CSI 05520
April 2006

Kee® Klamp

YOU'LL NEVER BE BETTER CONNECTED℠

Fittings Manual

INDUSTRIAL & COMMERCIAL

PUBLIC & DOMESTIC ACCESS

EXHIBITIONS

RETAIL & DISPLAY

TÜV PRODUCT SERVICE
Production monitored
Safety tested

Kee Klamp®

The Connection System That Has Revolutionized Tubular Structures

Steel pipe is an inherently efficient structural component. It is strong and has no sharp corners. It can be obtained in a wide range of sizes and thickness and is freely available worldwide.

The difficulty arises in joining pipe to form structures. Threaded pipe must be supplied in set lengths and is therefore relatively expensive and inflexible in application. Welding is labor intensive and requires a highly skilled workforce.

The answer is provided by the ***Kee Klamp Fitting*** which has become the basis of a rigid tubular construction system proven the world over. The underlying principle is simple but highly effective – a slip-on fitting that can be used to create versatile and rigid tubular structures.

The Kee Klamp principle has been developed and refined for more than 70 years into an extensive range of fittings that can be used to assemble all forms of tubular structures. The entire range of fittings is covered in this manual.

CONTENTS

CUSTOMER SERVICE

For technical or general questions, please call the Kee Klamp Information Helpline.

Toll Free in the USA 1-800-851-5181
Toll Free in Canada 1-877-505-5003
Internet: www.keeklamp.com
Email: info@keeklamp.com

QUALITY ASSURANCE

Quality is the overriding priority when manufacturing Kee Klamp fittings. It begins in the foundry where all fittings are manufactured and galvanized to ISO Standard BS EN ISO 1461:199 and subject to stringent inspection upon completion.

TÜV APPROVAL

TÜV, Europe's leading Independent Testing House, has approved the following Kee Klamp fittings in sizes 5 to 9:

10, A10, 12, A12, 14, 15, 16, 17, 19, 20, 21, A21/A26, 25, 26, 27, 28, 29, 30, 35, A35, 40, A40, 45, A45, 46, F50, M50, M51, M52, BC53, 55, 56, M58, 60, 61, 62, 63, 64, 65, 67, 68, 69, 70, 75, 86, 87, 88, 89, 114, 115, 121, 145.*

The maximum load of each fitting type is as stated on the TÜV Certificate, a copy of which is available upon request. The technical descriptions featured in this manual have not been part of the testing.**

HEALTH AND SAFETY

No Kee Klamp fittings have been found to be hazardous within the meaning of current OSHA Regulations, assuming that the materials are cut and assembled using normal pipe cutters, saws and hexagonal tools.

Kee Klamp fittings are designed so that the need to weld is avoided - an added safety element since the welding process does have OSHA implications, especially if the pipe is pre-galvanized or has any other pre-finish.

Kee Klamp fittings in Sizes 7, 8, and 9, when used to construct a 42" High Guard railing, will meet the requirements of the OSHA Safety Standard of a single 200 lb. load applied at any location along the top of the rail when the correct specification of pipe is used and the correct method of design is employed. The integrity of the structure to which the system is fixed and the fixings used will need to be inspected to ensure that they are capable of meeting the imposed load requirements.

Notes:

Kee Industrial Products can provide general guidance on the use of the fittings detailed in this manual. However, the nature of the product means that the ultimate responsibility for selecting the correct fitting for an application rests with the customer.

The customer should also ensure that any existing structure, to which a Kee Klamp fittings structure is being secured, is of sufficient strength to support both the weight of the Kee Klamp construction and the imposed loads applied, including wind loads, snow loads and any other superimposed loads.

* For an up to date TÜV listing see our website at http://www.keeklamp.com

**Due to possible dynamic load influences, some structures will need to be checked at regular intervals to ensure set screws are correctly tightened.

SPECIFYING KEE KLAMP FITTINGS

A brief Three Part Specification for Kee Klamp fittings is shown below for quick reference. The full specification is available for download on the Kee Klamp website at http://www.keeklamp.com.

05 52 00 METAL RAILINGS

PART 1 – 1 GENERAL

- 1.1 SCOPE
- 1.2 RELATED WORK
- 1.3 RAILING STRUCTURAL REQUIREMENTS
- 1.4 SUBMITTALS
- 1.5 QUALITY ASSURANCE
- 1.6 WARRANTY

PART 2 – 2 PRODUCTS

- 2.1 MANUFACTURER
  - A. Manufacturer of handrail, guardrail or railing systems shall be the following except where otherwise noted on the Drawings:
    1. Kee Industrial Products, Inc., Buffalo, NY, USA 1-800-851-5181,
    2. Kee Industrial Products, Ltd., Concord, ON, Canada 1-877-505-5003,
- 2.2 SYSTEMS
  - A. Handrails and Guardrails: Provide pipe, Kee Klamp or Kee Lite fittings, and accessories as indicated or required to match design indicated on the Drawings.
  - B. Guardrails for Hatches and Openings: Coordinate with Section 07 72 00, and provide KeeHatch Safety Railing system consisting of a top rail, mid rail, and chain or swinging gate, with the hatch curb acting as the toe plate. Extend railing system to a height of at least 42 inches (1067 mm) from the finished roof deck.
  - C. Roof Edge Guardrails: Coordinate with Section 07 72 00, and provide freestanding KeeGuard Roof Edge Protection System, including pipe railings, uprights, bases, counterweights and fittings.
- 2.3 METALS
  - A. Pipe:
    1. Steel Pipe: ASTM A 53
    2. Aluminum Pipe: Alloy 6105-T5 conforming to ASTM B 221
  - B. Fittings and Castings:
    1. Cast Iron Fittings or Castings to comply with ASTM A 47
    2. Hot Dip Galvanized finish to comply with BS EN ISO 1461:199
    3. Aluminum Alloy Fittings or Castings conforming to ASTM A 356 T-6
    4. Brackets, Flanges, and Anchors: Cast or formed metal of same material and finish as supported rails.
- 2.4 OTHER MATERIALS
- 2.5 FABRICATION- GENERAL

PART 3 – 3 EXECUTION

- 3.1 EXAMINATION AND PREPARATION
- 3.2 INSTALLATION
- 3.3 JOB CLOSE OUT

THE KEE KLAMP CONCEPT

THE KEE KLAMP FITTING

The simple but effective engineering principle of the Kee Klamp fitting is the foundation of the most versatile pipe connection system available. There are many variations of fitting to suit a wide range of applications, thus providing the versatility to achieve virtually any structural configuration.

Kee Klamp fittings are iron castings manufactured to the requirements of ASTM A47-77-32510. A range of fittings to suit eight sizes of pipe is available. Hex set screws firmly lock the pipe into the fitting. Set screws are manufactured in case hardened steel and are protected against corrosion by Kee Koat™.

A Kee Klamp fitting (size 5 to 9) can support an axial load of *2000 lbs. per set screw with the set screw tightened to a torque of 29 lbs./ft. This is normally obtained when the set screw is fully tightened using a ratchet wrench.

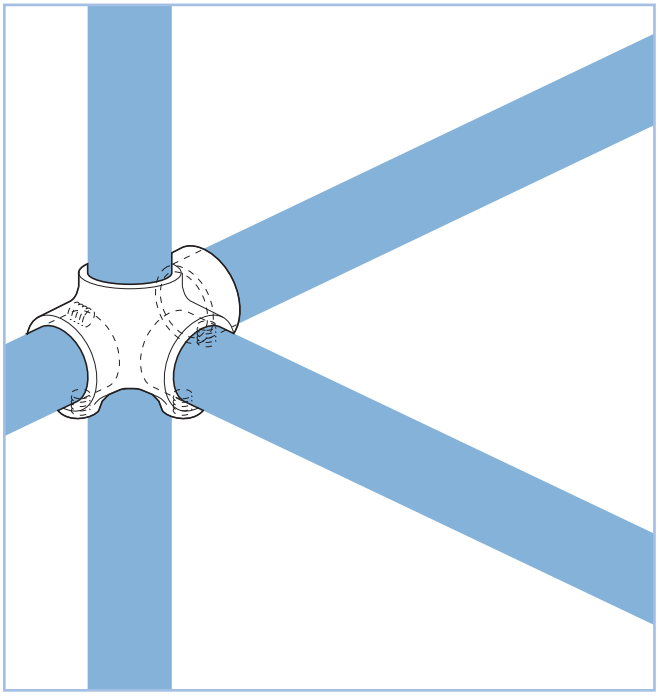
*(*rating includes a safety factor of 2:1)*

SELECTING KEE KLAMP FITTINGS

Every fitting is illustrated and accompanied by a table of sizes and weights. Each fitting has a simple numerical code reference, which is unique and differentiates it from every other fitting. The code defines the type of fitting and the pipe size, or sizes, it is designed to receive.

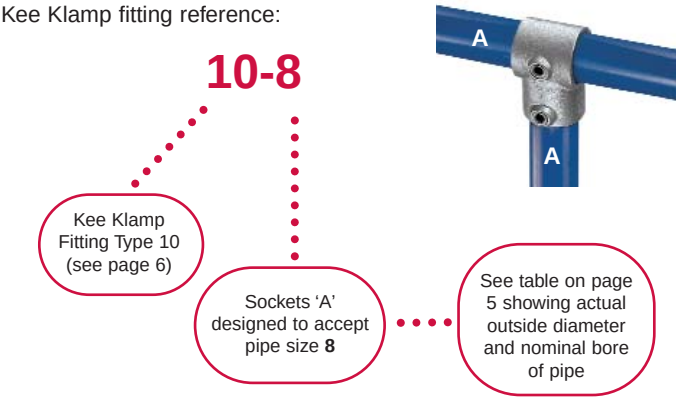
The first number, preceding the dash (-) identifies the type of Kee Klamp fitting.

A single digit, following the dash, defines pipe size. Two digits after the dash indicate that the fitting is designed to receive two sizes of pipe. Likewise, three digits after the dash indicate that the fitting is designed to receive three sizes of pipe. The Kee Klamp pipe size codes (a choice of eight, numbered from 2-9) are shown on pages 4 and 5 of this manual, where the Kee Klamp pipe code is related to actual pipe dimensions. (See table page 5).

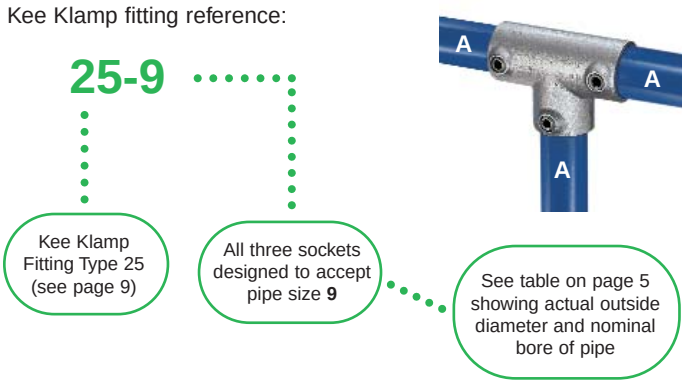


Examples

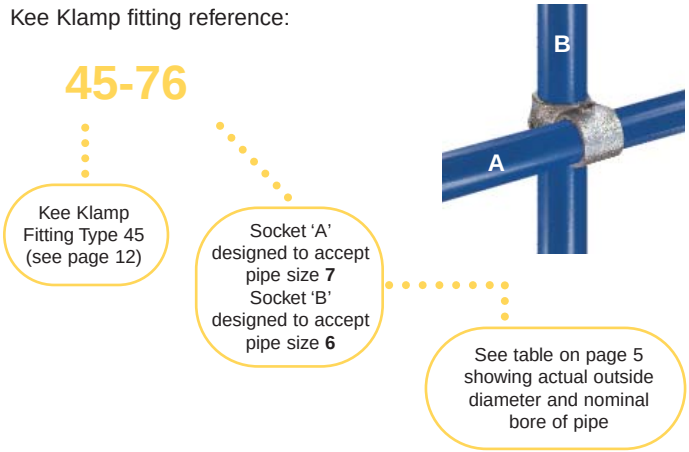
Kee Klamp fitting reference:

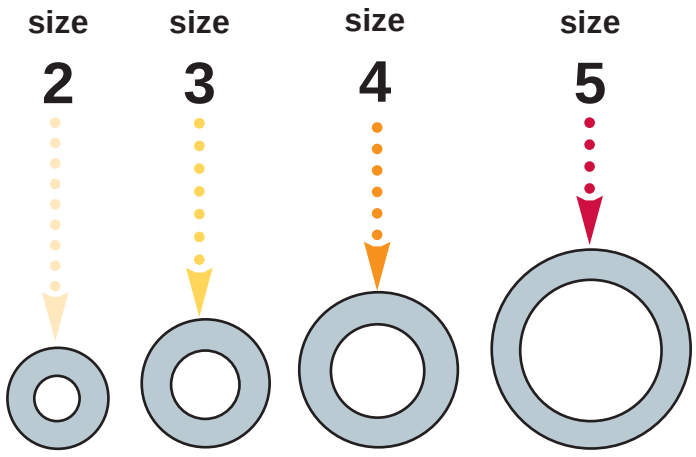


Kee Klamp fitting reference:



Kee Klamp fitting reference:





PIPE

Kee Klamp fittings are produced in a range of standard sizes to suit Schedule 40 steel pipe, sizes ¼" nominal bore to 2" nominal bore; also equivalent sizes of tubing in other materials.

Tubing of other specifications can be used, providing the outside diameter is compatible with Schedule 40 Pipe. Pipe with a wall thickness of less than ⅛" can only be used in lightly-loaded structures.

Pipe sizes are shown in the table and sectional drawings below.

Kee Klamp Pipe Ref.	Nom. Bore* in	Pipe Dia. O.D. in	Kee Klamp I.D. in**	Tube Dia. O.D. in
2	1/4	.54	.59	17/32
3	3/8	.68	.73	11/16
4	1/2	.84	.87	27/32
5	3/4	1.05	1.09	1
6	1	1.32	1.38	1 5/16
7	1 1/4	1.66	1.72	1 5/8
8	1 1/2	1.90	1.94	1 7/8
9	2	2.38	2.41	2 3/8

* Nominal bore is an arbitrary dimension, because the bore varies with the wall thickness of the pipe.

**Subject to normal manufacturing tolerances.

FINISHES

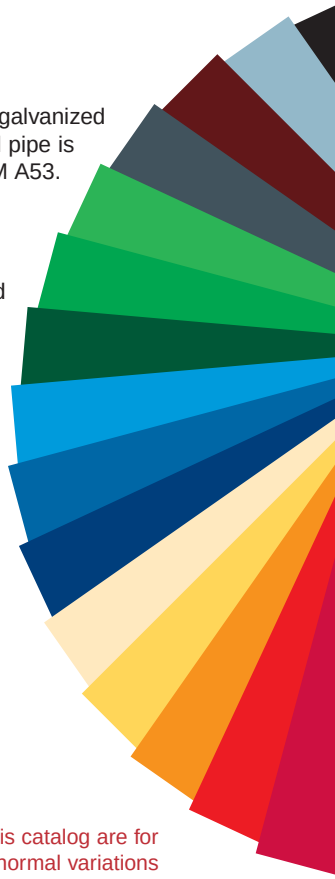
Kee Klamp fittings are supplied hot dip galvanized to BS EN ISO 1461:199. Standard steel pipe is galvanized to the requirements of ASTM A53.

COLORS

In addition to this standard finish, pipe fittings and accessories can be supplied with polyester coating in any RAL color.

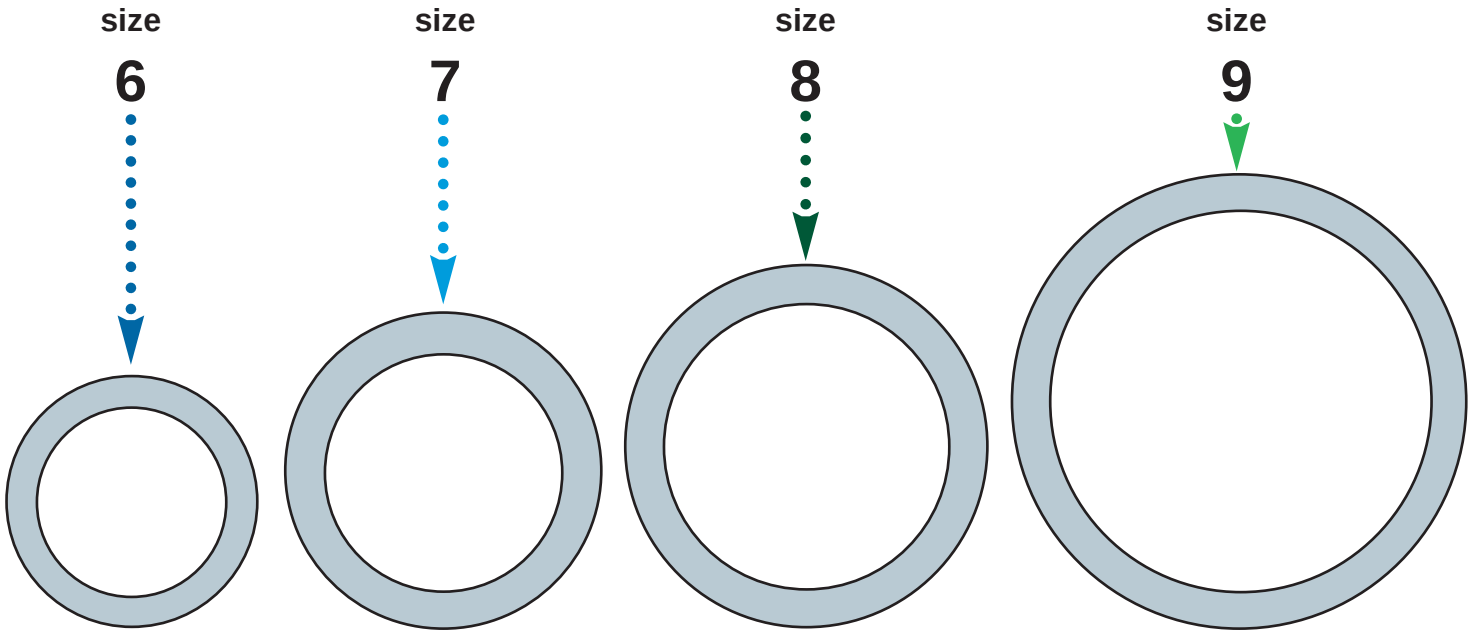
The polyester coating is highly durable and is usually applied to products that are already galvanized. Should damage occur to the coating, corrosion is still prevented.

Typical examples of available colors are shown on the pages featuring the Kee Klamp standard range of fittings. Colors and illustrative RAL references are presented in the format shown below.



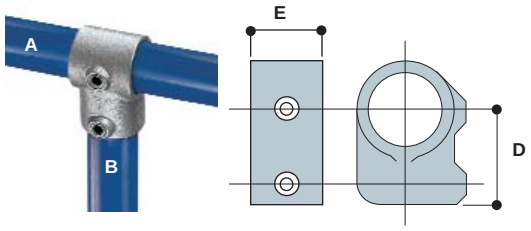
RAL 3016 **16**

Important: The RAL Color indicators in this catalog are for general guidance only and are subject to normal variations inherent in the printing process. When ordering RAL Colors and exact matching is required, an RAL Color Chart must be consulted.



FITTINGS PRODUCT RANGE

10 RAL 1001

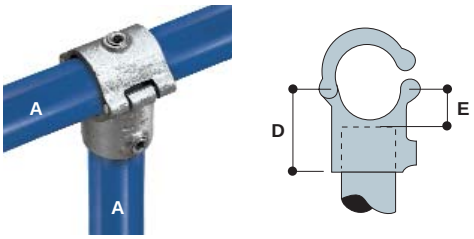


TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
10-2	2	2		1.00	0.77					0.04
10-3	3	3		1.13	0.94					0.15
10-4	4	4		1.36	1.20					0.29
10-5	5	5		1.63	1.47					0.51
10-6	6	6		1.81	1.84					0.64
10-65	6	5		1.75	1.42					0.55
10-67	6	7		2.20	2.06					0.95
10-7	7	7		2.38	2.16					0.99
10-75	7	5		2.25	1.44					0.71
10-76	7	6		2.25	1.80					0.95
10-78	7	8		2.88	2.38					1.39
10-8	8	8		2.69	2.38					1.28
10-87	8	7		2.47	2.03					1.10
10-9	8	7		3.31	2.88					2.14
10-98	8	7		2.94	2.50					1.43

Single Socket Tee

Designed to give a 90° butt joint between two pipes. Frequently used for the joint between end uprights and the middle rail on safety railing where the site is straight and level. Also for base ties on racking. This fitting cannot be used where the pipe through sleeve 'A' is required to be joined within the fitting. Type 25 should be used when a join in the pipe is necessary.

A10 RAL 1006

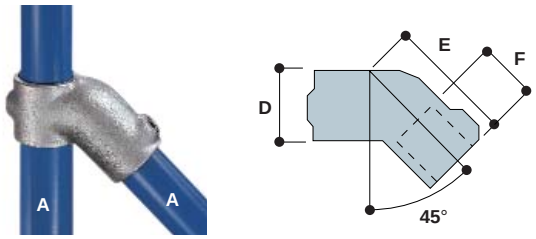


TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
A10-7	7			2.36	1.10					1.26
A10-8	8			3.46	1.30					1.59

Split Single Socket Tee

Designed to allow additions or extensions to existing structures without the need for dismantling. Pipe must not be joined within the fitting. Fitting has strength and function comparable to Type 10 fittings.

12 RAL 2010

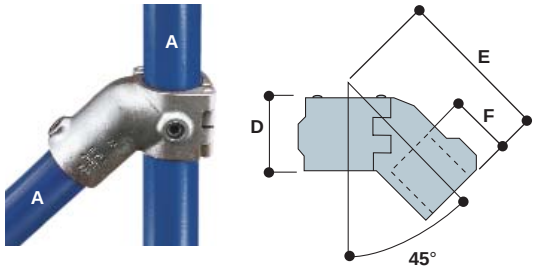


TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
12-5	5			1.46	2.83	1.38				0.66
12-6	6			1.73	3.35	1.38				0.95
12-7	7			2.17	3.70	1.58				1.56
12-8	8			2.36	4.25	1.58				2.02

45° Single Socket Tee

Most frequently used for bracing and struts.

A12 RAL 6018

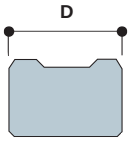


TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
A12-8	8			2.36	4.80	2.05				2.36

Split 45° Single Socket Tee

The unique "Hinge and Pin" system of this fitting enables existing structures to be easily extended without the need for dismantling. This fitting is most frequently used for bracing and struts.

14 RAL 3015

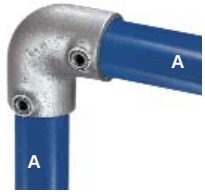


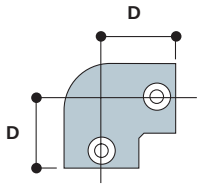
TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
14-4	4			2.28						0.31
14-5	5			3.03						0.60
14-6	6			3.50						0.86
14-7	7			4.01						1.15
14-8	8			4.09						1.41
14-9	9			4.88						2.38

Straight Coupling

Designed to form an inline joint between two pieces of pipe of the same size. Where a constant diameter is required along the outside of the pipe (such as for ADA handrail or garment storage), an internal spigot (Type 18) should be considered.

15 RAL 4006



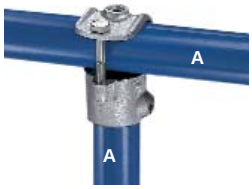


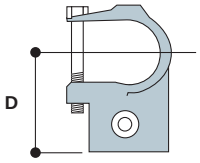
TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
15-4	4			1.33						0.29
15-5	5			1.61						0.60
15-6	6			1.81						0.86
15-7	7			2.36						1.48
15-8	8			2.67						1.70
15-9	9			3.34						2.82

90° Elbow

A 90° elbow joint, most frequently used as an end joint for the top rail of safety railing on a level site.

16 RAL 3016



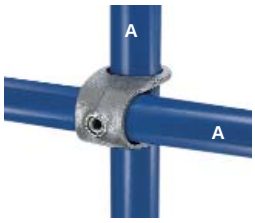


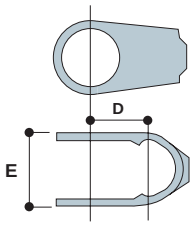
TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
16-5	5			1.97						0.64
16-6	6			2.05						0.73
16-7	7			2.68						1.30
16-8	8			2.87						1.32
16-9	9			3.54						2.03

Clamp-on Tee

Widely used for adding to and modifying existing structures. This performs the same function as a Type 10, but because of its open socket, it can be added to a complete structure. For alternative fitting, see type A10. Type 25 should be used when a join in the pipe is necessary.

17 RAL 3003



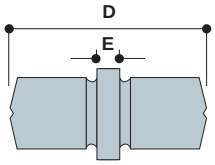


TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
17-5	5			1.06	1.61					0.33
17-6	6			1.34	1.89					0.51
17-7	7			1.69	2.48					0.95
17-8	8			1.93	2.68					1.23
17-9	9			2.40	3.07					1.98

Clamp-on Crossover

Designed to provide a 90° cross-over joint. Can be added to an existing structure. Pipe should not be joined within this fitting. For alternative fitting, see Type 45 or Type A45.

18 RAL 3003



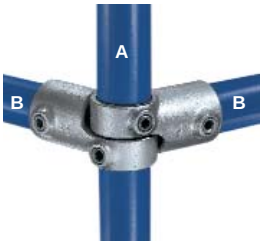
	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
18-6	6			2.99	0.79					0.57
18-7	7			2.99	0.79					0.84
18-8	8			3.74	0.79					1.19

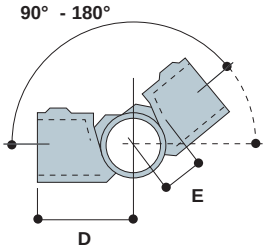
Internal Coupling

An internal spigot providing a flush joint between two pipes of the same diameter. Not as strong as Type 14 and must not be used where a direct tensile load is applied. This fitting can only be used with Schedule 40 steel pipe.

Danger: Type 18 fitting must not be used as a load bearing joint.

19 RAL 6018





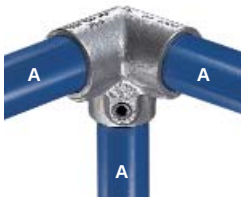
	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
19-5	5	5		2.36	1.22					0.44
19-6	6	6		2.28	1.30					0.64
19-7	7	7		2.87	1.57					0.90
19-8	8	8		3.54	2.17					1.17
19-85	8	5		2.87	1.77					1.43
19-9	9	9		4.33	1.93					2.18

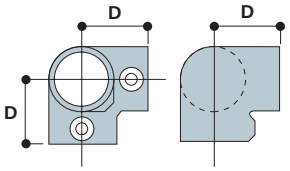
Adjustable Side Outlet Tee

Used in pairs to form variable angle joints between 90° and 180°. When calculating cutting lengths for pipe, dimension 'E' should be subtracted to give true pipe length. In the case of Type 19-8 and Type 19-85, you can produce an angle range between 60° and 180°.

Note: Type 19 fittings are normally used in pairs. In the United Kingdom, France, and Germany, they are sold and priced separately. In the USA and Canada, they are sold and priced in pairs.

20 RAL 6002



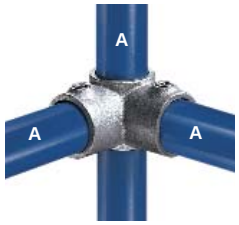


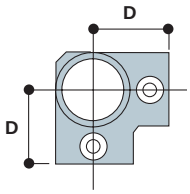
	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
20-4	4			1.34						0.37
20-5	5			1.61						0.84
20-6	6			1.81						1.06
20-7	7			2.36						1.79
20-8	8			2.68						2.49
20-9	9			3.35						4.01

Side Outlet Elbow

A 90° corner joint most frequently used for the top rail of safety railing. It can also be considered for the corner joint of benches, work tables, and other rectangular structures.

21 RAL 6004





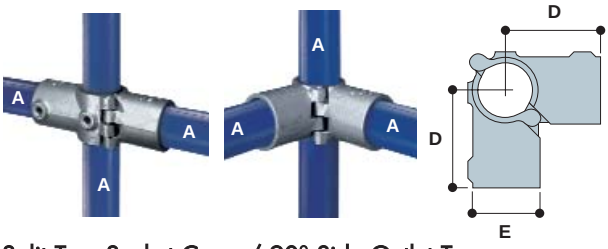
	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
21-4	4			1.34						0.31
21-5	5			1.61						0.62
21-6	6			1.81						0.90
21-7	7			2.36						1.52
21-8	8			2.68						1.87
21-9	9			3.35						3.00

90° Side Outlet Tee

Most frequently paired with Type 20 to give a 90° corner joint for the middle rail of safety railing and other rectangular structures. The upright passes through the fitting.

A21/ A26

RAL 4009



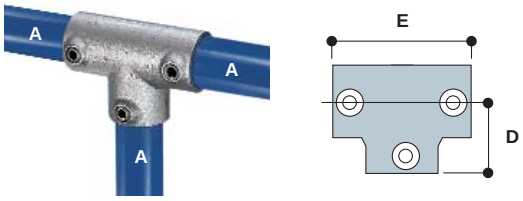
TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
A21/A26-8	8			3.46	2.36					2.36

Split Two Socket Cross / 90° Side Outlet Tee

This fitting performs the same function as either Type 21 or Type 26, but because of its unique "Hinge and Pin" system, it can be added to an existing tubular assembly. Type A21/A26 fittings are supplied and priced as a kit including 2 castings and 2 taper pins, which can be assembled in either configuration.

25

RAL 4005



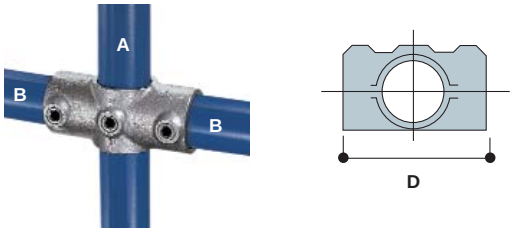
TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
25-4	4			1.34	2.68					0.40
25-5	5			1.61	3.23					0.82
25-6	6			1.81	3.62					1.08
25-7	7			2.36	4.72					1.87
25-8	8			2.68	5.35					2.40
25-9	9			3.35	6.61					3.84

Three Socket Tee

Most commonly used as the 90° joint between the top rail and an intermediate upright on safety railing. As there are two socket set screws in the sleeve, this fitting can be used where a join is required in the horizontal pipe. The Type 10 fitting can be used as an alternative when a join in the pipe is not required.

26

RAL 5012



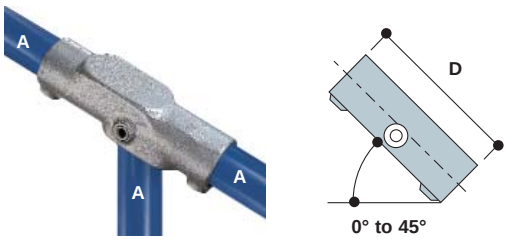
TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
26-4	4	4		2.68						0.29
26-5	5	5		3.23						0.60
26-6	6	6		3.62						0.88
26-7	7	7		4.72						1.43
26-8	8	8		5.35						1.87
26-87	8	7		4.96						1.39
26-9	9	9		6.61						3.22

Two Socket Cross

Usually paired with Type 25 to give a 90° joint between the middle rail and an intermediate upright on safety railing. The upright passes through the fitting.

27

RAL 5017

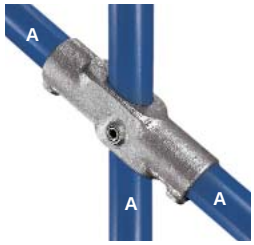


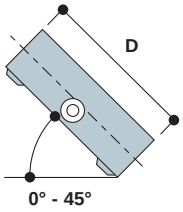
TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
27-6	6			6.30						1.81
27-7	7			7.48						2.73
27-8	8			8.50						3.29

Three Socket Custom Tee

Used for safety railing on slopes between 0° and 45°, between the top rail and an intermediate upright which is required to remain vertical. These fittings are held in stock as blanks which are machined to individual requirements. **It is essential when ordering that the required angle is stated.**
Note: When Type 27 fittings are used in pairs (i.e. on stairs or ramps), they will not be handed. The set screws on one side will therefore face inwards on the stair or ramp. For an alternative to this fitting, see Type 29. Weights given in the table are for unmachined fittings.
(Special Order Only).

28 RAL 1001





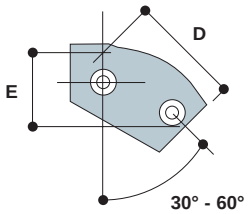
	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
28-6	6			6.30						1.81
28-7	7			7.48						2.73
28-8	8			8.50						3.29

Two Socket Custom Cross

Used for safety railing on slopes between 11° and 30°, between the midrail and an intermediate upright which is required to remain vertical. These fittings are held in stock as blanks which are machined to individual requirements. **It is essential when ordering that the required angle is stated.** *(Special Order Only).*

Note: When Type 28 fittings are used in pairs (i.e. on stairs or ramps), they will not be handed. The set screws on one side will therefore face inwards on the stair or ramp. For an alternative to this fitting, see Type 30. Weights given in the table are for unmachined fittings.

29 RAL 1006

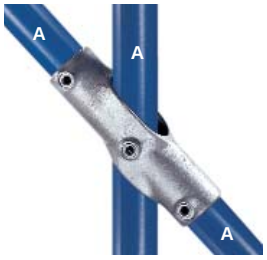


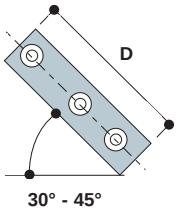
	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
29-6	6			3.23	2.52					0.97
29-7	7			3.66	2.91					1.39
29-8	8			4.02	2.68					2.14

30° to 60° Single Socket Tee

Designed as an alternative to the Type 12 fitting, this adjustable fitting is most frequently used for bracing and struts. It may be used at any selected angle between 30° and 60°. As an alternative, it is possible to use Type 29 in its vertical position in place of the Type 27, using the Type 27 only where a join in the pipe occurs.

30 RAL 2010



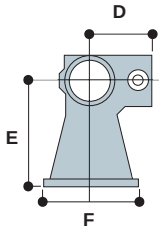


	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
30-6	6			5.75						1.41
30-7	7			7.01						2.14
30-8	8			8.50						2.87

30° to 45° Adjustable Cross

Designed as an alternative to the Type 28 fitting, this adjustable fitting can be used for railing on staircases between the midrail and an intermediate upright which is required to remain vertical. It may be used at any selected angle between 30° and 45°.

31 RAL 3015

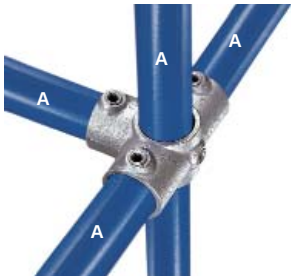


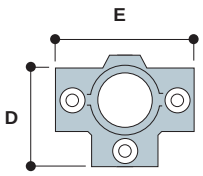
	Pipe ref.			Inches						lbs
TYPE	A	B	C	D	E	F	G	H	Ø	
31-8	8			2.99	5	4.53				4.41

Pallet Flange

This fitting has been designed for the construction of post pallets. Incorporates sockets for the upright and side pipes, and a locating bell for stacking pallets. *(Special Order Only)*

35 RAL 4006



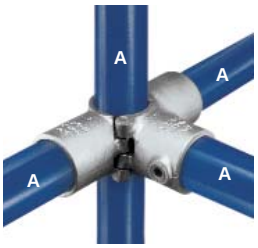


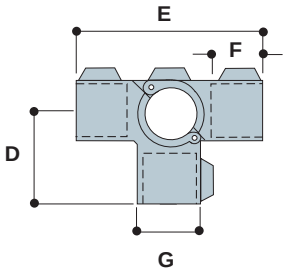
	Pipe ref.			Inches						lbs
TYPE	A	B	C	D	E	F	G	H	Ø	
35-4	4			1.34	2.68					0.44
35-5	5			1.61	3.23					0.77
35-6	6			1.81	3.62					0.99
35-7	7			2.36	4.72					1.70
35-8	8			2.68	5.35					2.62
35-9	9			3.35	6.61					4.04

Three Socket Cross

Most frequently used to tie uprights with horizontal pipes in three directions, all at 90° to the upright. The upright passes through the fitting.

A35 RAL 2002



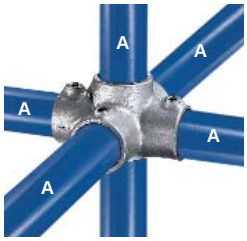


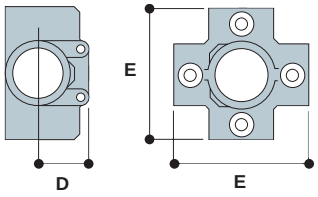
	Pipe ref.			Inches						lbs
TYPE	A	B	C	D	E	F	G	H	Ø	
A35-8	8			3.46	6.93	2.17	2.36			3.46

Split Three Socket Cross

The unique "Hinge and Pin" system of this fitting, enables existing structures to be easily extended without the need for dismantling. This fitting has been designed to tie an upright with horizontal pipes in three directions, all at 90° to the upright. The upright passes through the fitting.

40 RAL 3016



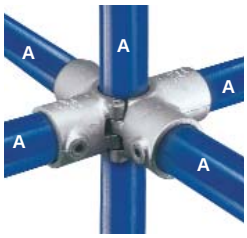


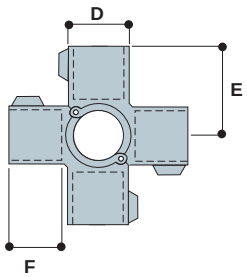
	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
40-5	5			1.26	3.23					1.12
40-6	6			1.46	3.62					1.32
40-7	7			1.81	4.72					2.32
40-8	8			2.09	5.35					3.22
40-9	9			2.44	6.61					5.07

Four Socket Cross

Most frequently used in multiple upright structures to tie a center upright with horizontal pipes in four directions. The upright passes through the fitting.

A40 RAL 1006



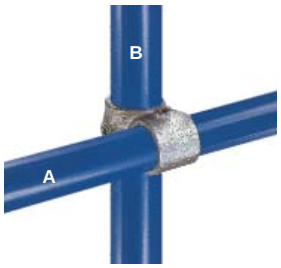


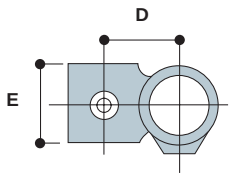
	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
A40-8	8			2.36	3.46	2.17				4.32

Split Four Socket Cross

The unique "Hinge and Pin" system of this fitting enables existing structures to be easily extended without the need for dismantling. This fitting is most frequently used in multiple upright structures to tie a center upright with horizontal pipes in four directions. The upright passes through the fitting.

45 RAL 3003





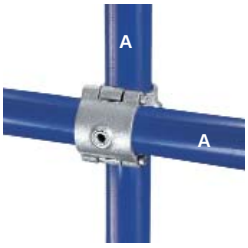
TYPE	Pipe ref. A	B	C	Inches D	E	Lbs.
45-2	2	2		0.63	0.75	0.04
45-3	3	3		0.83	0.94	0.16
45-4	4	4		0.98	1.10	0.34
45-5	5	5		1.34	1.22	0.45
45-6	6	6		1.57	1.50	0.76
45-65	6	5		1.42	1.69/1.46	0.64
45-7	7	7		2.13	1.81	1.18
45-76	7	6		1.77	1.81/1.50	0.99
45-8	8	8		2.17	2.01	1.30
45-86	8	6		1.89	2.00/1.50	1.00
45-87	8	7		2.01	2.00/1.81	1.20
45-9	9	9		2.64	2.40	2.00
45-98	9	8		2.36	2.99/2.99	2.40

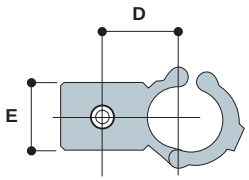
Crossover

Designed to give a 90° offset crossover joint. Frequently used on safety railing, where, to reduce cost by minimizing the pipe cuts, a continuous horizontal rail is used. Pipe cannot be joined within this fitting. It may be also used to give intermediate levels on racks, etc, when horizontal ties between uprights across the section are not required.

Note: Where Dimension 'E" indicates two figures, the first figure refers to socket 'A' and the second refers to socket 'B' in the table.

A45 RAL 5012



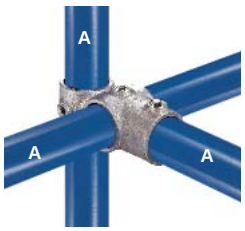


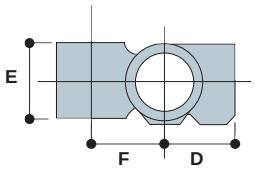
TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
A45-7	7			1.93	1.81					1.43
A45-8	8			2.17	1.96					1.74

Split Crossover

The unique "Hinge and Pin" system of this fittings enables existing structures to be easily extended without the need for dismantling. This fitting is designed to give a 90° offset crossover joint. Pipe should not be joined within the fitting. Type A45 function is comparable to Type 45 fittings.

46 RAL 6018





TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
46-4	4			1.34	1.10	0.98				0.33
46-5	5			1.61	1.22	1.34				0.66
46-6	6			1.81	1.50	1.57				1.08
46-7	7			2.36	1.81	1.93				1.52
46-8	8			2.68	2.01	2.17				2.01
46-9	9			3.35	2.40	2.64				3.40

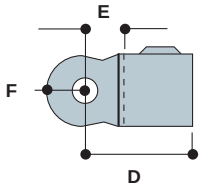
Combination Socket Tee and Crossover

Used on racking to join horizontal carrying rails to the upright, leaving the socket to take a horizontal tie across the section. For shelved racking it is usual to have the horizontal pipe outside the upright. On pallet racking it is preferable to have the carrying rails inside the upright.

SWIVEL FITTINGS - Types F50, M50, MH50, M51, MH51, M52, & M58

These are known as swivel fittings and can be assembled as Types C50, CH50, C51, CH51, C52, and C58 or supplied as separate items. They are frequently used for bracing but can also overcome problems where joints are required at angles other than those achieved by fixed angle fittings. For economical use of pipe, when making "C" fittings, types F50 (sizes 5-9 only) can be combined with different sizes of Types M50, MH50, M51, MH51, M52 and M58. F50-4 and M50-4 will only combine with each other. **Warning!** An entire structure should not be constructed from swivel fittings, as they would not provide sufficient stability or rigidity in the structure. Types M50, MH50, M51, MH51, M52 and M58 can also be used separately to secure various types of infill panel (i.e. flake-board, plastic sheeting, etc.). These fittings are not designed to take bending moments.

F50 RAL 6002



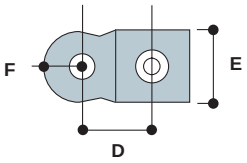
TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
F50-4	4			1.42	0.55	0.43			0.26	0.15
F50-5	5			2.36	0.98	0.75			0.39	0.62
F50-6	6			2.36	0.98	0.75			0.39	0.75
F50-7	7			2.68	0.98	0.75			0.39	0.93
F50-8	8			2.99	0.98	0.75			0.39	1.15
F50-9	9			3.35	1.02	0.75			0.39	1.43

Female Single Swivel Socket Member

One part of a combination fitting. The Type F50, in size 4, has only one ear while Type F50, in sizes 5 through 9, has two ears. Ø indicates diameter of bolt hole.

Note: Type F50-4 will only mate with a Type M50-4.

M50 RAL 6004



TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
M50-4	4			1.02	0.79	0.43			0.25	0.13
M50-5	5			1.57	1.57	0.75			0.39	0.53
M50-6	6			1.69	1.57	0.75			0.39	0.60
M50-7	7			1.89	1.85	0.75			0.39	0.79
M50-8	8			2.13	1.85	0.75			0.39	0.92
M50-9	9			2.44	2.05	0.75			0.39	1.19

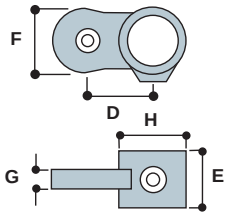
Male Single Swivel Socket Member

One part of a combination fitting. This can also be used for attaching flat panels to tubular structures.

Ø indicates diameter of bolt hole.

Note: Type M50-4 will only mate with a type F50-4.

MH50 RAL 4005

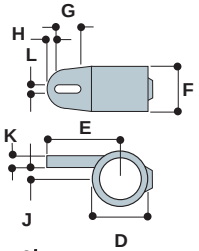


TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
MH50-6	6			1.69	1.42	1.50	0.43	1.81	0.39	0.66

Male Single Horizontal Swivel Socket Member

This fitting can be used for attaching flat panels to tubular structures. Specially designed for retail shelving applications. Can also be used as part of a Type CH50 combination fitting. Ø indicates diameter of bolt hole.

P50 RAL 6018

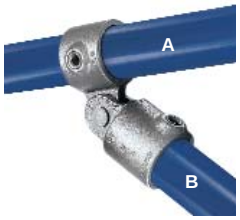


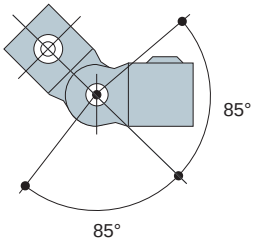
TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	J	K	L	Lbs.
P50-8	8			2.40	3.15	1.85	1.26	0.31	0.39	0.43	0.51	1.06

Modified M50-8 With Offset Slot

Designed for the securing of various types of panels and flooring to pipe structures. (i.e. plywood, plastic sheeting, wood planking etc.). This fitting has one offset flange to allow the flush attachment of panels to pipe. Often used with Type P51. See also Type P57.

C50 RAL 4009



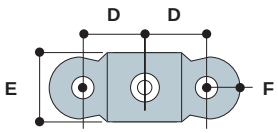


TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
C50-44	4	4								0.33
C50-55	5	5								1.23
C50-66	6	6								1.41
C50-77	7	7								1.76
C50-88	8	8								2.01
C50-99	9	9								2.69

Single Swivel Socket

Complete combination fitting. Reducing combinations of Type C50 are available sizes 5 through 9. See types F50 and M50 for individual fitting specifications. See "SWIVEL FITTINGS" box on page 13 for more information.

M51 RAL 4005

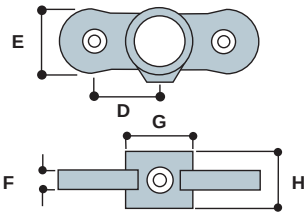


TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
M51-5	5			1.57	1.57	0.75			0.39	0.73
M51-6	6			1.69	1.57	0.75			0.39	0.84
M51-7	7			1.89	1.85	0.75			0.39	1.01
M51-8	8			2.13	1.85	0.75			0.39	1.06
M51-9	9			2.44	2.05	0.75			0.39	1.57

Male Double Swivel Socket Member

One part of a type C51 combination fitting. This fitting can also be used for attaching flat panels to tubular structures.
Ø indicates diameter of bolt holes.

MH51 RAL 3016

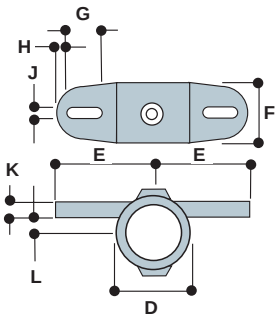


TYPE	Pipe ref. A	B	C	inches D	E	F	G	H	Ø	Lbs.
MH51-6	6			1.69	1.50	0.43	1.81	1.50	0.39	0.97

Male Double Horizontal Swivel Socket Member

This fitting can be used for attaching flat panels to tubular structures. Specially designed for retail shelving applications, the MH51 can be used as part of a Type CH51 combination fitting.

P51 RAL 2010

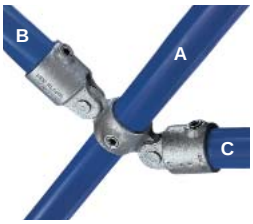


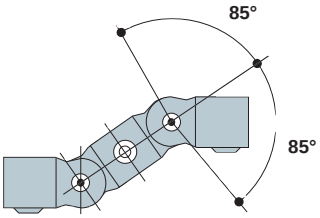
TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	J	K	L	Lbs.
P51-8	8			2.40	3.19	1.85	1.26	0.31	0.51	0.43	0.39	1.54

Modified M51-8 With Offset Slots

Designed for the secure fitting of various types of panels and flooring to pipe structures (i.e. plywood, plastic sheeting, wood planking, etc.) This fitting has two offset flanges to allow the flush attachment of panels to pipe.

C51 RAL 5012



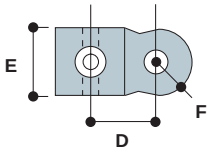


TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
C51-555	5	5	5							2.18
C51-666	6	6	6							2.45
C51-777	7	7	7							2.98
C51-888	8	8	8							3.46
C51-999	9	9	9							4.54

Double Swivel Socket

Complete combination fitting. Type C51 is made by combining two Type F50 fittings and one Type M51. For dimensions refer to Type F50 and Type M51. See "SWIVEL FITINGS" box on page 13 for more information.

M52 RAL 5017

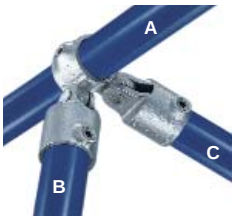


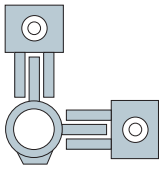
TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
M52-5	5			1.57	1.57	0.75			0.39	0.84
M52-6	6			1.69	1.57	0.75			0.39	0.82
M52-7	7			1.89	1.85	0.75			0.39	0.98
M52-8	8			2.13	1.85	0.75			0.39	1.00

Male Corner Swivel Socket Member

One part of a Type C52 combination fitting. This fitting can also be used for attaching flat panels to tubular structures.
Ø indicates diameter of bolt hole.

C52 RAL 1001



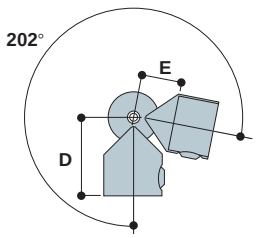


TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
C52-555	5	5	5							2.14
C52-666	6	6	6							2.47
C52-777	7	7	7							2.96
C52-888	8	8	8							3.42

Corner Swivel Socket

Complete combination fitting. Reducing combinations of Type C52 are available, sizes 5 to 8. For dimensions refer to Type F50 and Type M52. See "SWIVEL FITTINGS" box on page 13 for more information.

BC53 RAL 1006

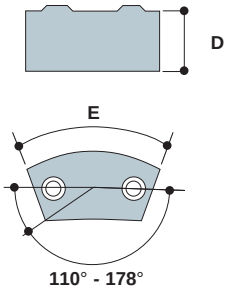


TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
BC53-8	8			3.35	1.77					2.48

Swivel Elbow

The Type BC53-8 fitting has been designed as a variable angle inline connection, adjustable through 202°.
Warning! An entire structure should not be constructed from Type BC53-8 or any other swivel fitting, as these types would not provide sufficient stability or rigidity in the structure due to the free rotation of the fitting.

55 RAL 2010

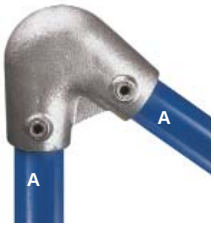


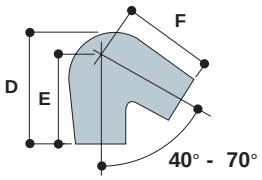
TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
55-6	6			1.81	4.57					1.12
55-7	7			2.17	6.06					1.80
55-8	8			2.36	6.02					1.90

Obtuse Angle Elbow

The Type 55 is an ideal fitting to use as an alternative to bending, or when a junction between a sloping pipe and an end post is required - i.e., guardrailing and staircases. (Refer to page 33 for more information).

56 RAL 2002



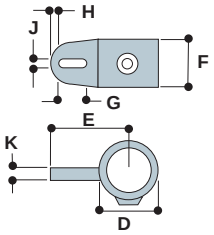


TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
56-8	8			5.28	4.41	4.41				2.92

Acute Angle Elbow

Type 56 is an ideal fitting to use as an alternative to bending, or when a junction between a sloping pipe and an end post is required - i.e., guardrailing and staircases. (Refer to page 33 for more information).

P57 RAL 5017

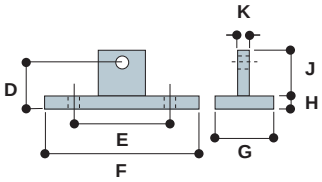


TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	J	K	Lbs.
P57-7	7			2.15	4.01	1.26	1.00	0.13	0.50	0.43	0.82
P57-8	8			2.40	3.19	1.85	1.26	0.31	0.39	0.43	1.54

Modified M50-8 With Slot

Designed for the securing of various types of panels and flooring to pipe structures (i.e. plywood, plastic sheeting, wood planking, etc.). This fitting has a single offset flange to allow for the attachment of panels to pipe. See Type P50.

M58 RAL 3015

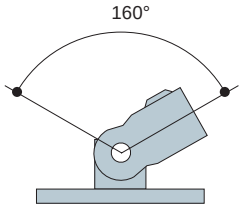


TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	J	K	Ø	Lbs.
M58				1.38	3.27	4.41	2.05	0.24	1.77	0.35	0.47	0.82

Base Plate

This fitting may be considered for various wall and brace fixings. It is often combined with Type F50 to give an adjustable angle fitting Type C58. Ø indicates diameter of base plate fixing holes. The diameter of the attachment bolt hole is 0.39 inch (10mm).

C58 RAL 4006



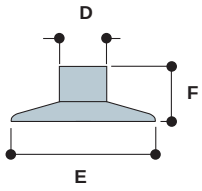
TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
C58-5	5									1.54
C58-6	6									1.68
C58-7	7									1.85
C58-8	8									2.07
C58-9	9									2.36

Swivel Flange

A swivel fitting for attachment of angled pipe to a flat surface. For dimensions refer to Type F50 and Type M58.

Warning! It is not recommended for use as a base flange to support guardrailing, balustrading or other types of structure.

59 RAL 3016



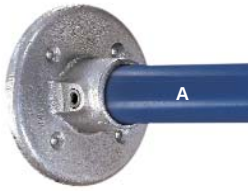
TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
59-5	5			0.75	3.19	1.10				0.24
59-6	6			1.02	3.43	1.26				0.26
59-7	7			1.30	3.86	1.34				0.44
59-8	8			1.50	4.09	2.05				0.62
59-9	9			2.01	4.37	1.85				0.66

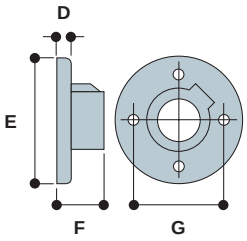
Spigot Flange

A spigot flange which fits inside the pipe and is *not* secured by a set screw. Type 59 can only be used with pipe wall thickness of 1/8" and in light, self supporting structures. Type 59 is manufactured in aluminum. (Refer to table on page 35).

Note: No fixing holes are provided in this fitting.

60 RAL 3003





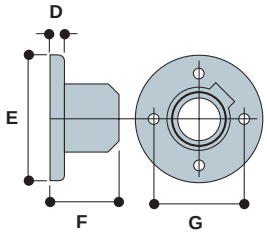
TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
60-5	5			0.55	5.12	2.52	3.11		0.31	2.54
60-6	6			0.55	5.51	2.52	3.39		0.31	2.54
60-7	7			0.55	5.87	2.52	3.74		0.31	2.87
60-8	8			0.55	6.18	2.52	4.02		0.31	3.26

Extra Heavy Flange

A heavy duty flange, with wide base, for spreading loads over a large surface area. This flange, with holes provided for countersunk flat head screw fixings only, is for use on structures where the fixing required is positional only. Frequently used as a wall fixing bracket. (Refer to table on page 35). Ø indicates diameter of fixing holes.

Warning! It is not recommended for use as a base flange to support guardrailing or balustrading. (See Type 62.)

61 RAL 5012



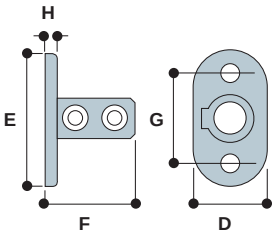
TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
61-3	3			0.25	2.76	1.26	1.85		0.26	0.42
61-4	4			0.25	3.07	1.54	2.13		0.26	0.51
61-5	5			0.25	3.15	1.57	2.24		0.26	0.73
61-6	6			0.25	3.54	1.93	2.52		0.26	1.10
61-7	7			0.25	4.02	2.01	2.99		0.31	1.37
61-8	8			0.25	4.53	2.32	3.50		0.31	1.48
61-9	9			0.39	5.00	2.48	3.74		0.39	2.38

Flange

This flange, with holes provided for countersunk flat head screw fixings only, is used on structures where the fixing required is positional only. Frequently used as a wall fixing bracket. (Refer to table on page 35). Ø indicates diameter of fixing holes.

Warning! It is not recommended for use as a base flange to support guardrailing or balustrading. (See Type 62).

62 RAL 6018

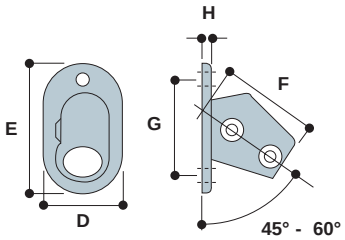


	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
62-2	2			1.26	2.52	1.73	1.54	0.20	0.35	0.09
62-5	5			2.56	4.57	3.11	2.99	0.24	0.43	1.30
62-6	6			2.99	5.04	3.50	3.50	0.31	0.55	1.61
62-7	7			2.99	5.51	3.54	4.02	0.43	0.55	2.87
62-8	8			3.34	6.10	3.50	4.53	0.39	0.55	2.86
62-9	9			4.02	6.50	5.00	5.00	0.39	0.71	3.88

Standard Railing Flange

Ideal when a structural fixing is required. When fixing guardrailing and balustrades, Type 62 should always be used. The holes are of sufficient diameter to insure proper fixing with either a mechanical or chemical anchor. The two set screws in the vertical socket give greater sideload stability to the upright. It is recommended that the fixing holes in the flange should be in line with the applied load. (Refer to table on page 35). Ø indicates diameter of fixing holes.

63 RAL 6002

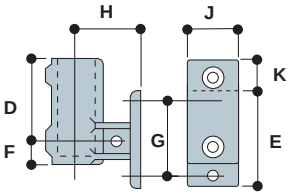


	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
63-6	6			3.07	5.12	3.62	3.78	0.31	0.55	2.16
63-7	7			2.99	5.43	3.74	4.17	0.39	0.55	2.54
63-8	8			3.54	6.10	3.94	5.43	0.39	0.55	3.31

Angle Base Flange

This fitting is similar to Type 62, but is used to set up the upright at an angle between 45° to 60°. This fitting should only be subjected to light loads, which cannot be positioned at 90° to the applied load. For greater loads or other pipe sizes, a Type 62 flange is used and the upright bent to the required angle. (Refer to table on page 35). Ø indicates diameter of fixing holes.

64 RAL 4009

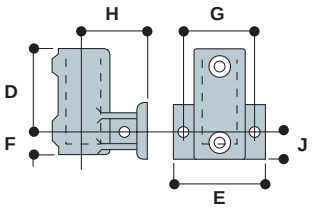


	Pipe ref.			Inches								Lbs.
TYPE	A	B	C	D	E	F	G	H	J	K	Ø	
64-6	6			3.43	3.74	0.83	2.64	2.24	1.77	1.57	0.55	1.70
64-7	7			3.31	4.25	1.18	2.83	2.56	2.01	1.38	0.55	2.47
64-8	8			3.90	4.76	0.87	3.50	2.76	2.20	0.98	0.55	3.40

Standard Vertical Railing Base

This fitting is designed for fixing guardrailing and balustrading to walls, parapets, steps and ramps. The upright cannot drop through the socket. Access to the top fixing hole is restricted by the position of the flange to the barrel. When selecting a hexagon head bolt or similar bolt fixing, the maximum length of the bolt including the head must not exceed 1". (Refer to table on page 35). **Note:** Should an upright be required to pass through the fitting, the base can be bored out to order. Ø indicates diameter of fixing holes.

65 RAL 4005



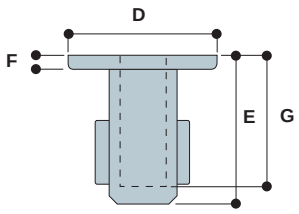
	Pipe ref.			Inches							Lbs.
TYPE	A	B	C	D	E	F	G	H	J	Ø	
65-6	6			3.27	3.86	0.87	2.64	2.24	0.87	0.55	1.68

Standard Horizontal Railing Base

This fitting is designed for palm fixing guardrailing and balustrading to walls, parapets, steps and ramps. Only available in size 6. The upright cannot drop through the socket. (Refer to table on page 35). Ø indicates diameter of fixing holes.

Note: Should an upright be required to pass through the fitting, the base can be bored out to order.

66 RAL 5012

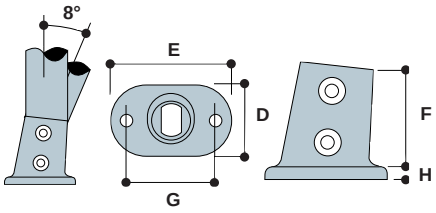


	Pipe ref.			Inches							Lbs.
TYPE	A	B	C	D	E	F	G	H	J	Ø	
66-6	6			5.00	4.84	0.43	4.53				4.12
66-7	7			5.51	5.35	0.43	5.00				5.12
66-8	8			5.51	5.35	0.43	5.00				5.51

Ground Socket

A ground socket fitting for setting in concrete; the posts may either be permanent or removable as required. It incorporates a socket set screw fixing and can be supplied with a plug to fill the hole when the pipe is removed. (Refer to table on page 35).

67 RAL 1001



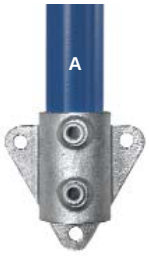
	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
67-8	8			3.78	5.98	3.54	4.49	0.35	0.55	2.87

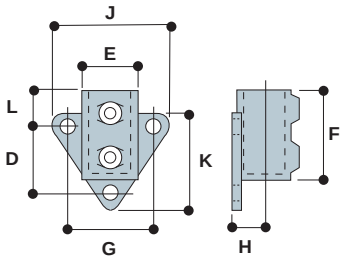
Angle Flange

Type 67 has been designed to allow the upright to pivot in the barrel, providing an angular displacement from 3° up to a maximum of 11°, measured from the vertical. Ideal to secure balustrade and guardrail systems on access ramps or other types of slopes. (Refer to table on page 35). Ø indicates diameter of fixing holes.

Note: It is generally recommended that when installing the 67-8, the fixing holes in the base should be in line with the applied load.

68 RAL 1006





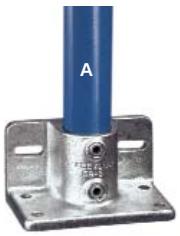
	Pipe ref.			Inches									Lbs.
TYPE	A	B	C	D	E	F	G	H	J	K	L	Ø	
68-6	6			2.48	1.77	3.03	2.80	0.94	3.75	4.06	1.00	0.43	1.37
68-7	7			2.83	2.09	3.27	3.27	1.10	4.19	4.25	1.00	0.43	1.76
68-8	8			3.07	2.36	3.50	3.39	1.22	4.44	4.56	1.00	0.43	2.09

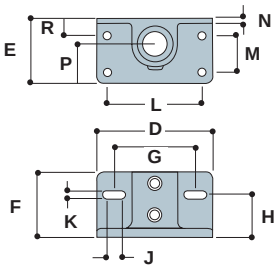
Wall Flange

Side fixing for guardrailing and balustrading to walls, parapets, steps and ramps. The upright cannot drop through the socket. (Refer to table on page 35). Ø indicates diameter of fixing holes.

Note: If the upright is required to pass through the fitting by machining out the base stop, the bottom fixing hole will be unusable.

69 RAL 4005





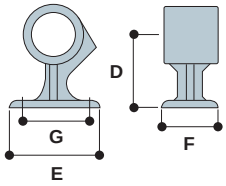
	Pipe ref.			Inches					
TYPE	A	B	C	D	E	F	G	H	J
69-6	6			5.12	2.95	3.07	3.74	2.28	0.59
69-7	7			5.71	3.15	3.54	3.82	2.28	0.79
69-8	8			6.30	3.54	3.54	4.41	2.28	0.79

								Lbs.
TYPE	K	L	M	N	P	R	Ø	
69-6	0.39	3.94	1.38	0.28	1.77	1.00	0.43	3.79
69-7	0.39	4.53	1.57	0.28	1.85	1.00	0.43	4.32
69-8	0.39	5.12	1.97	0.28	2.13	1.00	0.43	5.07

Railing Flange With Toeboard Adaptor

The Type 69 fitting has been designed for guardrailing and balustrading applications and provides the added benefit of attaching a toeboard to the base. The base plate holes are of sufficient diameter to allow for attachment with either a mechanical or chemical anchor, the side plates have slotted holes to allow for a degree of sideways movement for ease of installation. A toeplate designed for use with the Type 69 fitting is available from Kee Industrial Products. Ø indicates diameter of fixing holes.

70 RAL 2010

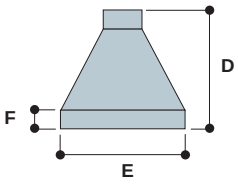


TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
70-5	5			2.17	3.07	1.81	2.24		0.31	0.79
70-6	6			2.28	3.46	1.57	2.76		0.31	0.97
70-7	7			2.52	4.02	1.81	3.23		0.31	1.23
70-8	8			2.76	4.25	2.05	3.23		0.31	1.72

Rail Support

This fitting, with holes provided for countersunk flat head screw fixings only, is designed to carry handrails along walls or to fix structures back to walls. The pipe passes through the fitting and cannot be joined within the fitting. Type 70 is also used to attach toeboards to the base of guardrail uprights. Ø indicates diameter of fixing holes.

71 RAL 2002

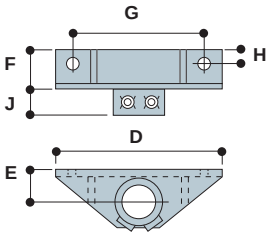


TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
71-6	6			4.92	5.63	0.98				0.53
71-7	7			5.91	6.06	0.98				0.71
71-8	8			6.10	6.57	0.98				0.79

Weather Cap

Type 71 is a weather cap designed for roof guardrailing to ensure a weathertight seal for base fixing flanges. The weather cap is secured to the upright by means of a combined sealant and adhesive.

72 RAL 3015



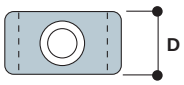
TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	J	Ø	Lbs.
72-8	8			7.99	1.54	2.01	5.98	0.75	1.30	0.43	2.76

Stair Tread Support

Type 72 is a stair tread support suitable for most types of stair tread, including timber, open steel and checker plate. Fixing of the treads is by two bolt holes in each fitting. Ø indicates diameter of fixing holes. *(Special Order Only)*

Warning! If Type 72 fittings are to be used for a permanent application or subjected to high loads, the stair tread support pipe which is located at its ends with a single set screw, should be drilled and pinned to avoid rotational slip.

75 RAL 4006

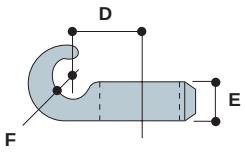


TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
75-4	4			0.91						0.11
75-5	5			1.02						0.29
75-6	6			1.02						0.29
75-7	7			1.02						0.33
75-8	8			1.02						0.42

Collar

A collar commonly used to support another fitting if the latter is required to be left untightened, such as on gate hinges. Type 75 is also useful when the loading on a structure exceeds the maximum permitted slip load for a set screw, as it gives extra support.

76 RAL 3016



TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
76-5	5			1.18	1.06	0.35				0.37
76-6	6			1.38	1.06	0.51				0.46
76-7	7			1.50	1.06	0.51				0.51
76-8	8			1.61	1.06	0.51				0.53

Hook

A fitting normally used for attachment of chains.

77 RAL 3003

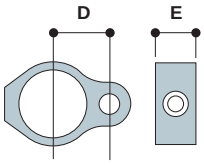
TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
77-4	4									0.002
77-5	5									0.009
77-6	6									0.015
77-7	7									0.035
77-8	8									0.044
77-9	9									0.055

Plastic Plug

A grey plastic plug to fit open ended pipes. See also fitting Type 84.

Note: This fitting can be used with Schedule 40 or 80 pipe only.

78 RAL 5017

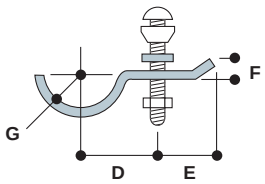


TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
78-5	5			1.18	1.02				0.46	0.46
78-6	6			1.30	1.02				0.55	0.55
78-7	7			1.50	1.02				0.57	0.57
78-8	8			1.61	1.02				0.62	0.62

Eye Fitting

A fitting used in conjunction with Type 83 fitting for gate hinges. Ø indicates diameter of pivot hole.

79 RAL 6018

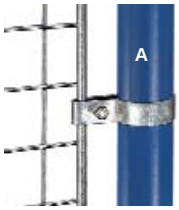


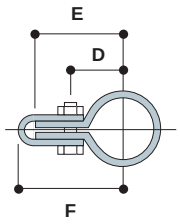
TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
79-7	7			1.81	1.34	0.31	0.83		0.31	0.18

Sheeting Clip

This fitting is used to attach profiled sheeting material to pipe. The fitting is supplied with the following hardware: one M6x50mm roofing bolt, one M6 square nut, and one M6 lock washer. BZP finish. Ø indicates diameter of bolt hole.

81 RAL 6002





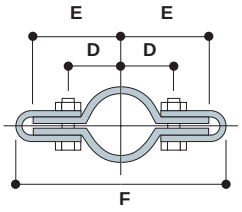
	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
81-5	5			0.94	1.77	2.20			0.28	0.15
81-6	6			1.06	2.05	2.32			0.28	0.18
81-7	7			1.26	2.24	2.52			0.28	0.18
81-8	8			1.34	2.32	2.60			0.28	0.20
81-9	9			1.57	2.56	2.83			0.28	0.22

Single Sided Clip

Single clips for attaching wire-mesh infilling. For economy it is possible to use Type 81 clips without the safety attachment, to secure various types of infill panels (plyboard, perspex, etc.) up to a thickness of 25/64". All clips are supplied with hexagonal head fixing bolts, M6x35mm long, and nut.

Note: For D and E dimensions the figures are given for the respective minimum and maximum dimensions allowed by the slotted hole.
Ø indicates diameter of the safety attachment bolt hole. The primary clip has a slot measuring .31 x .59 inches.

82 RAL 6004



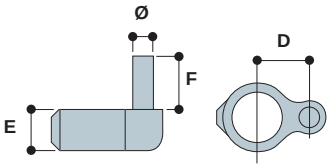
	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
82-5	5			0.94	1.77	4.41			0.28	0.24
82-6	6			1.06	2.05	4.65			0.28	0.26
82-7	7			1.26	2.24	5.04			0.28	0.29
82-8	8			1.34	2.32	5.20			0.28	0.31
82-9	9			1.57	2.56	5.67			0.28	0.31

Double Sided Clip

Double clips for attaching wire-mesh infilling. For economy it is possible to use Type 82 clips without the safety attachment, to secure various types of infill panels (plyboard, perspex, etc.) up to a thickness of 25/64". All clips are supplied with hexagonal head fixing bolts, M6x35mm long, and nut.
Ø indicates diameter of the safety attachment bolt hole. The primary clip has a slot measuring 8mm x 15mm.

Note: For D and E dimensions the figures are given for the respective minimum and maximum dimensions allowed by the slotted hole.

83 RAL 4009

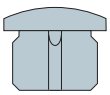


	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
83-5	5			1.18	1.02	1.50			0.51	0.44
83-6	6			1.30	1.02	1.50			0.51	0.55
83-7	7			1.50	1.02	1.50			0.51	0.64
83-8	8			1.61	1.02	1.50			0.51	0.66

Pin Fitting

This fitting is used in conjunction with Type 78 for gate hinges.

84 RAL 4005



	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
84-5	5									0.11
84-6	6									0.22
84-7	7									0.26
84-8	8									0.37
84-9	9									0.64

Malleable Plug

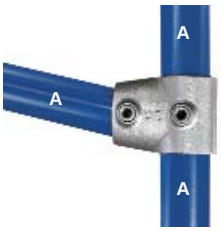
A metal drive-in plug which is difficult to remove when installed. For an alternative in plastic, see Type 77.

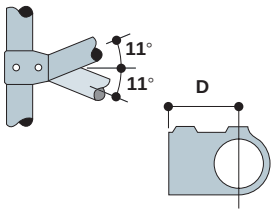
Note: This fitting can only be used with Schedule 40 steel pipe.

THE SLOPE RANGE

The slope range of fittings consists of fitting Types 86, 87, 88 and 89. These fittings are designed to facilitate in-line railings with vertical posts on slopes with angles between 0° and 11°. They can be used to construct railings on access ramps for people with disabilities when used in conjunction with the Kee Lite® Type L160 fitting.

86 RAL 5012



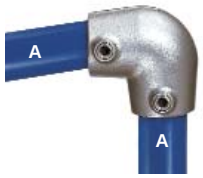


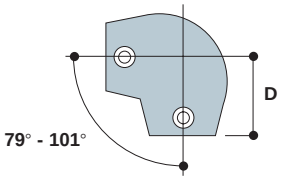
	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
86-8	8			2.68						1.68

Angle Tee

Used to join the middle rail to an end upright on a guardrail on a slope from 0° to 11°. Pipe cannot be joined within this fitting.

87 RAL 5017



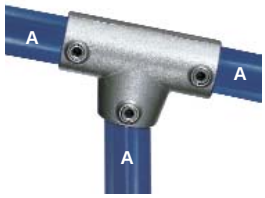


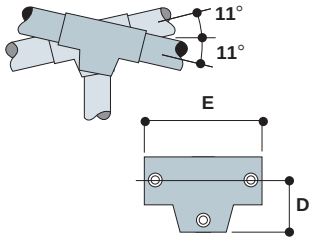
	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
87-8	8			2.68						1.98

Angle Elbow

Used to join the top rail to an end upright on a guardrail on a slope from 0° to 11° at both top and bottom of the run.

88 RAL 1001



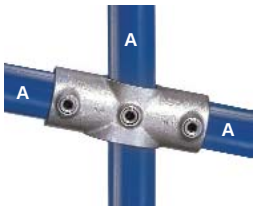


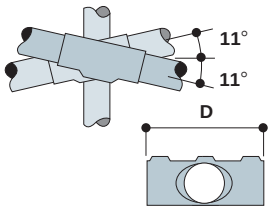
	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
88-8	8			2.68	6.22					2.73

Three Socket Angle Tee

Used to join the top rail to an intermediate upright on a guardrail on a slope from 0° to 11°. As there are two socket set screws in the sleeve, this fitting can be used to join two ends of rail.

89 RAL 1006





	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
89-8	8			6.22						2.05

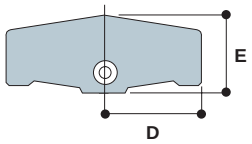
Two Socket Angle Cross

Used to join the middle rail to an intermediate upright on a guardrail on a slope from 0° to 11°. The upright passes through the fitting.

THE 90 to 95 RANGE

These are known as Pedestrian Guardrail (PGR) fittings and are used as an alternative to Types 10, 15, 25 and 26 when the site is not straight and level. There is sufficient play within the fitting to negotiate a slope up to 7° or a radius greater than 20 feet, when the uprights are at 6 ½ foot centers, using straight pipe. They also allow damaged rails to be removed without dismantling the adjacent structure. **The 90 to 95 range of fittings is available in size 8. Special Order Only.**

90 RAL 2010

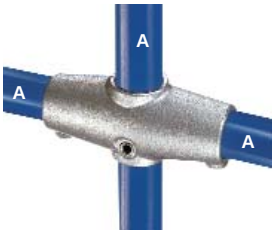


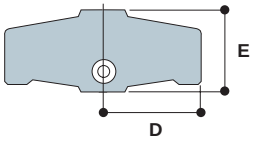
	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
90-8	8			3.90	3.46					3.90

PGR Three Socket Tee

Type 90 is used to join the top rail to an intermediate upright. *(Special Order Only).*

91 RAL 2002



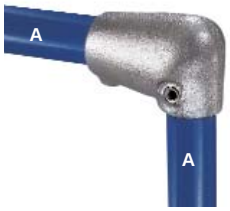


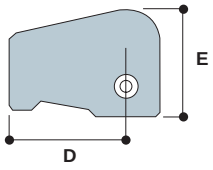
	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
91-8	8			3.90	3.50					3.97

PGR Two Socket Cross

Type 91 is used to join the midrail to an intermediate upright. *(Special Order Only).*

92 RAL 3015



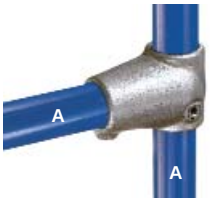


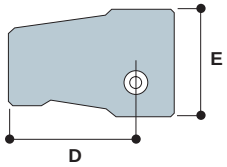
	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
92-8	8			3 90	3.50					2.84

PGR Elbow

Type 92 is used to join the top rail to an end post. *(Special Order Only)*

93 RAL 4006



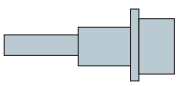


	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
93-8	8			3.90	3.54					2.65

PGR Tee

Type 93 is used to join the midrail to an end post. *(Special Order Only).*

95 RAL 3016



	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
95-8	8									1.01

PGR Internal Spigot

Internal spigot designed to prevent sagging of bends when using the 90 to 95 range of fittings. *(Special Order Only).*

Note: This spigot can only be used with Schedule 40 steel pipe.

97 RAL 3003

TYPE	To Suit Pipe Sizes	Description
97-2	2, 3	5/16" BSF
97-4	4	3/8" BSF
97-6	5, 6	ISO 228 G1 1/4"
97-7	7, 8, 9	ISO 228 G1 3/8"

Set Screws

Socket set screws are supplied in all Kee Klamp fittings as standard. Kee Koat™, applied as standard throughout the Kee Klamp range, provides the set screws with almost the same level of corrosion resistance as the galvanized Kee Klamp fitting.

98 RAL 5017

TYPE	To suit pipe sizes	A/F	Description
98			Ratchet Handle (1/2" Drive, 10" Long)
	4, 5, 6	1/4"	Hexagon Bit
	7, 8, 9	5/16"	Hexagon Bit

Ratchet

Ratchet tool complete with 2 hexagonal bits, one 1/4 inch and one 5/16 inch. Benefits: easier to fasten set screws and improved design. A/F refers to the dimension across the flats.

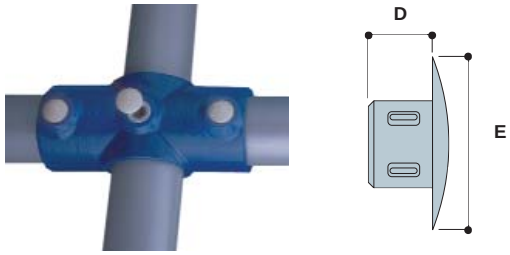
99 RAL 6008

TYPE	To suit pipe sizes	A/F
99-2	2, 3	5/32"
99-4	4	3/16"
99-6	5, 6	1/4"
99-7	7, 8, 9	5/16"

Hex Key

Simple hex key. A/F refers to the dimension across the flats.

100 RAL 6002

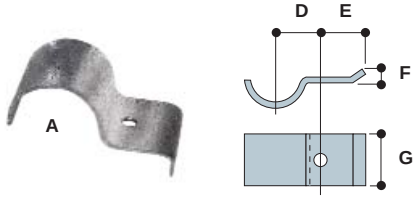


TYPE	To suit pipe sizes	Inches D	Inches E	Description
100-6	5, 6	0.24	0.63	to fit type 97-6
100-7	7, 8, 9	0.24	0.63	to fit type 97-7

Plastic Set Screw Cap

Grey plastic set screw caps provide the perfect finishing touch to galvanized Kee Klamp fittings. Secure push-in-fit application.

105 RAL 6004

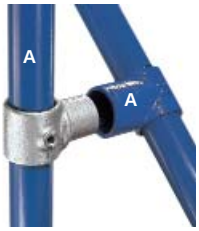


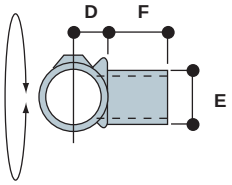
TYPE	Pipe ref. A	B	C	Inches D	E	F	G	H	Ø	Lbs.
105-6	6			1.26	1.57	0.51	1.97		0.35	0.31
105-7	7			1.50	1.57	0.51	1.97		0.35	0.35
105-8	8			1.57	1.57	0.51	1.97		0.35	0.40
105-9	9			1.89	1.57	0.51	1.97		0.35	0.51

Sheeting Clip Without Hardware

This fitting is used to attach profiled or flat sheeting. It is not supplied with hardware. Ø indicates diameter of bolt hole.

114 RAL 4009



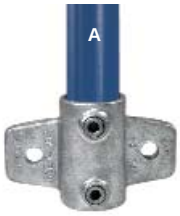


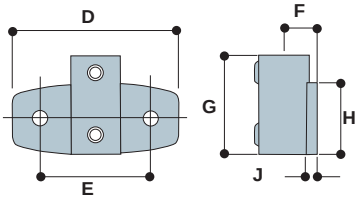
	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
114-2	2			0.43	0.51	0.83				0.04
114-6	6			0.83	1.34	1.14				0.79
114-7	7			1.02	1.65	1.42				1.19
114-8	8			1.14	1.93	1.61				1.41

Swivel Tee

An internal swivel fitting, designed to accommodate varying angles on handrailing for staircases, ramps, or bracing. Used in conjunction with Types 10, 15, 25 or 45, it eliminates the need for specially drilled angle fitting Type 27 and Type 28.

115 RAL 4005



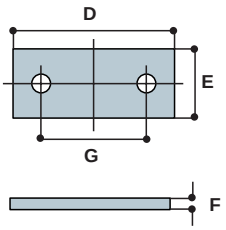


	Pipe ref.			Inches							Lbs.
TYPE	A	B	C	D	E	F	G	H	J	Ø	
115-6	6			5.91	3.94	1.18	3.54	2.56	0.39	0.55	2.34
115-7	7			5.91	3.94	1.38	3.54	2.56	0.39	0.55	2.71
115-8	8			5.91	3.94	1.61	3.54	2.56	0.39	0.55	3.13

Wall Flange

Type 115 is designed for palm fixing of guardrailing and balustrading to walls, parapets, steps and ramps. The upright cannot drop through the socket. Packer Plates (Type S115) are available to allow the fitting to be positioned in channels, slots, and other offset areas. Ø indicates fixing hole diameter.

S115 RAL 4005

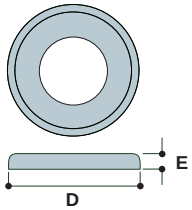


	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
S115				5.90	2.56	0.47	3.94		0.55	1.92

Packer Plate for Type 115

Type S115 allows the Type 115 fitting to be positioned in channels, slots, and other offset areas. Ø indicates fixing hole diameter.

118 RAL 2002

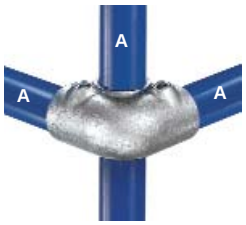


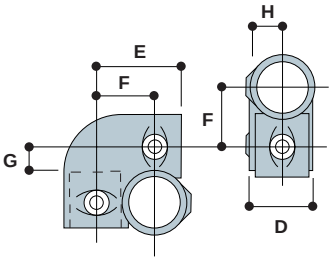
	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
118-8	8			4.00	0.60					0.88

Cover Flange

This fitting slips over uprights to finish below ground post installations. The fitting is secured to the upright pipe with a single recessed set screw.

121 RAL 5012





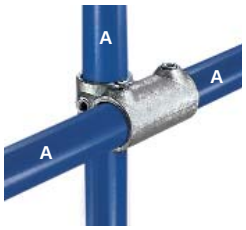
	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
121-7	7			1.81	2.83	1.93	0.87	0.98		2.03

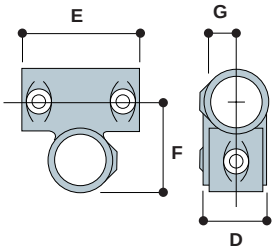
Corner Crossover

This fitting is designed to provide a 90 degree offset corner joint. When calculating the cutting lengths for pipe, dimension 'G' should be subtracted to give the pipe length for the rails and dimension 'H' should be added to give the pipe length for the upright.

Note: To obtain the true height of the upright the allowance for the base fittings must be included.

145 RAL 6004





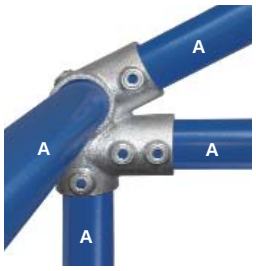
	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
145-7	7			1.81	4.02	1.93	0.91			1.83

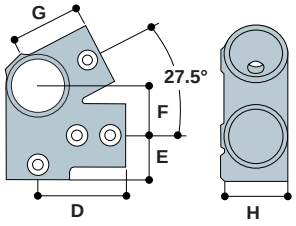
Crossover Coupling

This fitting is designed to give a 90 degree offset crossover. As there are two socket set screws in the sleeve, this Kee Klamp fitting can be used where a join is required in the horizontal pipe. For economy, it is possible to use a Type 45 in place of the 145, using the 145 only where a join in the pipe occurs. When calculating the cutting lengths for pipe, dimension 'G' should be added to give the pipe length for the upright.

Note: To obtain the true height of the upright the allowance for the base fittings must be included.

350 RAL 3016



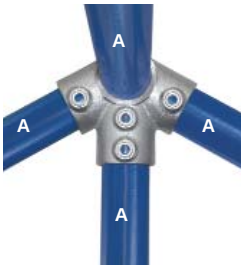


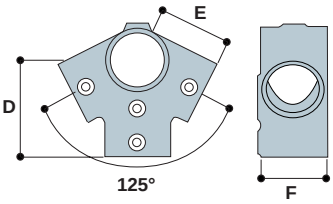
	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
350-8	8			3.27	1.65	1.85	2.64	2.36		2.62

Eaves Fitting

The Type 350 fitting has been designed for small structural building applications and provides for significant load rating. When used with the Type 351 ridge fitting a truss arrangement for additional support can be achieved. Double set screws are provided on the truss outlet to provide additional pull out resistance to hold structures firmly together.

351 RAL 5012





	Pipe ref.			Inches						Lbs.
TYPE	A	B	C	D	E	F	G	H	Ø	
351-8	8			3.50	2.64	2.36				2.11

Ridge Fitting

The Type 351 fitting has been designed for small structural building applications and provides for significant load rating. When used with the Type 350 eave fitting a truss arrangement for additional support can be achieved. Double set screws are provided on the downward truss outlet to provide additional pull out resistance and extra strength to the structure.

GET CONNECTED

Kee Klamp offers the widest and most versatile range of structural fittings available today.

The design of the Kee Klamp fitting has a functional purity and simplicity that renders the Kee Klamp concept the perfect solution to an enormous variety of applications, including: railing, enclosure, support and display.

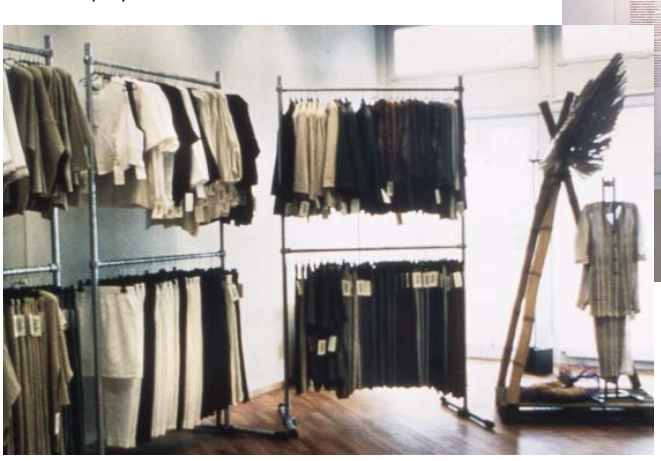
INDUSTRIAL & COMMERCIAL

Strong and durable, Kee Klamp fittings are suitable for any environment. Strength and total reliability ensure security and safety.

Safe and secure

RETAIL AND DISPLAY

Kee Klamp fittings are in demand for high quality retail and display applications. Their clean and functional appearance makes a strong design statement in keeping with progressive concepts in visual display.



Clean and modern appearance

PLAY AND RECREATION

The wide range and versatility of Kee Klamp fittings provide enormous scope for imaginative application in playgrounds and leisure facilities.

Color options available

MUNICIPAL

Kee Klamp fittings provide economical and sensible solutions for safety barriers and area demarcation. With the ability to withstand a variety of environments. Kee Klamp is durable, long lasting, and low maintenance.

Economical municipal safety

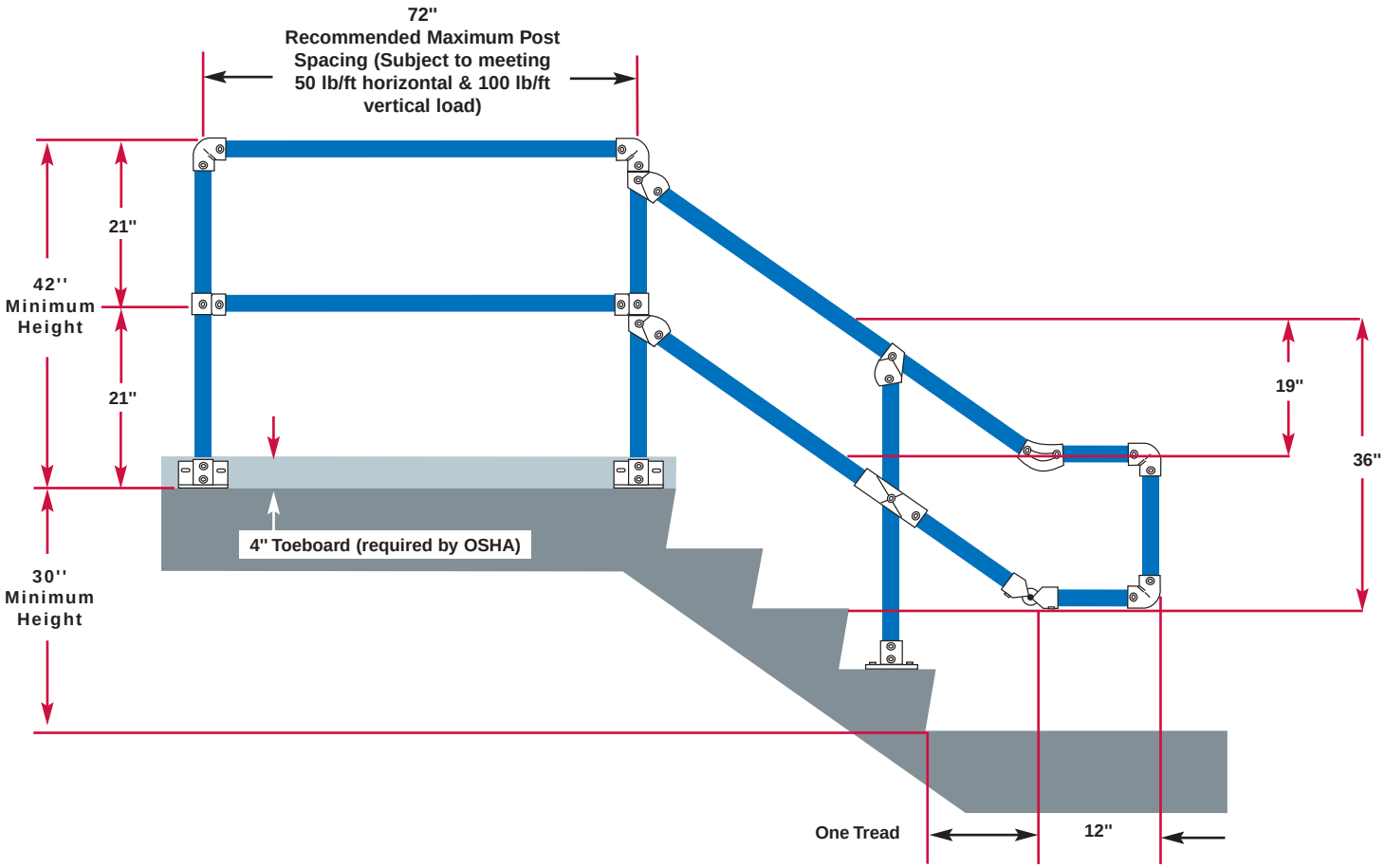
RESIDENTIAL

Kee Klamp fittings are ideal for residential applications, providing the perfect blend of practicality and attractive appearance.

Versatile solutions for residential applications

Building Compliant Railings with Kee Klamp Fittings

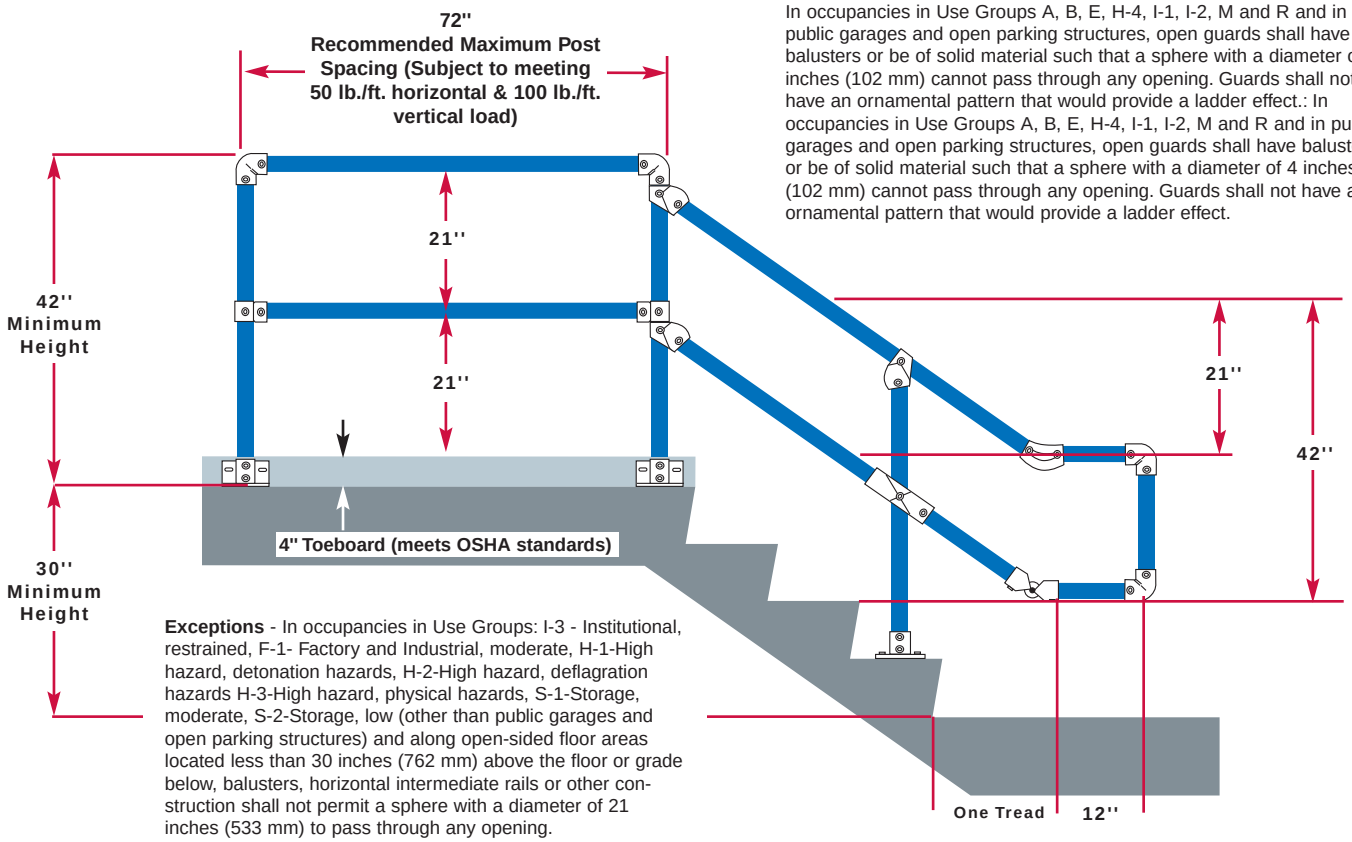
Standard Building Code



Section 1020, Business - 1020.3 Handrails and guardrails. Exception: In areas not accessible to the public and in fully enclosed stairways in office buildings not serving an A, E or R occupancy, the clear distance between rails or ornamental pattern shall be such to prevent the passage of a 21-inch (533mm) diameter sphere.
Section 1022, Factory-Industrial - 1022.4 Handrails and guardrails. Exception: In areas not accessible to the public in Group F, the clear distance between rails or ornamental pattern shall be such to prevent the passage of a 21-inch (533mm) diameter sphere.
Section 1023, Hazardous - 1023.2 Handrails and guardrails. Exception: In areas not accessible to the public in Group H,, the clear distance between rails or ornamental pattern shall be such to prevent the passage of a 21-inch (533mm) diameter sphere.
Section 1024, Institutional - 1024.2.11 Handrails and guardrails. Exception: In areas not accessible to the public in Group I Restrained the clear distance between rails or ornamental pattern shall prevent the passage of a 21-inch (533mm) diameter sphere.
Section 1025, Mercantile - 1025.3 Handrails and guardrails. Exception: In areas not accessible to the public and fully enclosed stairways in Group M, not serving a Group A, E or R occupancy, the clear distance between rails or ornamental pattern shall be such to prevent the passage of a 21-inch (533mm) diameter sphere.
Section 1027, Storage - 1027.5 Handrails and guardrails. Exception: In areas not accessible to the public in Group S, the clear distance between rails or ornamental pattern shall be such prevent the passage of a 21-inch (533mm) diameter sphere.

The BOCA® National Building Code

Section 1021.0 Guards

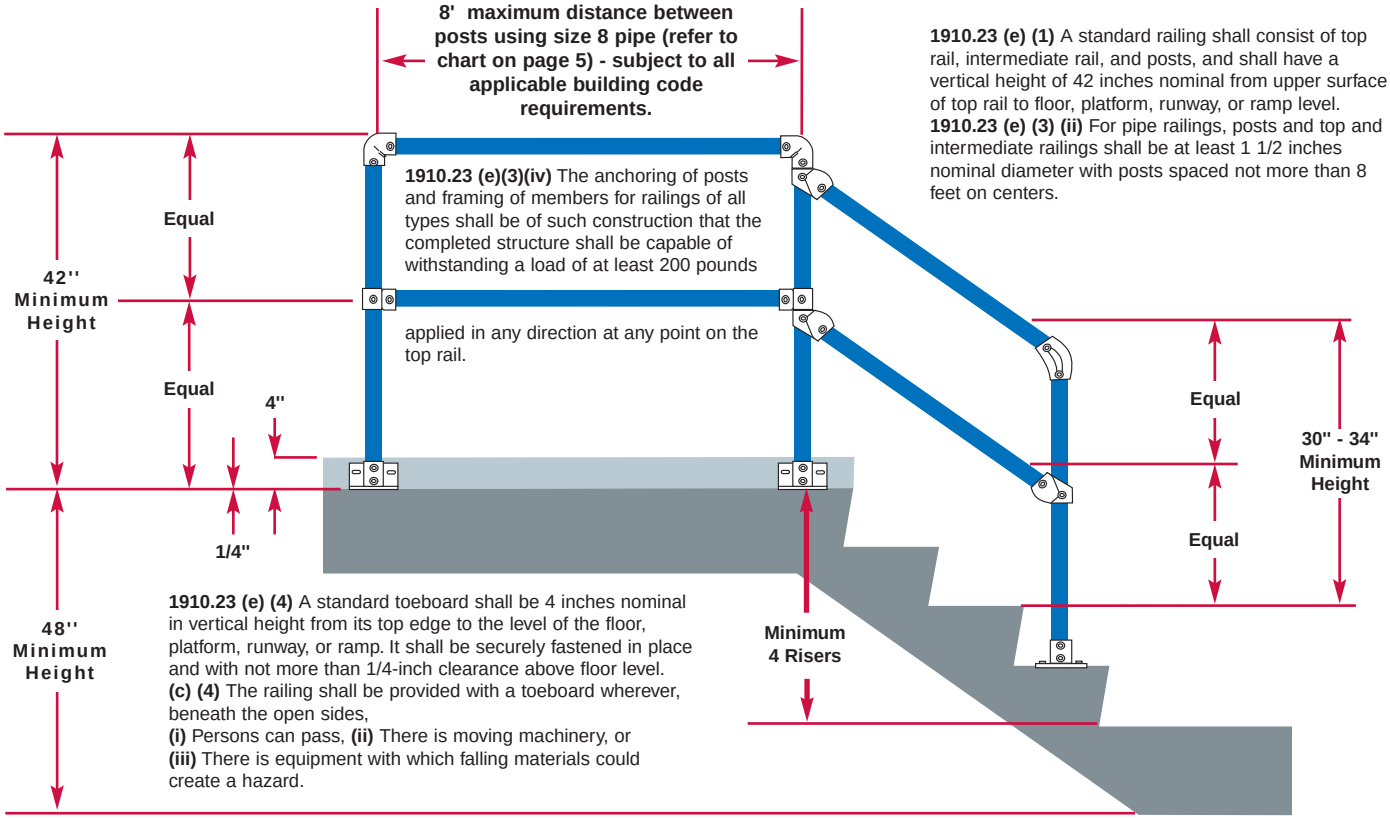


1021.3 Openings Limitations.
In occupancies in Use Groups A, B, E, H-4, I-1, I-2, M and R and in public garages and open parking structures, open guards shall have balusters or be of solid material such that a sphere with a diameter of 4 inches (102 mm) cannot pass through any opening. Guards shall not have an ornamental pattern that would provide a ladder effect.: In occupancies in Use Groups A, B, E, H-4, I-1, I-2, M and R and in public garages and open parking structures, open guards shall have balusters or be of solid material such that a sphere with a diameter of 4 inches (102 mm) cannot pass through any opening. Guards shall not have an ornamental pattern that would provide a ladder effect.

Exceptions - In occupancies in Use Groups: I-3 - Institutional, restrained, F-1- Factory and Industrial, moderate, H-1-High hazard, detonation hazards, H-2-High hazard, deflagration hazards H-3-High hazard, physical hazards, S-1-Storage, moderate, S-2-Storage, low (other than public garages and open parking structures) and along open-sided floor areas located less than 30 inches (762 mm) above the floor or grade below, balusters, horizontal intermediate rails or other construction shall not permit a sphere with a diameter of 21 inches (533 mm) to pass through any opening.

OSHA Standard Pipe Railing

1910.23 Guarding floor and wall openings and holes



1910.23 (e)(3)(iv) The anchoring of posts and framing of members for railings of all types shall be of such construction that the completed structure shall be capable of withstanding a load of at least 200 pounds applied in any direction at any point on the top rail.

1910.23 (e) (1) A standard railing shall consist of top rail, intermediate rail, and posts, and shall have a vertical height of 42 inches nominal from upper surface of top rail to floor, platform, runway, or ramp level.
1910.23 (e) (3) (ii) For pipe railings, posts and top and intermediate railings shall be at least 1 1/2 inches nominal diameter with posts spaced not more than 8 feet on centers.

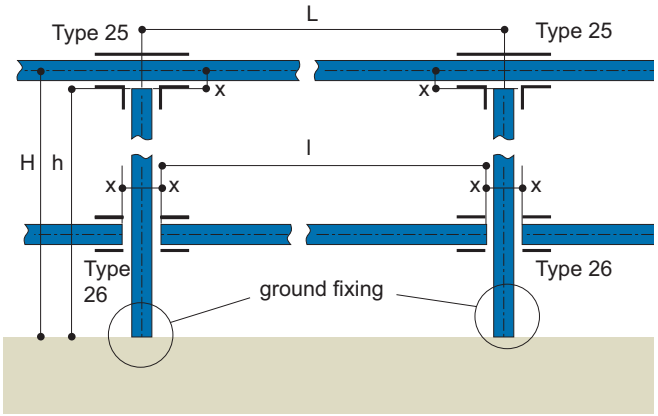
1910.23 (e) (4) A standard toeboard shall be 4 inches nominal in vertical height from its top edge to the level of the floor, platform, runway, or ramp. It shall be securely fastened in place and with not more than 1/4-inch clearance above floor level.
(c) (4) The railing shall be provided with a toeboard wherever, beneath the open sides,
(i) Persons can pass, **(ii)** There is moving machinery, or
(iii) There is equipment with which falling materials could create a hazard.

STRAIGHT AND LEVEL GUARDRAILING

(Using Types 10, 15, 20, 21, 25 & 26)

Where:

L = distance between centers of uprights
l = length of horizontal pipe
H= distance from ground to center line of top rail
h = length of upright pipe



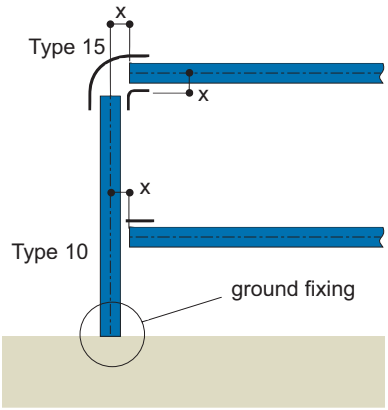


Table 1 gives details of dimension 'x' in the formula
l = L - 2x for calculating rail lengths and uprights
h = H - x ± (ground fixing).

Table 1

Kee Klamp Fitting Size	x (in)
2	- 3/8
3	- 1/2
4	- 1/2
5	- 1/2
6	- 5/8
7	- 7/8
8	- 1
9	- 1 1/8

Note: When reducing fittings are being used care must be taken to use the correct 'x' dimension.

Example, Type 10-87 (vertical pipe size 8, horizontal pipe size 7). To find the correct length of the horizontal pipe, the length 'x' is that for the size 8 vertical pipe.

When using Types 35 and 40 the above 'x' dimension should be used.

Although guardrailing is normally constructed in size 6, 7 and 8 pipe, Table 1 shows the cutting length for all Kee Klamp pipe sizes, and can therefore be applied to many other rectangular structures.

GUARDRAILING UP SLOPES 0° - 45° USING MACHINED FITTINGS

Where the upright remains vertical, i.e. ramps and stairways, (using Types 27, 28, 29)

(i) dimension 'x' to be subtracted from the upright centers dimension measured on the slope to give rail length. (l = L - 2x)

(ii) dimension 'y' to be added to the center dimension to give the length of the upright. (h = H + Y + ground fixing)

Note: between angles of 30° and 45° Type 29 fitting may be used to terminate the handrail, but for angles of less than 30° use a Type 10 with the rail bent to fit.

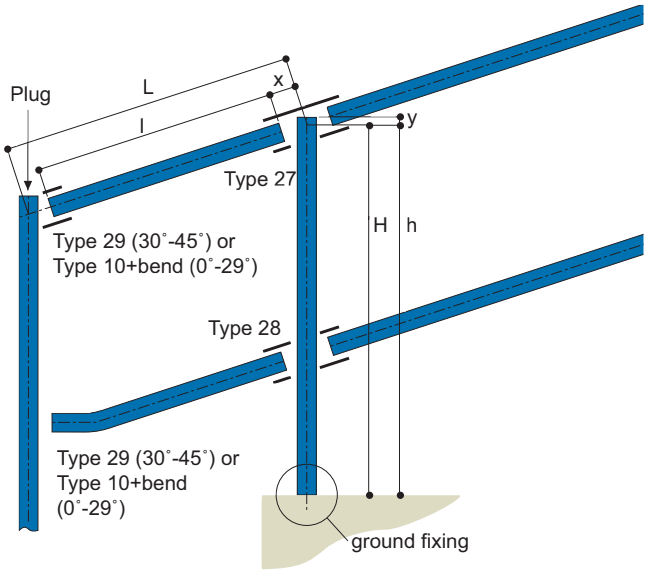


Table 2 gives details of dimensions required for calculating the rail lengths, where angles are between 0° and 45°.

Table 2: Rails

Angle of Slope°	Size 6 Fittings x (in)	Size 7 Fittings x (in)	Size 8 Fittings x (in)
0° to 4°	- 3/4	- 7/8	- 1
5° to 9°	- 7/8	- 1	- 1 1/8
10° to 11°	- 1	- 1 1/8	- 1 1/4
15°	- 1	- 1 1/4	- 1 3/8
20°	- 1 1/8	- 1 1/4	- 1 1/2
25°	- 1 1/4	- 1 3/8	- 1 5/8
30°	- 1 3/8	- 1 5/8	- 1 3/4
35°	- 1 1/2	- 1 3/4	- 2
40°	- 1 5/8	- 1 7/8	- 2 1/4
45°	- 1 7/8	- 2 1/8	- 2 1/2

Table 3 gives details of dimensions required for calculating the upright lengths, where angles are between 0° and 45°.

Table 3: Uprights

Angle of Slope°	Size 6 Fittings y (in)	Size 7 Fittings y (in)	Size 8 Fittings y (in)
0° to 4°	+ 3/4	+ 7/8	+ 1
5° to 9°	+ 5/8	+ 3/4	+ 3/4
10° to 11°	+ 5/8	+ 5/8	+ 3/4
15°	+ 1/2	+ 5/8	+ 3/4
20°	+ 1/2	+ 1/2	+ 5/8
25°	+ 3/8	+ 1/2	+ 5/8
30°	+ 3/8	+ 1/2	+ 1/2
35°	+ 3/8	+ 3/8	+ 1/2
40°	+ 1/4	+ 3/8	+ 3/8
45°	+ 1/4	+ 1/4	+ 3/8

GUARDRAILING UP SLOPES 0°-11°

Where the upright remains vertical, i.e. ramps and stairways, (using Types 86, 87, 88 and 89 - size 8 only)

(i) dimension 'x' to be subtracted from the upright centers dimension measured on the slope to give rail length. (l = L - 2x)

(ii) dimension 'y' to be added to the center dimension to give the length of the upright. (H = h + y + ground fixing)

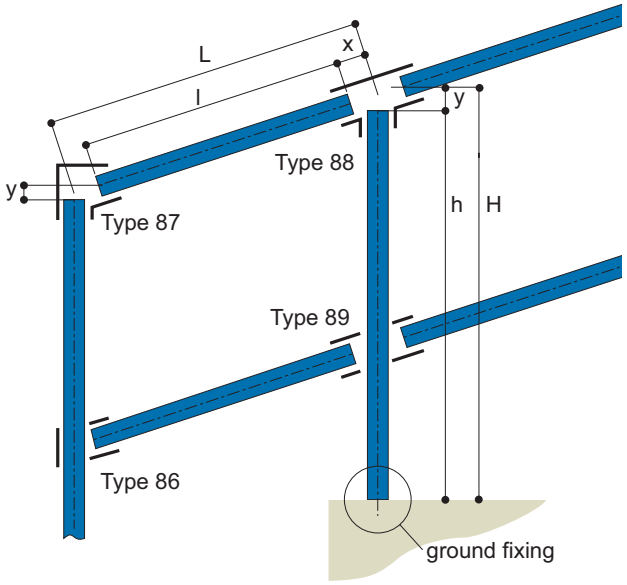


Table 4 gives details of dimensions required for calculating the rail lengths, where angles are between 0° and 11°.

Table 4: Rails

Angle of Slope°	Size 8 Fittings x (in)
0° to 4°	- 1
5° to 9°	- 1 1/8
10° to 11°	- 1 1/4

Table 5 gives details of dimensions required for calculating the upright lengths, where angles are between 0° and 11°.

Table 5: Uprights

Angle of Slope°	Size 8 Fittings y (in)
0° to 4°	- 1
5° to 9°	- 1 1/8
10° to 11°	- 1 1/4

GUARDRAILING UP SLOPES 30°-45° USING ADJUSTABLE FITTINGS

Where the upright remains vertical, i.e stairways (using Types 29, 30, 55 & 56, size 6, 7 and 8)

(i) dimension x, y, or z to be subtracted from the upright centers. Dimension (L), to give the length of rail.

(ii) dimension u, v and w for determining the upright length.

Table 6: Rails using Type 29 & 30 fittings

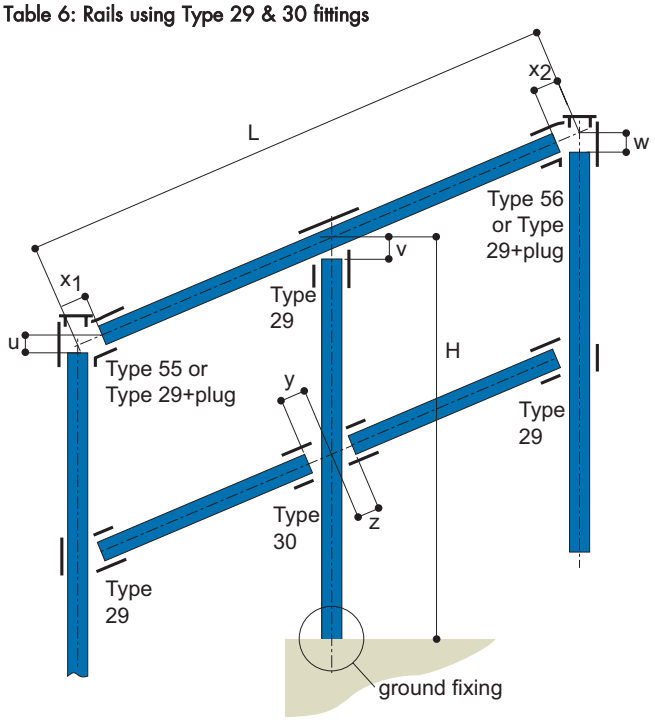


Table 6 gives details of dimensions required for calculating the rail lengths, where angles are between 30° and 45°.

Angle of Slope°	Size 6 Fitting			Size 7 Fitting			Size 8 Fitting		
	x (in)	y (in)	z (in)	x (in)	y (in)	z (in)	x (in)	y (in)	z (in)
30°	-1 1/4	-2 1/8	-1 3/8	-1 5/8	-2 1/2	-1 5/8	-1 3/4	-3	-2 1/8
35°	-1 3/8	-2	-1 1/2	-1 3/4	-2 3/8	-1 3/4	-2	-2 7/8	-2 1/4
40°	-1 1/2	-1 7/8	-1 5/8	-1 7/8	-2 1/4	-1 7/8	-2 1/8	-2 1/2	-2 3/8
45°	-1 3/4	-1 3/4	-1 3/4	-2 1/8	-2	-2	-2 3/8	-2 1/2	-2 5/8

Table 7 gives details of dimensions required for calculating the upright lengths, where angles are between 30° and 45°.

Table 7: Uprights using Type 29 & 30 fittings

Angle of Slope°	Size 6 Fitting			Size 7 Fitting			Size 8 Fitting		
	u (in)	v (in)	w (in)	u (in)	v (in)	w (in)	u (in)	v (in)	w (in)
30°	+1 3/8	-1 1/4	+1	+1 3/4	-1 5/8	+1 1/8	+1 7/8	-1 3/4	+1 1/4
35°	+1 5/8	-1 3/8	+3/4	+2	-1 3/4	+7/8	+2 1/8	-2	+1
40°	+1 7/8	-1 1/2	+1/2	+2 3/8	-1 7/8	+1/2	+2 1/2	-2 1/8	+1/2
45°	+2 1/4	-1 3/4	+1/8	+2 3/4	-2 1/8	+1/8	+3	-2 3/8	+1/8

Table 8: uprights and rails using Type 55 & 56 - size 8 only

	u (in)	x_1 (in)	w (in)	x_2 (in)
20° to 29°	-3/4	-3/4	-2	-2
30° to 39°	-5/8	-5/8	-2 3/8	-2 3/8
40° to 49°	-1/2	-1/2	-2 3/4	-2 3/4
50° to 59°	-1/2	-1/2		
60° to 69°	-3/8	-3/8		
70° to 79°	-3/8	-3/8		
80° to 88°	-1/4	-1/4		

SHELVING

(Using Type 46)

Shelving with carrying rails positioned on the outside of the upright.

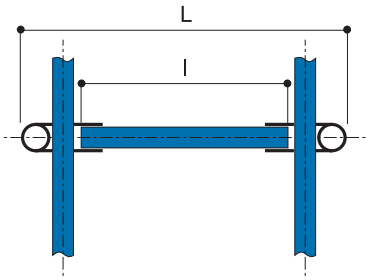


Table 9 gives the dimension 'x' to be subtracted from overall shelf width 'L' to give the length of the cross rail in the formula l = L - x.

Table 9

Kee Klamp Fitting Size	x (in)
4	- 3 7/8
5	- 5 1/4
6	- 6 3/8
7	- 7 3/4
8	- 9
9	- 10 7/8

CONSTRUCTION OF BRACES AND STRUTS

(using Types C50, C51 and C52)

When using multiple pipe sizes in one structure, Types F50-5 to F50-9 can all be combined with:

M50-5 to M50-9

M51-5 to M51-9

M52-5 to M52-8

to construct combination fittings, for example:

C50-75, C50-85, C51-655 and C52-855.

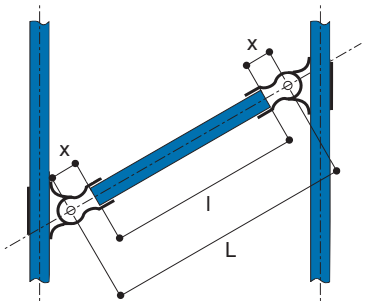


Table 10 gives details of dimension 'x' to be subtracted to give the pipe length required for use with the fitting Type F50.

Table 10

Kee Klamp Fitting Size	x (in)
4	-1/2
5	- 1
6	- 1
7	- 1
8	- 1
9	- 1 1/4

Note: Dimension 'L' must be established by direct measurement, since it is dependent on the proposed angle of the strut.

PALLET RACKING

(Using Type 46)

Pallet racking with the carrying rails on the inside of the upright.

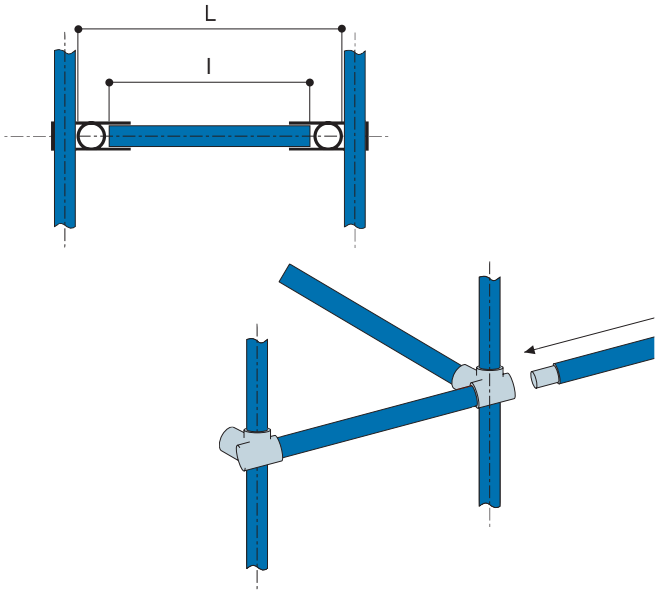


Table 11 gives dimension 'x' which must be subtracted from the overall width of the carrying rails, to give the length of the cross rail in the formula
l = L - x

Table 11

Kee Klamp Fitting Size	x (in)
4	- 1 7/8
5	- 2 3/8
6	- 2 7/8
7	- 3 3/8
8	- 4
9	- 5

Pallet racking is not recommended in less than size 7 pipe.

The length of the longitudinal member can be calculated from multiples of the length of the bay between the centers of uprights, plus dimension 'z' in Table 12. This applies to constructions using fitting type 45.

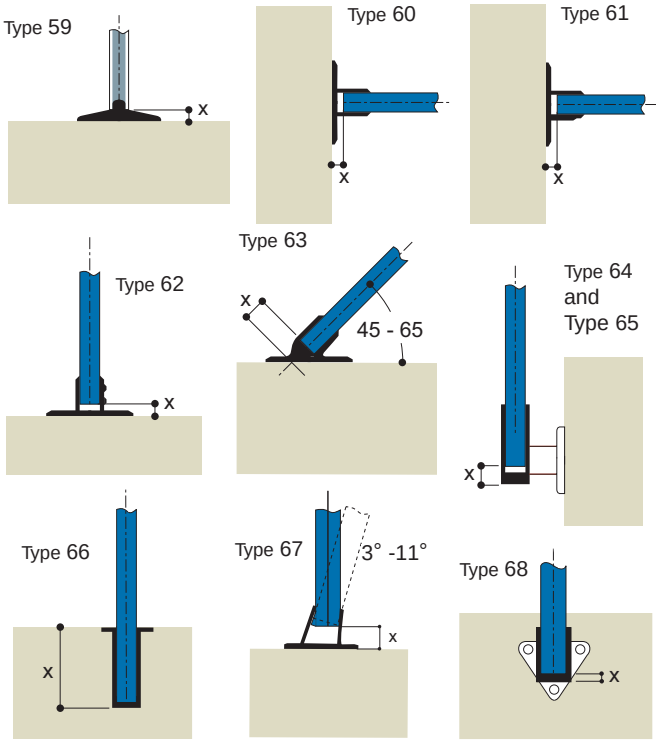
Table 12

Kee Klamp Fitting Size	z (in)
3	+ 1
4	+ 1 1/8
5	+ 1 1/4
6	+ 1 1/2
7	+ 1 7/8
8	+ 2
9	+ 2 3/8

Longitudinal pipes are joined using fittings Type 14 or 18, which must be positioned to occur at the edge of the Type 46 fitting, and must not all occur in the same bay at alternate levels.

Spigots can be either pipes or rods, riveted into position, or the Type 18 fitting. When using the latter, a gap of 3/4". must be allowed for the set screw fixing.

BASE & WALL FIXINGS



See type 69 for tailing flange with toeboard adaptor.

(Refer to individual fitting charts for size availability.).

Table 13 gives details of the ground fixing dimension 'x', to be subtracted from the height 'H' to give the length of the upright 'h'.

Table 13

Flange Type	x (in)
59	- 3/8
60	- 3/8
61	- 1/4
62	- 1/4
67	- 1/4

Table 14 gives details of the ground fixing dimension 'x', for Type 63-6 only, to be subtracted to give the length of the upright for each angle condition.

Table 14

Angle°	x (in)
45°	- 1 1/2
50°	- 1 1/4
60°	- 1
65°	- 1/2

Table 15 gives the dimension 'x' to be subtracted from the length of the upright for fittings, Types 64, 65, 67 and 68.

Table 15

Kee Klamp Fitting Size	x (in)
6	- 1/4
7	- 1/4
8	- 1/4

Table 16 gives the ground fixing dimension 'x', to be added to the upright member to allow for the setting into the socket Type 66.

Table 16

Kee Klamp Fitting Size	x (in)
6	+ 4 1/2
7	+ 5
8	+ 5

CIRCLES AND TRIANGLES

Introduction

Slopes and radii present no problem to the Kee Klamp system. Fitting Types 27, 28, 29, 30, C50, C51, C52, 55, 56, 86, 87, 88 and 89 and the 90 range Pedestrian Guardrailing Fittings are designed to allow for raked handrailing while keeping the uprights vertical. Pipe can be bent and radiused to suit most situations. Also, true lengths have to be determined where braces and struts are being used.

To enable Kee Industrial Products to machine fittings and radius pipe some basic information is required e.g. angle of slope, arc lengths etc. We have provided simple formulas and work examples to help you solve individual problems.

Staircases and Ramps

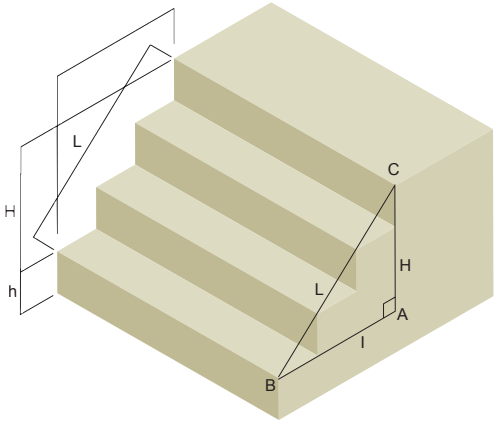
Types 27 and 28 are held in stock as blanks. These are then machined to individual requirements. It is therefore essential when ordering that the required angle from the horizontal is stated. Other pipe lengths need to be determined when using fitting Types 29 and 30, C50, C51 and C52 and the 90 range Pedestrian Guardrailing Fittings.

Worked Example

Consider the following concrete single flight staircase.

Calculating the Angle of the Staircase

Refer to diagram and table.



Where

H = Vertical height from 1st nosing to last nosing.

h = Vertical height from ground level to 1st nosing.

I = Horizontal dimension from 1st nosing to last nosing.

L = Hypotenuse dimension (Pitch Line) from 1st nosing to last nosing.

Data Known		Formula For Side and Angle	
H & L	$I = \sqrt{L^2 - H^2}$	$\text{Sin } B = \frac{H}{L}$	C = 90° - B
L & I	$H = \sqrt{L^2 - I^2}$	$\text{Sin } C = \frac{I}{L}$	B = 90° - C
H & I	$H = \sqrt{H^2 - I^2}$	$\text{Tan } B = \frac{H}{I}$	C = 90° - B

Note: The table can be used to solve angles and true lengths for braces and struts.

Step 1

From a simple site survey or information from a working drawing, obtain the following dimensions.

Note: For greater accuracy vertical dimensions should be taken by means of a Dumpy Level or a Theodolite.

H = vertical height from the 1st nosing to the last (55 in).

L = pitch line, the diagonal dimension from the 1st nosing to the last (96 in).

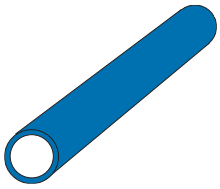
Step 2

From the table to determine angle B we use;

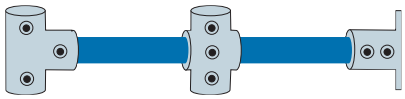
$\text{Sin } B = \frac{55}{96}$ Angle B = 35°

Ramps can be dealt with in a similar way. Most ramps have a stated gradient e.g. 1:12, for every 12 units traversed horizontally, 1 unit of vertical height is obtained.

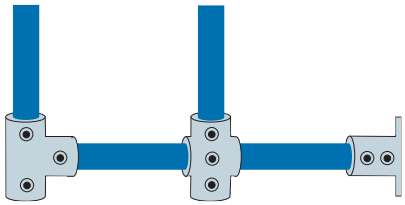
HOW TO MAKE JIGS FOR RAILING POSTS



SET-UP Step 1: Start with pre-cut pipe.

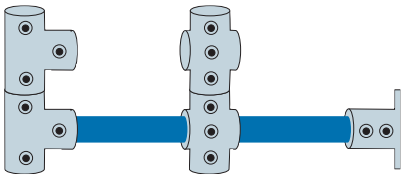


Step 2: Measure and locate fittings on first post only.

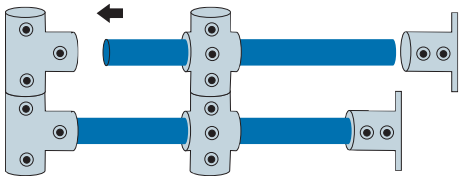


Step 3: Lay post horizontal, and insert two pieces of scrap pipe.

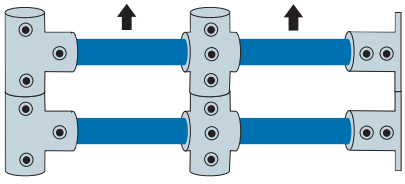
This is all that's involved in setting up your jig! From this point, duplicate posts can be produced by unskilled labor, without further measuring, at the rate of 20-30 posts per hour.



PRODUCTION Step 1: Set top and middle fittings in place, unfastened, on the two pieces of scrap pipe.



Step 2: Insert pre-cut pipe into fittings, then add flange.



Step 3: Simply tighten set screws, then lift off.

The principle is the same for corner posts. Simply substitute corner fittings for straight run fittings, as in Step 1 of the Production stage.

Kee® Klamp

FITTING ALTERNATIVES

Less rigid. Can be added to structure after assembly.
Type 16 can be substituted by a Type A10.

Pipes can be joined within the fitting.

Internal joint. Joint less rigid.

Requires a longer pipe. Type 84 can be used instead of Type 77.

Requires a longer pipe. Type 84 can be used instead of Type 77.

Requires a longer pipe. Type 84 can be used instead of Type 77.

Only acceptable if the horizontal pipes are not required to be at the same level. Choice of angles. Joint less rigid.

No facility for joining pipes inside the sleeve.

Type 45 can be considered if a crossover joint is acceptable.
No facility for joining pipes inside fitting.

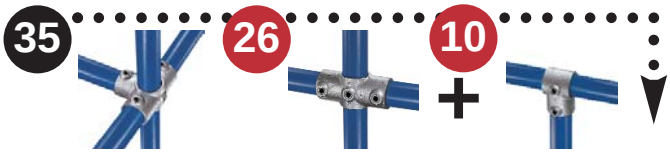
Only acceptable if the horizontal pipes are not required to be at the same level. Choice of angles. Joint less rigid. Type 26 can be substituted by a Type A21/A26.

Type 27 can be substituted by a Type 29 used vertically, between 30° to 60°

Type 28 can be substituted by a Type 30, between 30° and 45° only.

The joint is less rigid.

Must be machined out to required angle.

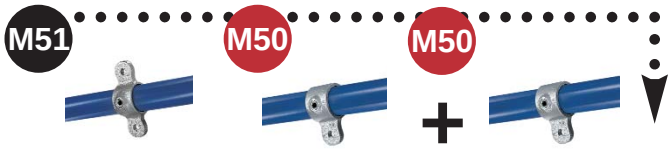


Only suitable if the horizontal pipes are not required to be at the same level. Choice of angles. Joint less rigid. Type 35 can be substituted by a Type A35.

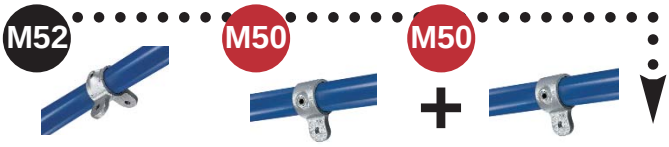
Only suitable if the horizontal pipes are not required to be at the same level. Choice of angles. Joint less rigid. Type 40 can be substituted by a Type A40.

Joint less rigid. Type 45 can be substituted by a Type A45.

Only suitable if the horizontal pipes are not required to be at the same level. Choice of angles.



Only suitable if the fixings are not required to be in line.



Only suitable if the fixings are not required to be in line.

Interchangeable if the design features acceptable.

Only substitute Type 62 and bend pipe.

Interchangeable depending on most convenient fixing plate arrangement. Type 65 is only available in size 6.

Type 70 can be substituted with Types 10 and 61 with stub of pipe.

Type 70 can be substituted with Types 114 and 61.

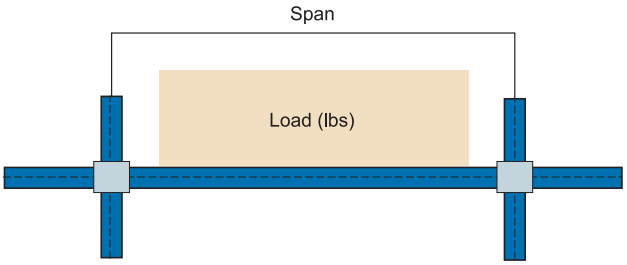
Not for connecting pipe.

Only suitable if the clips are not required to be at the same level.

Table 17: Beam load table (lbs)

	Fitting size					
	5	6	7	8	9	
Span	Pipe size (in)					Span
	3/4 N.B.	1 N.B.	1 1/4 N.B.	1 1/2 N.B.	2 N.B.	
1′	1658	3123	5516	7669	13180	1′
2′	829	1562	2758	3834	6590	2′
3′	553	1041	1838	2556	4393	3′
3′ 6″	474	892	1576	2191	3766	3′ 6″
4′	414	781	1379	1917	3295	4′
4′ 6″	368	694	1226	1704	2929	4′ 6″
5′	332	625	1103	1534	2636	5′
5′ 6″	302	568	1003	1394	2396	5′ 6″
6′	277	520	919	1278	2197	6′
6′ 6″	255	481	849	1180	2028	6′ 6″
7′	237	446	788	1096	1883	7′
7′ 6″	221	417	735	1023	1757	7′ 6″
8′	207	390	690	959	1648	8′
9′	184	347	613	852	1464	9′
10′	166	313	551	767	1318	10′

Table reflects a safety factor of 1.67:1



The table gives an indication only of the safe load, uniformly distributed, in lbs., that may be carried per shelf consisting of front and back pipes when used as continuous beams.

For uneven load distributions or single spans, the required pipe size must be determined by standard bending moment calculations assuming a Kee Klamp joint to give a simply supported beam.

At loads greater than *2000 lbs consideration must be given to set screw slip.

*(*rating includes a safety factor of 2:1)*

Table 18: Load table (lbs) - un-fixed upright

	Fitting size					
	5	6	7	8	9	
Span	Pipe size (in)					Span
	3/4 N.B.	1 N.B.	1 1/4 N.B.	1 1/2 N.B.	2 N.B.	
1′	1868	3243	4445	5238	7738	1′
1′ 3″	1633	2958	4213	4955	7398	1′ 3″
1′ 6″	1420	2673	3875	4650	7160	1′ 6″
1′ 9″	1213	2375	3630	4395	6785	1′ 9″
2″	995	2108	3335	4138	6448	2′
2′ 3″	840	1813	3048	3883	6210	2′ 3″
2′ 6″	700	1583	2753	3570	5848	2′ 6″
2′ 9″	603	1395	2505	3243	5575	2′ 9″
3′	N/A	1220	2170	2985	5180	3′
3′ 3″	N/A	1078	1993	2698	4863	3′ 3″
		948	1810	2418	4525	3′ 6″
		N/A	1643	2250	4218	3′ 9″
		N/A	1488	2065	3880	4′
			1313	1880	3675	4′ 3″
			1215	1698	3303	4′ 6″
			N/A	1560	3123	4′ 9″
			N/A	1450	2918	5′
			N/A	N/A	2693	5′ 3″
				N/A	2523	5′ 6″
				N/A	2398	5′ 9″
				N/A	2150	6′
					2048	6′ 3″
					1878	6′ 6″
					N/A	6′ 9″
					N/A	7′
					N/A	7′ 3″
					N/A	7′ 6″
					N/A	7′ 9″

Table reflects a safety factor of 2:1

Loads specified are in lbs

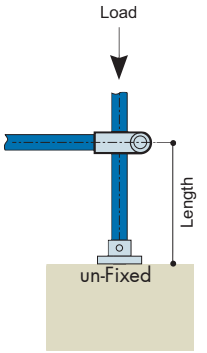


Table 18 gives an indication only of the safe load, in lbs., that may be carried between the above restraints by single Schedule 40 pipe when used as uprights.

Table 19: Load table (lbs) - fixed uprights

	Fitting size					
	5	6	7	8	9	
Span			Pipe size (in)			Span
	3/4 N.B.	1 N.B.	1 1/4 N.B.	1 1/2 N.B.	2 N.B.	
1′	2045	3390	4635	5403	7975	1′
1′ 3″	1855	3183	4445	5235	7635	1′ 3″
1′ 6″	1633	2958	4213	4955	7443	1′ 6″
1′ 9″	1493	2705	3948	4730	7160	1′ 9″
2″	1283	2480	3715	4500	6843	2′
2′ 3″	1058	2245	3470	4268	6685	2′ 3″
2′ 6″	953	2020	3273	4003	6355	2′ 6″
2′ 9″	823	1780	2993	3730	6063	2′ 9″
3′	700	1583	2703	3523	5835	3′
3′ 3″	635	1435	2563	3283	5520	3′ 3″
		1288	2283	3083	5270	3′ 6″
		1160	2085	2858	4978	3′ 9″
		1025	1938	2603	4818	4′
			1783	2393	4503	4′ 3″
			1643	2225	4218	4′ 6″
			1488	2098	3958	4′ 9″
			1363	1920	3675	5′
			1270	1785	3415	5′ 3″
				1698	3268	5′ 6″
				1520	3088	5′ 9″
				1450	2918	6′
					2715	6′ 3″
					2578	6′ 6″
					2398	6′ 9″
					2263	7′
					2150	7′ 3″
					2048	7′ 6″
					1913	7′ 9″

Table reflects a safety factor of 2:1

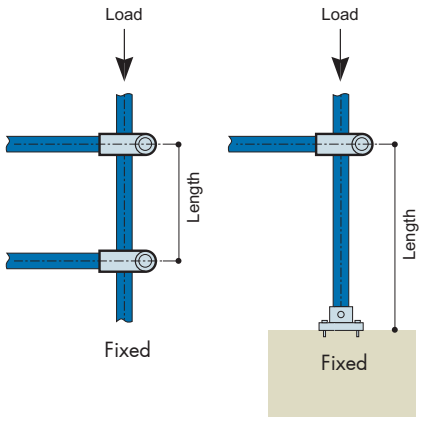


Table 19 gives an indication only of the safe load, in lbs., that may be carried between the above restraints by single Schedule 40 pipes when used as uprights.

TEST REPORT: Vibration of Kee Klamp Assemblies

Exhaustive tests on samples of standard size 7 Kee Klamp fittings were performed by an independent research laboratory. The purpose of the test was to evaluate the use of either standard set screws or self-locking set screws.

Test Arrangement

A "Tee" section test assembly was made using three 12 ft. lengths of galvanized size 7 standard pipe held together by a three socket tee fitting (Type 25-7). The vertical leg of the test assembly was supported in a standard railing flange (Type 62-7). The completed assembly was then rigidly attached to the vibration table.

The test assembly was initially assembled using standard set screws and tested in this configuration. The standard set screws were then replaced with the self-locking screws and the tests repeated.

Test Procedure

The test was conducted on a Ling 667 kg Electromagnetic vibration table. The table was programmed to perform a resonance search between 25 and 350 Hz. and resonant frequencies were recorded and shown in Table 20.

During the resonance search amplification factors, Q, were measured at each resonant frequency, the point of reference being the end of one horizontal pipe. The table was then held at one of the resonant frequencies, set in motion with a controlled acceleration level of 4g, and ran for a period of six hours. This was repeated for three more resonant frequencies in descending order of "Q" factor.

Table 20: Test results

Resonance Frequencies	Q Factor	Running Time
74	1.27	Nil
106	1.27	Nil
158	1.53	6 hours
200	1.8	6 hours
221	5	6 hours
295	9	6 hours

During the twenty-four hours of vibration at the four resonant frequencies above no signs of loosening with either type of attachment screw occurred.

TELESCOPIC RELATIONSHIP

Telescopic relationship between Schedule 40 and 80 steel pipes

2″	Schedule 80	- will accept 1 1/2″ Schedule 40 or 80
2″	Schedule 40	- will accept 1 1/2″ Schedule 40 or 80
1 1/2″		- no telescopic relationship Requires special spigotting material
1 1/4″	Schedule 80	- no telescopic relationship Requires special spigotting material
1 1/4″	Schedule 40	- will accept 1″ Schedule 40 or 80
1″		- no telescopic relationship Requires special spigotting material
3/4″		- no telescopic relationship Requires special spigotting material
1/2″		- no telescopic relationship Requires special spigotting material
3/8″		- no telescopic relationship Requires special spigotting material
1/4″		- no telescopic relationship Requires special spigotting material

Kee Klamp® Across The Globe

Scotland

England

United States/Canada Border at Niagara Falls

Germany

Kee® Klamp

Kee Industrial Products

USA

100 Stradtman Street

Buffalo, NY 14206

Tel: (716) 896-4949

Fax: (716) 896-5696

Toll Free: (800) 851-5181

Canada

219 Connie Crescent, Unit 9

Concord, Ontario L4K 1L4

Tel: (905) 669-1494

Fax: (905) 669-4347

Toll Free: (877) 505-5003

Internet: www.keeklamp.com

E-mail: info@keeklamp.com

Your Distributor:

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