †	Area	I	S
1/2	1/2	.062	.130	36	.109	.003	.014
5/8	5/8	.062	.167	31	.142	.007	.024
3/4	3/4	.062	.205	24	.171	.013	.036
3/4	3/4	.125	.374	10	.312	.021	.056
1	1	.062	.278	16	.233	.034	.068
1	1	.125	.525	8	.437	.057	.114
1 1/4	1 1/4	.078	.438	9	.366	.084	.134
1 1/4	1 1/4	.125	.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

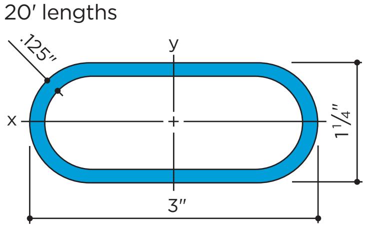
Round
20' lengths



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 35 for fittings

Oval
20' lengths



	lb/ft	Bars per Bundle†	Area	Ix	Sx	Iy	Sy
6437	1.057	5	.879	.210	.336	.799	.532

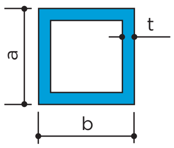
†Aluminum extrusions are pre-wrapped in 100-lb paper interleaved bundles to speed shipment and prevent damage. Quantities are subject to change without notice.

ALUMINUM STEEL

All dimensions in inches and weight in pounds per lineal foot

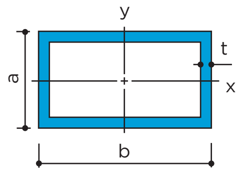
STRUCTURAL TUBING

Aluminum Alloy 6061-T6, 24′ lengths



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
2 1/2	2 1/2	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



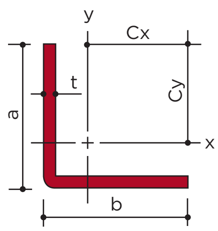
Rectangular

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

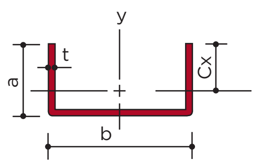
a	b	t	lb/ft	Area	I	S	Cx Cy
1/2	1/2	1/8	.38	.109	.002	.007	.330
5/8	5/8	1/8	.48	.141	.005	.011	.424
3/4	3/4	1/16	.30	.089	.005	.009	.539
3/4	3/4	1/8	.59	.172	.009	.017	.517
1	1	1/8	.81	.234	.022	.031	.704
1	1	3/16	1.16	.341	.030	.044	.682
1 1/4	1 1/4	1/8	1.02	.297	.044	.049	.891
1 1/4	1 1/4	3/16	1.48	.435	.062	.071	.869
1 1/2	1 1/2	1/8	1.24	.359	.078	.072	1.079
1 1/2	1 1/2	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
1 1/4	3/4	1/8	.80	.234	.037	.045	.812	.010	.018	.562
1 1/2	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	1/2	1/2	.093	.40	.122	.003	.010	.299	.004	.016
4732	3/4	3/4	.093	.57	.192	.011	.023	.465	.017	.044
4734	1	1	.109	1.03	.303	.030	.049	.625	.048	.096
4744	1 1/4	1 1/4	.109	1.32	.385	.061	.078	.792	.099	.158
4750	1 1/2	1 1/2	.109	1.59	.467	.109	.114	.958	.178	.237
4752	2	2	.125	2.41	.719	.309	.240	1.285	.496	.496

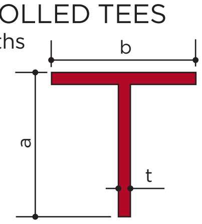
Unequal Sides

	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*	3/4	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	1 1/2	1	.109	1.22	.358	.035	.052	.674	.117	.155
4759	1 3/4	1 1/8	.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

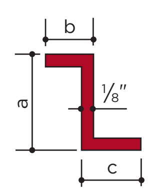


	a	b	t	lb/ft
4724	1	1	1/8	.90

For use with Loafer Rail 4445

HOT-ROLLED ZEES

Square Root
20′ lengths



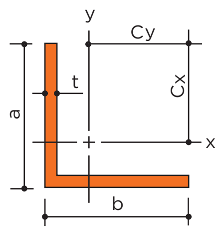
	a	b	c	lb/ft
4721	1 3/16	5/8	3/4	.94

BRONZE Alloy C38500

All dimensions in inches and weight in pounds per lineal foot

ANGLES

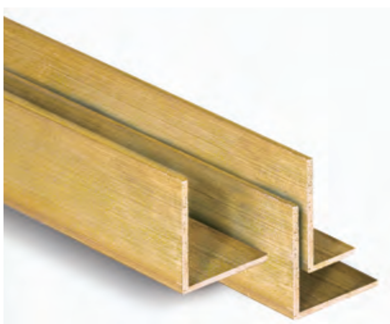
Sharp Corners
20′ lengths, except as noted



Equal Legs

a	b	t	lb/ft	Area	Ix	Sx	Cx Cy
1/2	1/2	1/8	.42	.109	.002	.006	.330
5/8	5/8	1/8	.52	.141	.005	.011	.424
3/4	3/4	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
1 1/4	1 1/4	1/8	1.09	.297	.044	.049	.891
1 1/4	1 1/4	3/16	1.60	.435	.062	.071	.869
1 1/4	1 1/4	1/4	2.05	.562	.077	.091	.847
1 1/2	1 1/2	1/8	1.35	.359	.078	.072	1.079
1 1/2	1 1/2	3/16	1.92	.529	.110	.104	1.056
1 1/2	1 1/2	1/4	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	1/4	3.37	.938	.348	.247	1.408
2 1/2	2 1/2	1/8	2.24	.609	.378	.206	1.829
2 1/2	2 1/2	1/4	4.33	1.187	.703	.394	1.783
3*	3	1/4	5.25	1.437	1.244	.577	2.160

* 16′ lengths



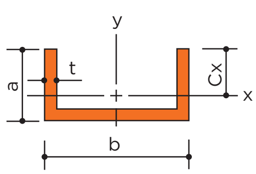
Unequal Legs

a	b	t	lb/ft	Area	Ix	Sx	Cx	Iy	Sy	Cy
3/4	3/8	1/8	.45	.125	.007	.015	.453	.001	.004	.266
1	1/2	1/8	.65	.172	.017	.027	.619	.003	.008	.369
1	3/4	1/8	.75	.203	.020	.029	.668	.009	.017	.543
1 1/4	3/4	1/8	.88	.234	.037	.045	.812	.010	.018	.562
1 1/2	3/4	1/8	.97	.266	.061	.064	.952	.010	.018	.577
1 1/2	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	1/4	4.32	1.187	1.087	.542	2.007	.392	.260	1.507
4*	2 1/2	1/4	5.70	1.562	2.602	.973	2.675	.805	.418	1.925

* 16′ lengths

CHANNELS

Sharp Corners
20′ lengths



Equal Sides

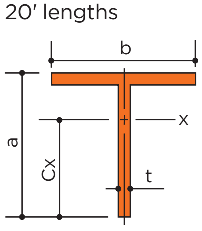
b	a	t	lb/ft	Area	Ix	Sx	Cx	Iy	Sy
1/2	1/2	3/32	.44	.126	.003	.009	.348	.004	.017
3/4	3/4	1/8	.90	.250	.014	.030	.453	.020	.053
1	1	1/8	1.25	.344	.034	.055	.619	.053	.105
1 1/4	1 1/4	1/8	1.60	.438	.069	.088	.853	.110	.176
1 1/2	1 1/2	1/8	1.94	.531	.123	.129	.952	.198	.264

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
3/4	3/8	1/8	.57	.159	.002	.009	.238	.011	.028
1	1/2	1/8	.85	.219	.005	.014	.330	.028	.057
1	3/4	1/8	1.04	.281	.015	.031	.479	.040	.081
1 1/4	1/2	1/8	.91	.250	.005	.015	.344	.050	.080
1 1/4	5/8	1/8	1.06	.281	.010	.023	.424	.060	.096
1 1/2	1/2	1/8	1.02	.281	.005	.015	.354	.080	.106
1 1/2	5/8	1/8	1.12	.312	.010	.023	.437	.094	.126
1 1/2	1	1/8	1.47	.406	.039	.059	.668	.139	.185
2	3/4	1/8	1.47	.406	.025	.039	.543	.221	.221
2 1/4	7/8	1/8	1.75	.469	.031	.048	.637	.331	.294
2 1/2	1	1/8	1.94	.531	.046	.064	.732	.471	.377

TEES

Sharp Corners
20′ lengths



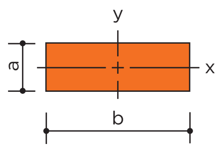
b	a	t	lb/ft	Area	Ix	Sx	Cx	Iy	Sy
3/4	3/4	1/8	.64	.171	.009	.017	.518	.004	.012
1	1	1/8	.89	.233	.022	.031	.705	.011	.021
1 1/2	1 1/2	1/8	1.35	.358	.077	.072	1.080	.035	.047
1 1/2	1 1/2	3/16	1.94	.529	.110	.104	1.056	.054	.071
2	2	3/16	2.61	.717	.271	.190	1.430	.126	.126

BRONZE Alloy C38500

All dimensions in inches and weight in pounds per lineal foot

FLAT BARS

Sharp Corners
16′ lengths, except as noted

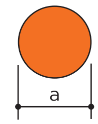


a	b	lb/ft	Area	Ix	Sx	Iy	Sy
1/8	1/2	.23	.063	.000	.001	.001	.005
1/8	5/8	.29	.078	.000	.002	.003	.008
1/8	3/4	.35	.094	.000	.002	.004	.012
1/8	1	.46	.125	.000	.003	.010	.020
1/8	1 1/4	.58	.156	.000	.003	.020	.032
1/8	1 1/2	.69	.188	.000	.004	.035	.047
1/8	2	.92	.250	.000	.005	.083	.083
1/8	3	1.38	.375	.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

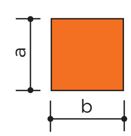


a	lb/ft	Area	I	S
3/8	.41	.110	.001	.005
1/2	.72	.196	.003	.012
5/8	1.13	.307	.008	.024
3/4	1.63	.442	.016	.041
7/8*	2.22	.601	.029	.066
1	2.89	.785	.049	.098
1 1/8	3.66	.994	.079	.140
1 1/4	4.52	1.227	.120	.192
1 1/2	6.51	1.767	.249	.331
1 3/4	8.86	2.405	.460	.526
2*	11.57	3.142	.785	.785
2 1/2	18.00	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

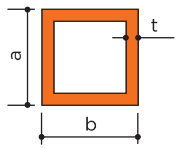
** 10' lengths

BRONZE Alloy C38500, except as noted

All dimensions in inches and weight in pounds per lineal foot

TUBING

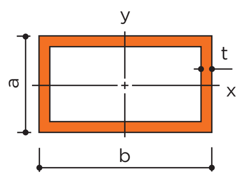
Square
Sharp Corners
16′ lengths



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

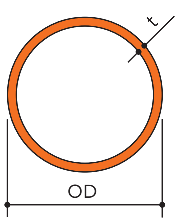
* Rounded inside corners, r = 1/4"

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

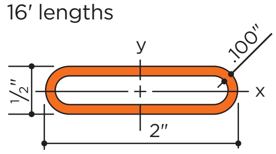
Round
20′ lengths,
except as noted



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** ** 12′ length

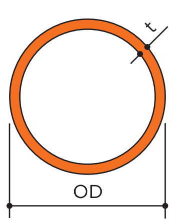
Oval
16′ lengths



	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

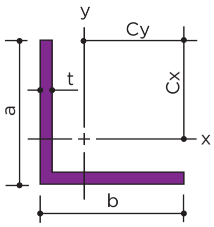
This pipe is furnished with plain ends, unmarked, and with a smooth finish suitable for polishing.
See pages 20-31 for stock pipe fittings.

NICKEL-SILVER Alloy C79800

All dimensions in inches and weight in pounds per lineal foot

ANGLES

Sharp Corners
20′ lengths



Equal Legs

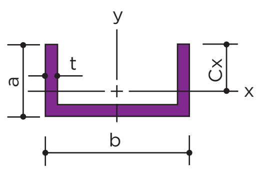
a	b	t	lb/ft	Area	I	S	Cx Cy
3/4	3/4	1/8	.45	.125	.007	.015	.453
1	1	1/8	.89	.234	.022	.031	.704
1 1/2	1 1/2	1/8	1.35	.359	.780	.072	1.079
1 1/2	1 1/2	1/4	2.52	.688	.139	.134	1.034

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

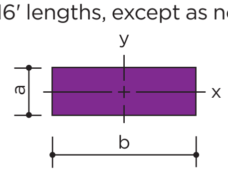
Sharp Corners
20′ lengths



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

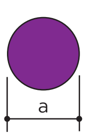


a	b	lb/ft	Area	Ix	Sx	Iy	Sy
1/8	1 1/4	.58	.156	.000	.003	.020	.032
1/8	1 1/2	.69	.188	.000	.004	.035	.047
1/4	3/4	.69	.188	.001	.008	.009	.023
1/4	1 1/4	1.15	.313	.002	.016	.041	.066
1/4	2	1.84	.500	.003	.024	.167	.167
1/4	3	2.77	.750	.004	.032	.563	.375
3/8	3/4	1.04	.281	.003	.018	.013	.035
3/8	1	1.38	.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

†8′ lengths

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

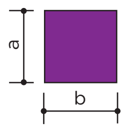
* 12′ lengths
** 10′ lengths
†8′ lengths

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

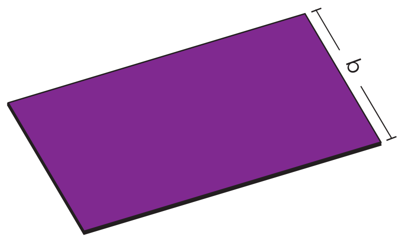


a	b	lb/ft	Area	I	S
1/2	1/2	.92	.250	.005	.021
3/4	3/4	2.08	.563	.026	.070
1	1	3.69	1.000	.083	.167
1 1/4	1 1/4	5.76	1.563	.204	.326
1 1/2**	1 1/2	8.28	2.250	.422	.563

** 10' lengths

NICKEL-SILVER SHEET

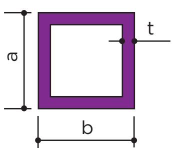
Satin Finish, masked one side
7′ lengths, Alloy C78200



b	Thickness
8	18 ga
19	18 ga

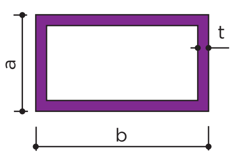
TUBING

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

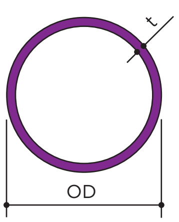
Rectangular
Sharp Corners
16′ lengths



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

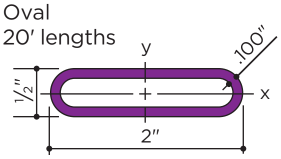
Round
16′ lengths, except as noted



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

* 20' lengths ■ Item No. **5289**

Oval
20′ lengths



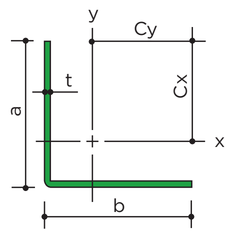
		lb/ft	Area	Ix	Sx	Iy	Sy
■ **5288**	Nickel-Silver	1.56	.426	.011	.044	.152	.152

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

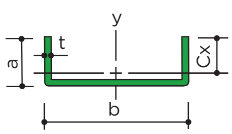
20′ lengths



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



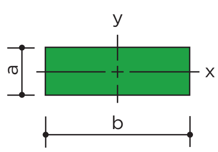
b	a	t	lb/ft	Area	Ix	Sx	Cx	Iy	Sy
1/2	1/2	.062	.284	.085	.002	.007	.310	.003	.013
5/8*	5/16	.078	.293	.085	.001	.003	.206	.004	.014
3/4	3/8	.062	.279	.085	.001	.004	.259	.001	.003
3/4	3/4	.062	.451	.132	.015	.024	.621	.012	.033
1	1/2	.062	.385	.116	.003	.007	.350	.017	.034
1	1	.062	.591	.178	.019	.029	.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



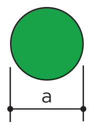
a	b	lb/ft	Area	Ix	Sx	Iy	Sy
3/16	3/4	.478	.141	.000	.004	.007	.018
3/16	1	.638	.188	.001	.006	.016	.032
3/16	1 1/4	.797	.235	.001	.007	.031	.050
3/16	1 1/2	.957	.282	.001	.009	.053	.071
3/16	2	1.280	.376	.001	.012	.125	.125
3/16	3	1.990	.564	.002	.018	.422	.281
1/4	3/4	.636	.188	.001	.008	.009	.023
1/4	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

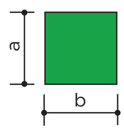


a	lb/ft	Area	I	S
3/8	.378	.110	.001	.005
1/2	.671	.196	.003	.012
9/16*	.850	.249	.005	.018
5/8	1.050	.307	.008	.024
3/4	1.510	.442	.016	.041
7/8*	2.060	.601	.029	.066
1*	2.680	.785	.049	.098
1 1/4*	4.200	1.227	.120	.192

* Type 303

SQUARE BARS

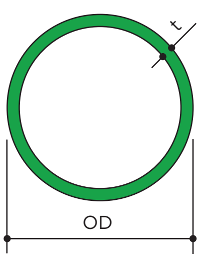
Sharp Corners
12′–14′ lengths



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

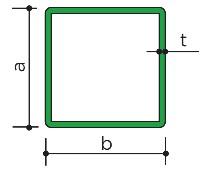
Cold-rolled Ornamental Grade
20′ lengths
No. 4 Finish, 180 grit, paper-wrapped



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

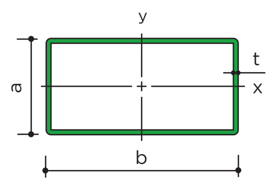
TUBING

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

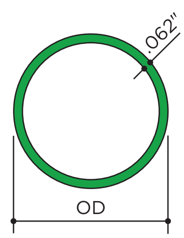
Rectangular
Ornamental Grade
20′ lengths, except as noted



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

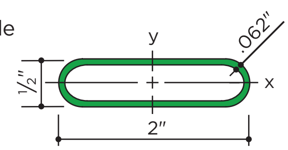
* 21′-1″ lengths

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 ACRYLIC / WOOD

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

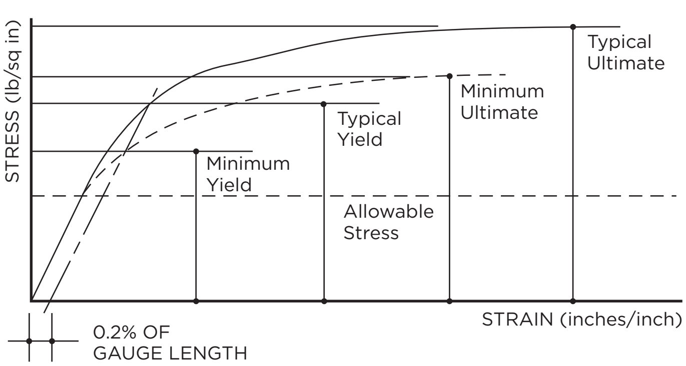
Structural requirements for railings usually are expressed in one of two ways, depending on governing codes and regulations. Some of these specify an applied loading distributed uniformly along the rail while others specify loading concentrated on the top rail. The designer should consult governing codes, 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 117.1-09.

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

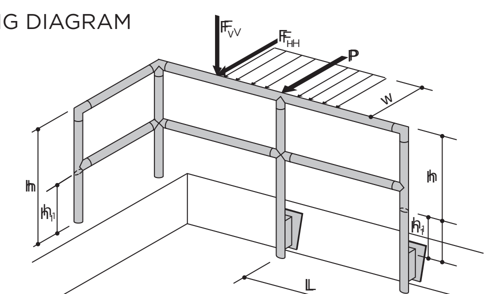
Properties of sections of JB® handrail mouldings, posts, and support sections are listed on page 125. For properties of bars, shapes, and tubes, see pages 109-123.

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 major axis	19,500	35,000	10.0
shapes minor axis	27,700	35,000	10.0
Aluminum 6063-T6, shapes major axis	15,200	25,000	10.0
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
Acrylic/Wood	3,760	4,975	1.8

LOADING DIAGRAM



EXPLANATION OF SYMBOLS

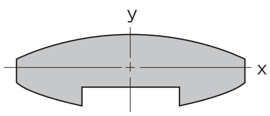
- w* = Uniform horizontal loading, perpendicular to the rail (lb/ft).
- L = Span between centerlines of posts or brackets (in.).
- P = Horizontal force, perpendicular to rail applied at top of post (lb).
- F_H = Horizontal force, perpendicular to rail at any point along the railing (lb).
- F_V = Vertical 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_f = 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 ACRYLIC / WOOD

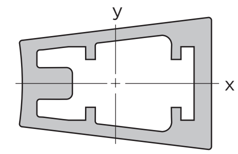
HANDRAILS



Shape	Area	Minor Axis Ix (in4)	Minor Axis Sx (in3)	Minor Axis cx (in.)	Major Axis Iy (in4)	Major Axis Sy (in3)	Major Axis 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

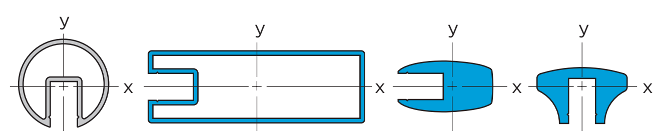
CARLSTADT® POSTS



Shape	Area	Minor Axis Ix (in4)	Minor Axis Sx (in3)	Minor Axis cx (in.)	Major Axis Iy (in4)	Major Axis Sy (in3)	Major Axis 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



Railing Number	Area	Minor Axis Ix (in4)	Minor Axis Sx (in3)	Minor Axis cx (in.)	Major Axis Iy (in4)	Major Axis Sy (in3)	Major Axis 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
8662	11.062	3.954	3.954	1.000	30.152	9.420	3.201
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 130 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 equal 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):

$$M = \frac{w/12 \times L^2}{K} \qquad M = S \times f$$

$$f = \frac{w/12 \times L^2}{S \times K}$$

$$L = \sqrt{\frac{f \times K \times S}{w/12}}$$

K = 8 for one or two spans
K = 9.5 for three or more spans of a continuous rail

2. For concentrated loads (F) applied at mid span:

$$M = \frac{F \times L}{K} \qquad M = S \times f$$

$$f = \frac{F \times L}{S \times K}$$

$$L = \frac{S \times K \times f}{F}$$

K = 4 for one span
K = 5 for two or more spans of a continuous rail

Note: 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):

$$M = P \times h \qquad P = w/12 \times L \qquad M = S \times f$$

$$f = \frac{w/12 \times L \times h}{S} \qquad L = \frac{S \times f}{w/12 \times h}$$

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 131. 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:

$$M = P \times h \qquad P = F_h \times P_f$$

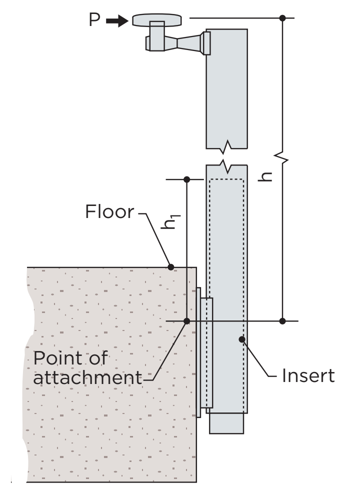
$$f = \frac{F_h \times h \times P_f}{S}$$

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: $P = \dfrac{f_s \times S}{h - h_1}$

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: $P = \dfrac{f_s \times S_r}{F_r \times h_1}$

RAILING FORMULAS

3. Post at base:

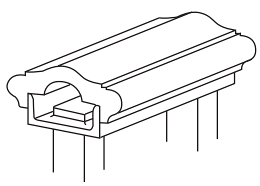
Moment in post: $M = P \times \left[h - (F_r \times h_1) \right]$

Fibre stress in post: $f = \dfrac{M}{S_p} = \dfrac{P \times \left[h - (F_r \times h_1) \right]}{S_p}$

Loading limit: $P = \dfrac{f_s \times S_p}{h - (F_r \times h_1)}$

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:

$$S = \frac{I_a + I_b}{c_{max}} \quad (c_{max} \text{ is either } c_a \text{ or } c_b\text{, whichever is greater})$$

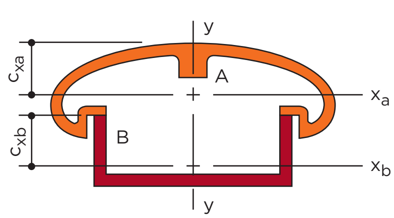
In the railing formulas, substitute the above equation for the value of S whenever combined sections of the same material are used.

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:

$$\text{Load Carried by A} = \frac{\text{Total Load}}{1 + \dfrac{E_b \times I_b}{E_a \times I_a}}$$

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 129).

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:

$$\Delta = \frac{P \times h^3}{3 \times E \times I} \quad \text{or} \quad \frac{w/12 \times L \times h^3}{3 \times E \times I}$$

For posts with reinforcing insert of similar or dissimilar material:

$$\Delta = \frac{P \times (h - h_1)^3}{3 \times E_p \times I_p} + \frac{P \times \left[h^3 - (h - h_1)^3 \right]}{3 \times \left[(E_p \times I_p) + (E_r \times I_r) \right]}$$

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):

$$\Delta = \frac{5 \times w/12 \times L^4}{384 \times E \times I} \quad \text{for simple spans}$$

$$\Delta = \frac{w/12 \times L^4}{145 \times E \times I} \quad \text{for two or more spans}$$

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.

Note: 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 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 124);
Section modulus, S = .321 in^3 (refer to page 125)

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 $M_{(applied)}$

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

$$L = \frac{f_s \times S}{w/12 \times h}$$

$$L = \frac{12{,}600 \times .321}{50/12 \times 38}$$

$$L = 25.60 \text{ in.}$$

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 124)

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 $M_{(applied)}$

$$f_s \times S = F \times h$$

$$S = \frac{F \times h}{f_s}$$

$$S = \frac{200 \times 42}{16{,}800}$$

$$S = 0.500 \text{ in}^3$$

EXAMPLE 3:

DETERMINE MAXIMUM SPAN FOR HANDRAIL MOULDINGS, CONCENTRATED LOAD REQUIREMENTS:

Concentrated load, F = 200 lbs

MATERIAL SPECIFIED:

Handrail moulding: #6489, 1 1/2" O.D. bronze tubing
f_s = 14,500 psi; S_x = .144 in^3

The railing will be installed with more than two consecutive spans, therefore the Bending Moment Constant, K = 5 (refer to page 126).

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 in^4; c_{xa} = .586 in.
Support channel: 2" x 1/2" x 1/8" aluminum channel
f_s = 12,600 psi; I_{xb} = .006 in^4; 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 126).

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 $M_{(applied)}$

$$f_s \times \left(\frac{I_{xa} + I_{xb}}{c_{max}}\right) = \frac{F \times L}{K}$$

$$L = \frac{f_s \times (I_{xa} + I_{xb}) \times K}{F \times c_{max}}$$

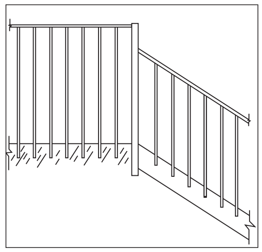
$$L = \frac{12{,}600 \times (.059 + .006) \times 5.0}{200 \times .586} = 35 \text{ in.}$$

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 10^6; I_y = .709 in^4; S_y = .540 in^3

Intermediate posts: #430, aluminum 6063-T6
f_s = 15,200 psi; E = 10 x 10^6; I = .241 in^4; S = .297 in^3

End posts: 2 1⁄2″ x 2 1⁄2″ x 3⁄16″ square aluminum – 6061-T6 – tubing
f_s = 19,500 psi; E = 10 x 10^6; S = 1.247 in^3

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:

$$f = \frac{F_h \times L}{S \times K} = \frac{300 \times 4}{.540 \times 5} = 444 \text{ psi}$$

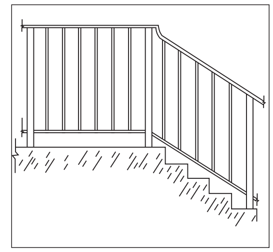
(12,600 psi allowable)

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 in^4; c_x = 0.449 in.; E = 14 x 10^6 psi
Posts: 1 1⁄2″ x 1 1⁄2″ x .140″ structural steel tubing
f_s = 27,700 psi; S = .316 in^3
Sub-rails: 1 1⁄2″ x 1⁄2″ x 1⁄8″ steel (C1010) channel — top and bottom: f_s = 16,800 psi; I_x = .005 in^4; c_x = 0.354 in.; E = 29 x 10^6 psi

DETERMINE:
Structural compliance of proposed construction

1. Stress at base of post:

$$\frac{M}{S} = \frac{w/12 \times L \times h}{S} \quad \text{At stairs: } \frac{50 \times 40 \times 34}{12 \times .316} = 17{,}932 \text{ psi}$$

$$\text{At landings: } \frac{50 \times 40 \times 42}{12 \times .316} = 22{,}152 \text{ psi}$$

(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.

Note: Resistance to vertical loading of upper and lower steel channels is additive. Therefore the value of I_{xs} 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.

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

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.

CONNECTORAIL® TEST RESULTS

1½" 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	

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
Note: 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

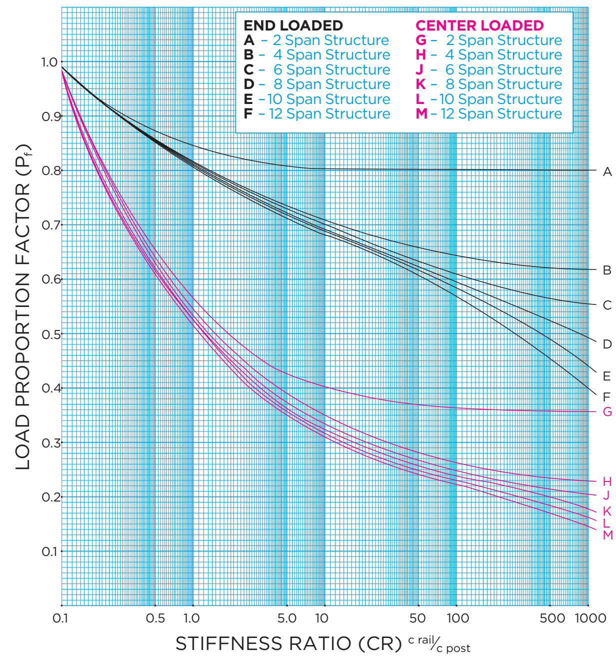
	1 or 2 spans	3 or more spans
Aluminum 6063-T52		
1¼" Sch. 10	65"	71"
1¼" Sch. 40	71"	78"
1½" Sch. 10	75"	82"
1½" Sch. 40	84"	92"

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.

	1 or 2 spans	3 or more spans
Bronze (Red Brass) C23000		
1¼" Sch. 40	70"	77"
1½" Sch. 40	83"	90"
Stainless Steel Type 304		
1½" Sch. 5	98"	107"

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 124 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.

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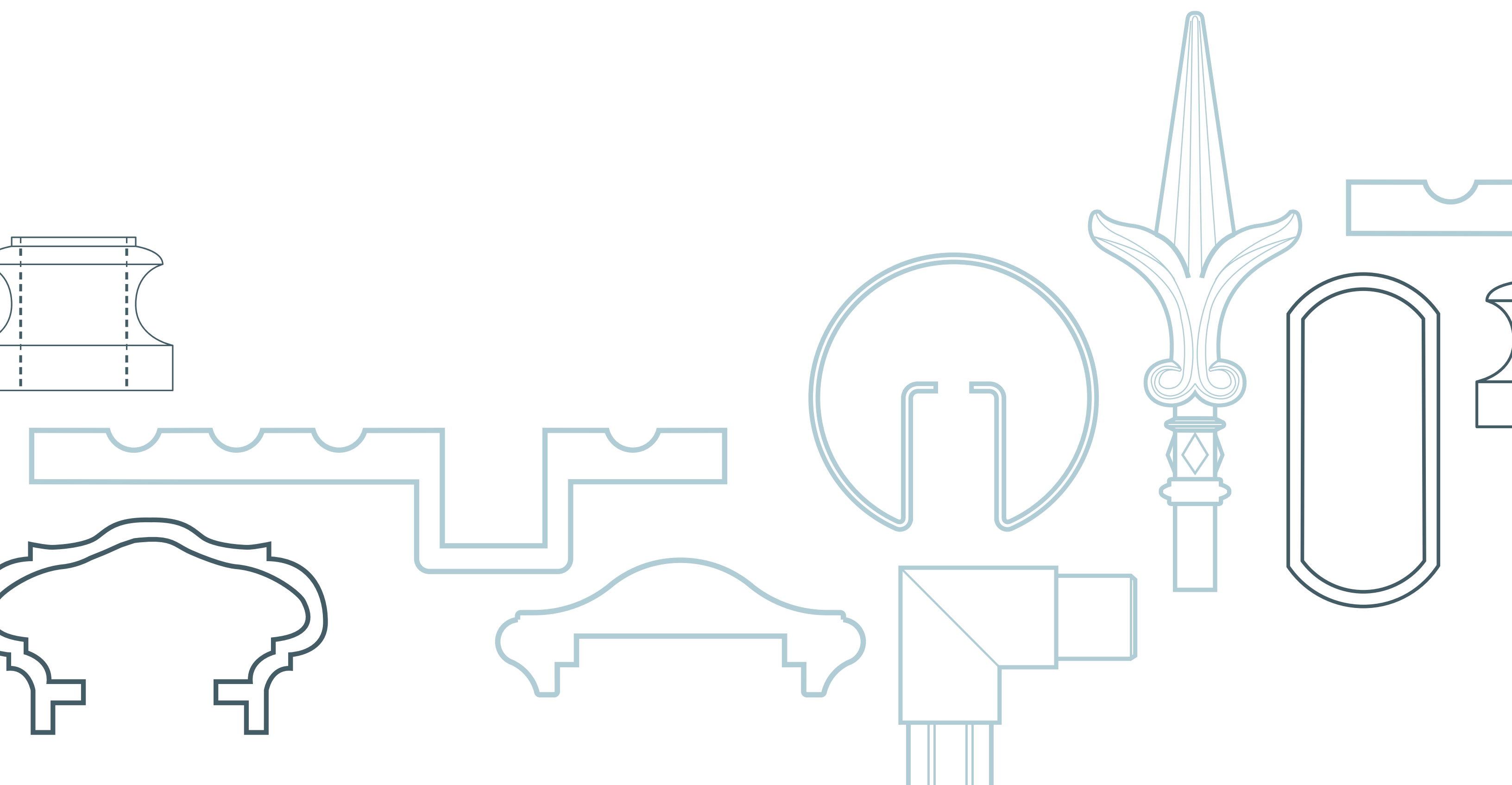

CATALOG 21