


1.0 Reference and Address			
Report Number	102505248LAX-001	Original Issued: 8-Dec-2016	Revised: 24-Feb-2026
Standard(s)	Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels [UL 2703:2015 Ed.1+R:11Jul2024]		
Applicant	The Hollaender Manufacturing Co.	Manufacturer 1	The Hollaender Manufacturing Co.
Address	10285 Wayne Avenue Cincinnati OH 45215	Address	10285 Wayne Avenue Cincinnati OH 45215
Country	USA	Country	USA
Contact	Todd Zureick Mike Hall	Contact	Todd Zureick Mike Hall
Phone	513/772-8800 x160 513/772-8800 x186	Phone	513/772-8800 x160 513/772-8800 x186
FAX	NA	FAX	NA
Email	toddz@hollaender.com mikeh@hollaender.com	Email	toddz@hollaender.com mikeh@hollaender.com

2.0 Product Description	
Product	PV Bonding Devices
Brand name	
Description	<p>The products covered by this report are the Hollaender Speed-Rail Fittings and Flanges that are intended to provide electrical bonding to Solar Pipe Racking with conductive surface. This report covers several fittings and flanges with different barrel diameters and lengths, and different set screw locations.</p> <p>The fitting or flange is secured in use to solar racking pipe by means of set screw connection. Approved pipe outer-diameters for use with fittings are 1.66" (size 7 fitting), 1.90" (size 8), and 2.375" (size 9).</p> <p>The grounding of the entire system is intended to be in accordance with the latest edition of the National Electrical Code, including NEC 250: Grounding and Bonding, and NEC 690: Solar Photovoltaic Systems. Any local electrical codes must be adhered in addition to the national electrical codes.</p> <p>This product investigation was performed only with respect to specific properties, a limited range of hazards, or suitability for use under limited or special conditions. The following risks and other properties of this product have not been evaluated: The Mechanical Loading Test, mechanical strength of materials, flammability, electric shock, Ultraviolet light exposure, fire resistance class ratings as a roof covering (e.g. Class A, B, or C Film) material.</p>
Models	5, 5E, 5EXT, 5SR, 5X, 17, 17E, 17X, 19, 19E, 45, 47, 5EXC-8, 17SM, 45SBC, 47R, 48, 48BC, 48H-2H, 48H-9, 48SB, 62, 65, 300, 500, 700, 1700, 1900, 2500, 7000
Model Similarity	5 indicates a "Tee" design (See Illustrations 1-5) 17 indicates adjustable brace fitting (See Illustrations 6 & 7) 19 indicates cross adjustable brace fitting (See Illustration 12) 45 indicates square base flange 47 indicates rectangle base flange E indicates single set-screw design EXT indicates extended barrel design SR indicates side rib supporting set-screw X indicates 90 degree offset between 2 barrel set screws
Ratings	Fuse Rating: 25A
Other Ratings	NA

2.0 Product Description	
Conditions of Acceptability	The products covered in this Report are incomplete in construction features or limited in performance capabilities and are intended for use and evaluation in other products. Consideration should be given to the following when the component is used in or with another product.
	1. Methods of installation to follow the instruction manual documented in this report. Periodic re-inspection is not stated in installation manual
	2. Hollaender Speed-Rail Fittings and Flanges are made of ALMAG 535 aluminum magnesium alloy and intended to be secured to aluminum or galvanized solar-rack piping by set-screw connections. Terminal connections are factory crimped. Hollaender Speed-Rail Fittings and Flanges exceeds minimum size requirements for bonding. These fittings and flanges will be subject to Bonding Path resistance, Temperature Cycling Test, and Humidity Test when used with other mounting surfaces.
	3. The system consists of Aluminum and Galvanized steel materials; therefore, no corrosion-resistant coatings or plating are required.
	4. Overall bonding and grounding of a Photovoltaic Mounting System using the Speed-Rail Fitting and Flanges must be investigated to section 8.0 in the end use product; also in accordance with the latest National Electrical Code, ANSI/NFPA70, including NEC 250.134 or 250.136 (A) regardless of voltage, and NEC 690: Solar Photovoltaic Systems. Any local electrical codes must be adhered to in addition to the National Electrical Code.
	5. The component is to be part of larger system as a recognized component of overall system. UL 2703 Grounding and bonding of complete racking system shall be verified in end use product including evaluation to standard under section 9 for bonding requirements. Additional testing may be required when used with other racking systems which may include but not limited to Humidity Freez, Thermal Cycling, bonding path resistance and bonding conductor testings.

3.0 Product Photographs

Photo 1 - Tee Fittings (two from left) and Adjustable Brace Fittings (two from right)



4.0 Critical Components							
#	Photo	Item no. ¹	Name	Manufacturer/ trademark ²	Type / model ²	Technical data and securement means	Mark(s) of conformity ³
1		1	Tee Fitting	Hollaender	5 5E 5EXT 5SR 5X 5EXC-8	ALMAG 535 Aluminum Magnesium Alloy Fitting with 3/8" - 16 x 7/16" long Zinc-Alloy JS600 Zinc-plated set screws. See Illustrations 1-5, & 14 for model dimensions.	NR
1		2	Adjustable Tee Fitting	Hollaender	17 17E 17X 17SM 19 19E	ALMAG 535 Aluminum Magnesium Alloy Adjustable Fitting with 3/8" - 16 x 7/16" long Zinc-Alloy JS600 Zinc-plated set screws. Hinge created by a 1/4" steel drive pin, Stainless Steel AISI 303. See Illustrations 6, 7, 12, 13, 15 & 16 for model dimensions.	NR
1		3	Flange Fitting (not pictured)	Hollaender	45 45SBC 47 47R 48 48BC 48H-2H 48H-9 48SB	ALMAG 535 Aluminum Magnesium Alloy Adjustable Fitting with 3/8" - 16 x 7/16" long Zinc-Alloy JS600 Zinc-plated set screws. See Illustrations 10, 11, & 17-23 for model dimensions	NR

4.0 Critical Components							
#	Photo	Item no. ¹	Name	Manufacturer/ trademark ²	Type / model ²	Technical data and securement means	Mark(s) of conformity ³
1		4	Plugs (not pictured)	Hollaender	62	ALMAG 535 Aluminum Magnesium pipe plug for galvanized steel or aluminum pipes. See Illustrations 24 & 25 for model dimensions.	NR
					65		
1		5	Mend-A-Rail Elbow (not pictured)	Hollaender	300	ALMAG 535 Aluminum Magnesium Alloy pipe elbow with 3/8" -16 x 7/16" long Zinc-Alloy JS600 Zinc-plated set screws. See Illustration 26 for model dimensions.	NR
1		6	Mend-A-Rail Tee (not pictured)	Hollaender	500	ALMAG 535 Aluminum Magnesium Alloy Tee-fitting secured with 3/8" -16 x 7/16" long Zinc-Alloy JS600 Zinc-plated set screws. See Illustration 27 for model dimensions	NR
1		7	Mend-A-Rail Cross (not pictured)	Hollaender	700	ALMAG 535 Aluminum Magnesium Alloy cross-fitting secured with 3/8" -16 x 7/16" long Zinc-Alloy JS600 Zinc-plated set screws. See Illustration 28 for model dimensions	NR
1		8	Mend-A-Rail Elbow Adjustable Elbow or Tee (not pictured)	Hollaender	1700	ALMAG 535 Aluminum Magnesium Alloy adjustable elbow or tee fitting secured with 3/8" -16 x 7/16" long Zinc-Alloy JS600 Zinc-plated set screws. See Illustration 29 for model dimensions	NR
1		9	Mend-A-Rail Adjustable Cross (not pictured)	Hollaender	1900	ALMAG 535 Aluminum Magnesium Alloy adjustable cross-fitting secured with 3/8" -16 x 7/16" long Zinc-Alloy JS600 Zinc-plated set screws. See Illustration 30 for model dimensions	NR
1		10	Mend-A-Rail Side Outlet (not pictured)	Hollaender	2500	ALMAG 535 Aluminum Magnesium Alloy side outlet elbow or tee secured with 3/8" -16 x 7/16" long Zinc-Alloy JS600 Zinc-plated set screws. See Illustration 31 for model dimensions	NR

4.0 Critical Components							
#	Photo	Item no. ¹	Name	Manufacturer/ trademark ²	Type / model ²	Technical data and securement means	Mark(s) of conformity ³
1		11	Mend-A-Rail Coupling (not pictured)	Hollaender	7000	ALMAG 535 Aluminum Magnesium Alloy coupling secured with 3/8" -16 x 7/16" long Zinc-Alloy JS600 Zinc-plated set screws. See Illustration 32 for model dimensions	NR

4.0 Critical Components							
#	Photo	Item no. ¹	Name	Manufacturer/ trademark ²	Type / model ²	Technical data and securement means	Mark(s) of conformity ³
<p>NOTES:</p> <p>1) Not all item numbers are indicated (called out) in the photos, as their location is obvious.</p> <p>2) "Various" means any type, from any manufacturer that complies with the "Technical data and securement means" and meets the "Mark(s) of conformity" can be used.</p> <p>3) Indicates specific marks to be verified, which assures the agreed level of surveillance for the component. "NR" - indicates Unlisted and only visual examination is necessary. "See 5.0" indicates Unlisted components or assemblies to be evaluated periodically refer to section 5.0 for details.</p>							

5.0 Critical Unlisted CEC Components

No Unlisted CEC components are used in this report.

6.0 Critical Features	
<p><u>Recognized Component</u> - A component part, which has been previously evaluated by an accredited certification body with restrictions and must be evaluated as part of the basic product considering the restrictions as specified by the Conditions of Acceptability.</p>	
<p><u>Listed Component</u> - A component part, which has been previously Listed or Certified by an accredited Certification Organization with no restrictions and is used in the intended application within its ratings.</p>	
<p><u>Unlisted Component</u> - A part that has not been previously evaluated to the appropriate designated component standard. It may also be a Listed or Recognized component that is being used outside of its evaluated Listing or component recognition.</p>	
<p><u>Critical Features/Components</u> - An essential part, material, subassembly, system, software, or accessory of a product that has a direct bearing on the product's conformance to applicable requirements of the product standard.</p>	
<p><u>Construction Details</u> - For specific construction details, reference should be made to the photographs and descriptions. All dimensions are approximate unless specified as exact or within a tolerance. In addition to the specific construction details described in this Report, the following general requirements also apply.</p>	
1	Spacing - No verification of spacing required.
2	Mechanical Assembly - Hollaender Speed Rail Fittings (Flange, Tee, Adjustable Tee, Mend-A-Rail, Reducing Fittings) are mounted to the Solar Racking Pipe as described in section 2 by using provided set screws and torque values specified by installation instructions (see illustration 9)
3.	<u>Corrosion Protection</u> - No Ferrous Metal parts. All bonding surfaces are composed of ALMAG 535 Aluminum Magnesium Alloy which is inherently corrosion-resistant. Installation instructions advised fittings are to be used with corrosion-resistant Aluminum or Galvanized Solar Rack Piping.
4.	<u>Accessibility of Live Parts</u> - NA
5.	<u>Polarized Connection</u> - NA
6.	<u>Schematics</u> - NA
7.	<u>Internal Wiring</u> - NA
8.	<u>Grounding</u> - Overall bonding and grounding of a Photovoltaic Mounting System using the Speed-Rail Fitting and Flanges must be investigated to section 8.0 in the end use product; also in accordance with the latest National Electrical Code, ANSI/NFPA70, including NEC 250.134 or 250.136 (A) regardless of voltage, and NEC 690: Solar Photovoltaic Systems. Any local electrical codes must be adhered to in addition to the National Electrical Code. The Hollaender Speed Rail Fittings is a bonding method to create an electrical
9.	<u>Markings</u> - The smallest unit packaging shall have a plain, legible, permanent marking that includes: a) The manufacturer & model number: Hollaender b) The model number or the equivalent: c) The load rating: N/A d) The date or other dating period of manufacturer not exceeding any three consecutive months.
10	<u>Cautionary Markings</u> - NA
11.	<u>Installation, Operating and Safety Instructions</u> - Instructions for installation and use of this product are provided by the manufacturer in section 7.0.

7.0 Illustrations

Illustration 1 - 5E Tee Drawing

NOTE: DIMENSIONS LOCATED IN BOXES ARE COMMON
 SETBACK DIMENSIONS FOR EACH FITTING



#5E Tee-E

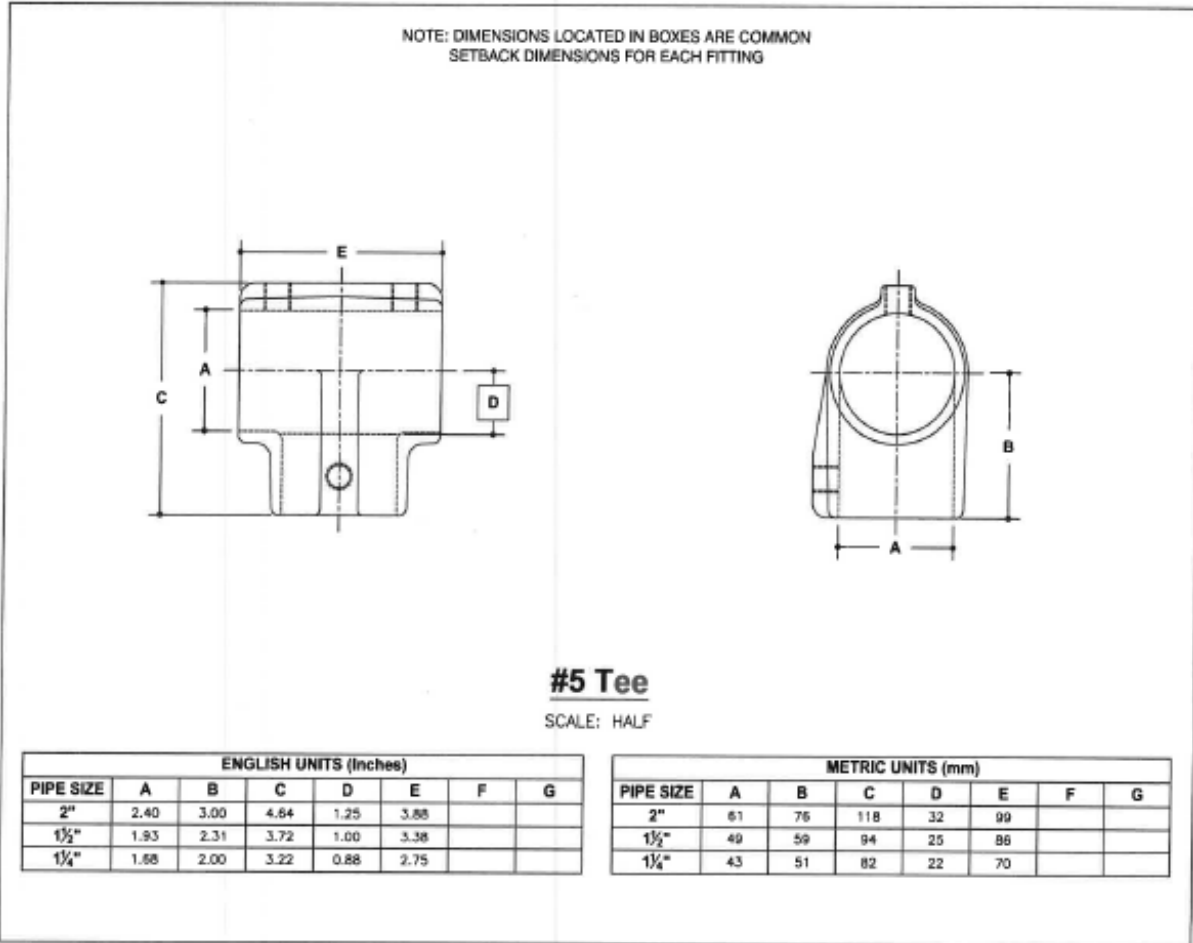
SCALE: HALF

ENGLISH UNITS (Inches)							
PIPE SIZE	A	B	C	D	E	F	G
1½"	1.93	2.25	3.41	1.00	2.31		
1¼"	1.68	2.00	3.00	0.88	2.00		
1"	1.34	1.75	2.63	0.72	1.75		
¾"	1.07	1.53	2.25	0.60	1.50		

METRIC UNITS (mm)							
PIPE SIZE	A	B	C	D	E	F	G
1½"	49	57	87	25	59		
1¼"	43	51	76	22	51		
1"	34	44	67	18	44		
¾"	27	39	57	15	38		

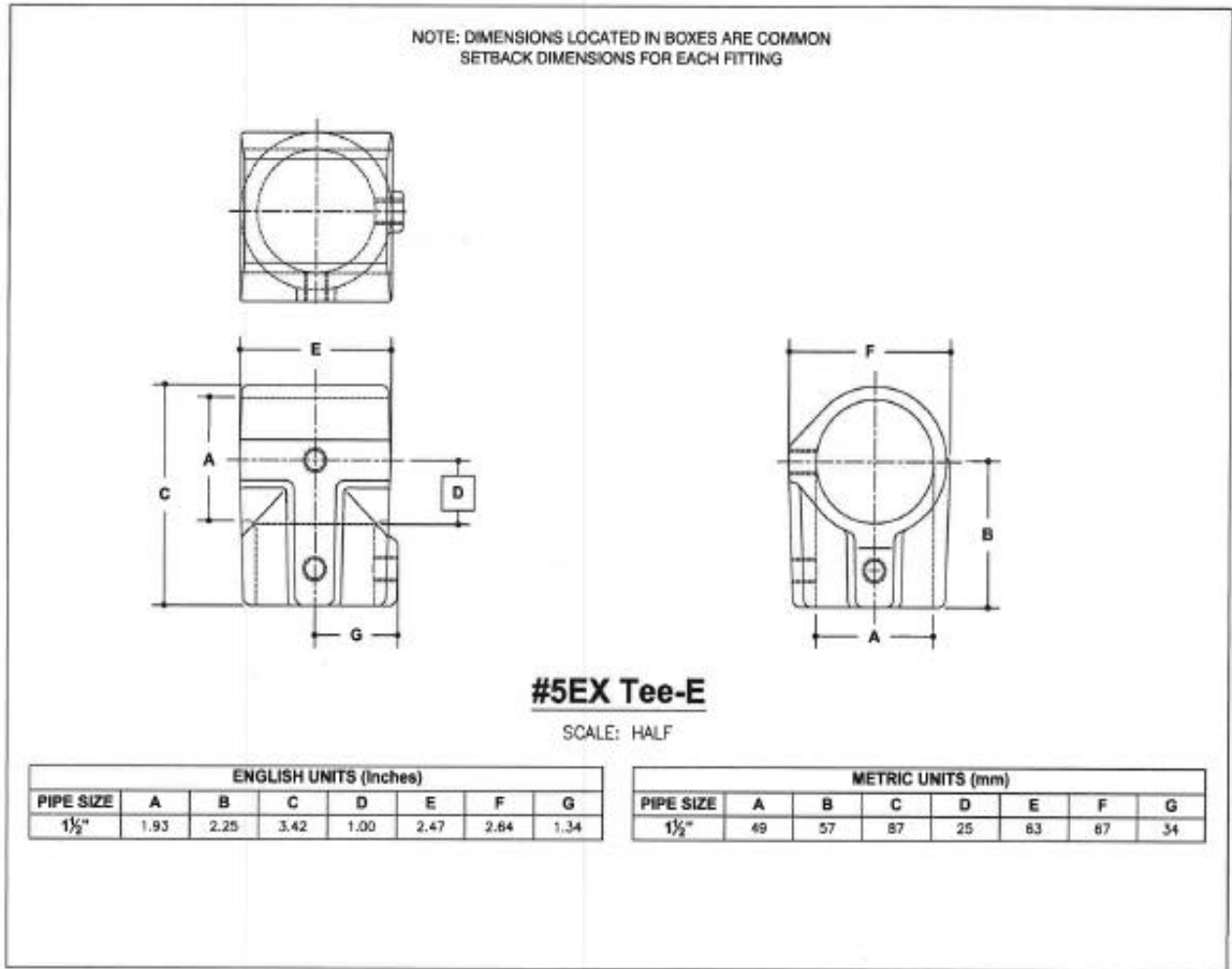
7.0 Illustrations

Illustration 2 - 5 Tee Drawing



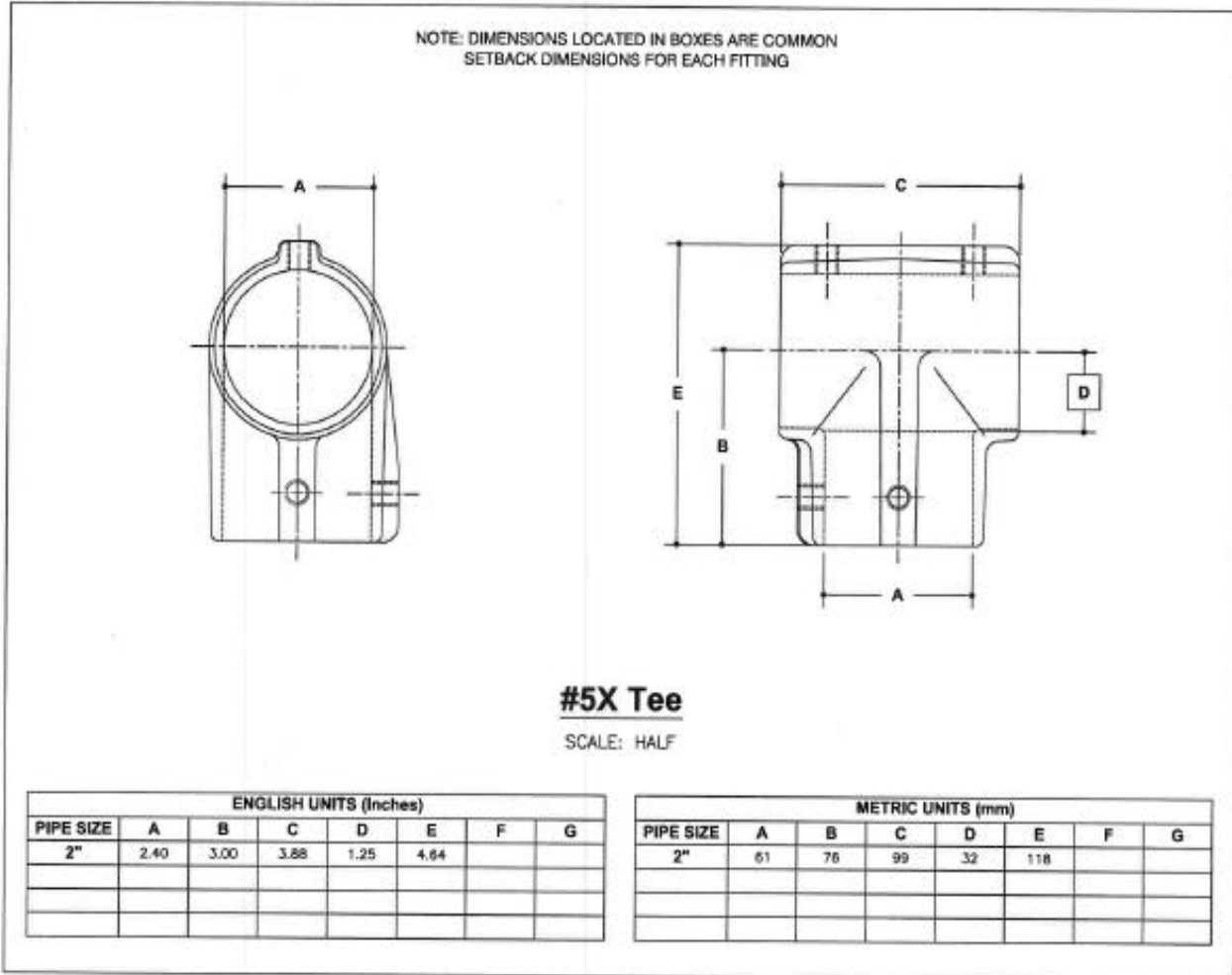
7.0 Illustrations

Illustration 3 - 5EX Tee Drawing



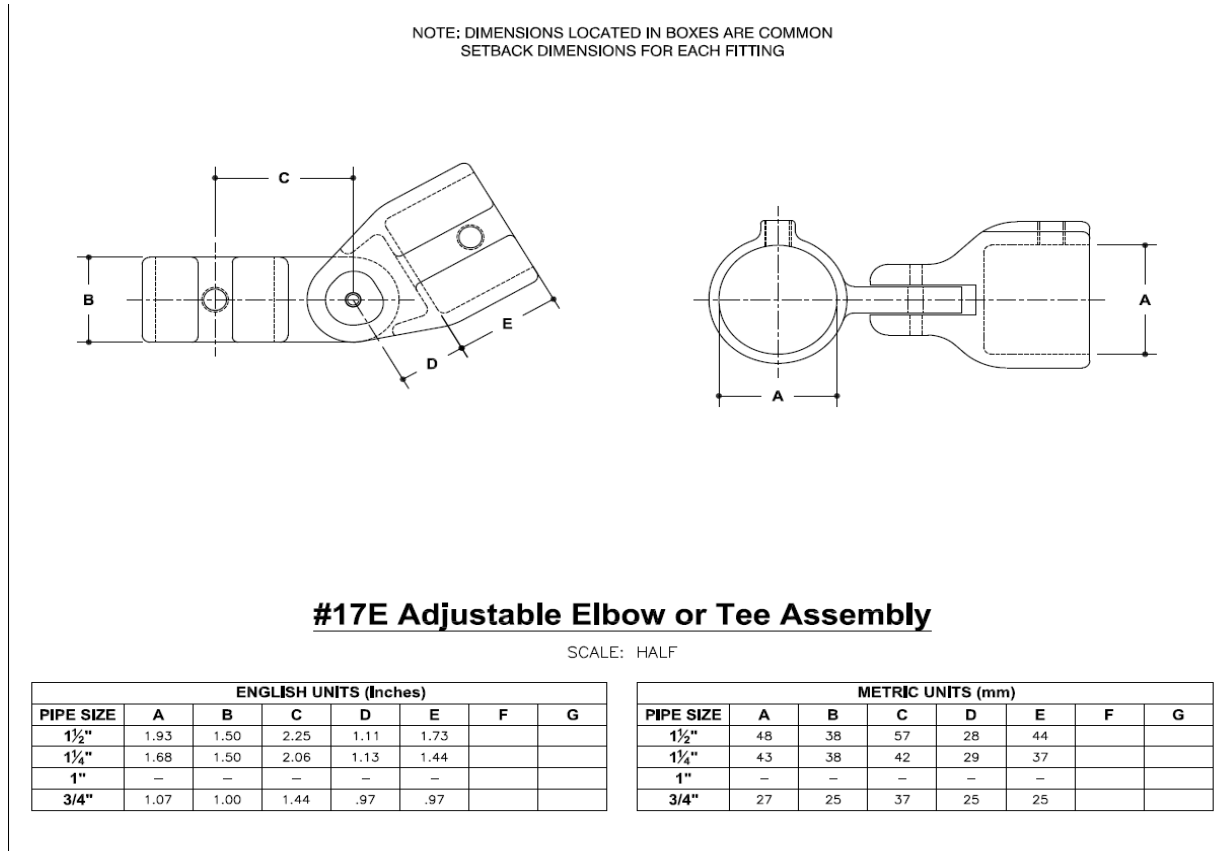
7.0 Illustrations

Illustration 5 - 5X Tee Drawing



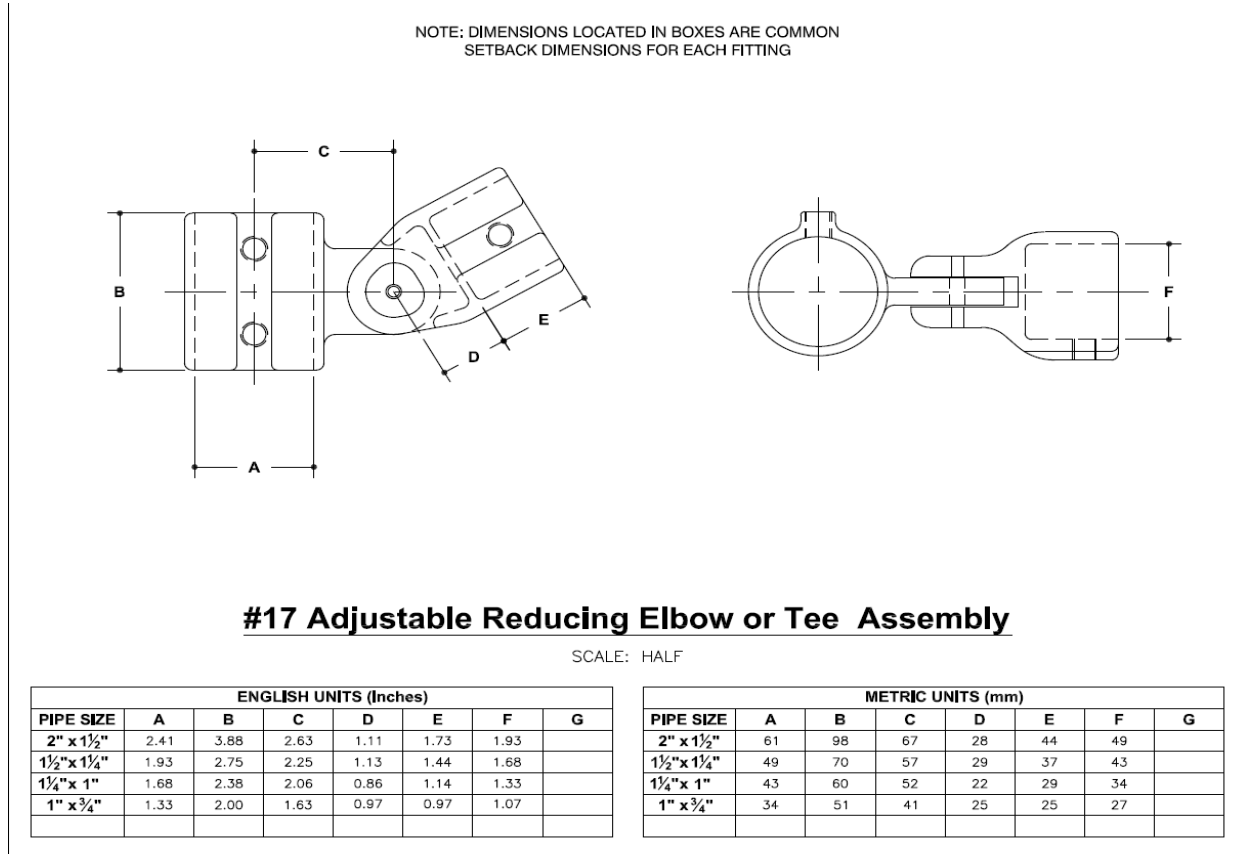
7.0 Illustrations

Illustration 6 - 17E Adjustable Tee Assembly Drawing



7.0 Illustrations

Illustration 7 - 17 Adjustable Tee Assembly Drawing



7.0 Illustrations

Illustration 8 - Installation Instructions Page 1

TEE FITTINGS			ADJUSTABLE/CROSS BRACING FITTINGS		
 #5 1-1/4", 1-1/2", 2"	 #5E 1-1/4", 1-1/2"	 #5EX* 1-1/2"	 #17 1-1/4", 1-1/2", 2"	 #17E 1-1/4", 1-1/2"	 #17X* 2"
 #5EXT* 1-1/2"	 #5X* 2"		 #19 1-1/4", 1-1/2", 2"	 #19E 1-1/2"	
MOUNTING FLANGES			MEND-A-RAIL®		
 #45 1-1/4", 1-1/2"	 #45CE 1-1/4", 1-1/2", 2", 3", 4"	 #45SBC 1-1/2"	 #300 1-1/2"	 #500 1-1/2"	 #700 1-1/2"
 #46 1-1/4", 1-1/2"	 #47 1-1/4", 1-1/2", 2"	 #47R 1-1/2"	 #1700 1-1/2"	 #1900 1-1/2"	 #2500 1-1/2"
 #48 1-1/4", 1-1/2", 2"	 #48BC 1-1/2"	 #48H 2"	 #7000 1-1/2"		
PLUGS			REDUCING FITTINGS		
	 #62 Sch.40/65 Sch.80 1-1/4", 1-1/2", 2"		 #5 1-1/2" to 2"	 #17 2" to 1-1/2" 1-1/2" to 1-1/4" 2" to 1-1/4"	 #19 2" to 1-1/2" 2" to 1-1/4"
* Fitting has Extra Set Screw					
<i>Photos show a black colored pipe, this is strictly for promotional purposes.</i>					

7.0 Illustrations

Illustration 9 - Installation Instructions Page 2

- ◆ Speed-Rail® fittings achieve bonding with the pipe when the set screws are adequately tightened, and penetrate the surface of the steel or aluminum pipe.
- ◆ Speed-Rail® fittings have been evaluated to UL 2703 grounding and bonding for single use only.
- ◆ Both in testing and in practice, customers should use A53 Sch. 40 galvanized pipe or 6061-T6 Sch. 40 aluminum pipe.

SET SCREWS SHOULD BE TIGHTENED TO THE TORQUE VALUES LISTED IN THE TABLE BELOW.

Pullout Capacity of Fitting Set Screws When Properly Torqued							
Solar Pipe Rack Fittings							
Aluminum Alloy 6061-T6 Sch. 40 Wall and A53 Sch. 40 Steel Pipe							
Pipe must be completely inserted into the barrel of the fitting and secured with recommended torque for proper pullout performance.							
Revised 2/2026							
Fitting Size	Resist Pullout No. Set Screws	Set Screw Orientation	Typical Fitting	AL		STL	
				Torque Ft. Lbs. [^]	Capacity*	Torque Ft. Lbs. [^]	Capacity*
4" IPS	2	IN LINE	45CE-13			20	1,600
3" IPS	2	IN LINE	45CE-11			20	1,600
2" IPS	1		Bracing Fitting: 17-9 Tee: 5-9	14	1,120	17	1,360
	2	IN LINE	Bracing Fittings: 19-9, 17X-9	14	1,550	17	1,705
	2	AT 90 DEGREES	Flanges: 47-9, 45CE-9, 48-9, 48H-9 Tee: 5X-9	14	Est. 1,860	17	2,080
1-1/2" IPS	1		Tees: 5-8, 5E-8, 5-89 Bracing Fittings: 17-8, 17-87, 17-98, 1700-8, 19-98, 1900-8, 2500-8	14	700	17	1,315
	2	IN LINE	Flanges: 45-8, 45CE-8, 45SBC-8, 46-8, 47-8, 47R-8, 48-8, 48BC-8	14	1,405	17	1,505
	2	AT 90 DEGREES	Tees: 5EX-8, 5EXC-8, 5EXT-8	14	Est. 1,700	17	2,080
1-1/4" IPS	1		Tees: 5-7, 5E-7 Bracing Fitting: 17-7, 17E-7, 17-97	14	700	17	1,265
	2	IN LINE	Flanges: 45-7, 45CE-7, 46-7, 47-7, 48-7 Bracing Fitting: 19-97	14	1,405	17	1,500
All pipe sizes recommended for added structural integrity.							
Shear on 303 SS Adj. Pin			Tested	14			1,960
1/4" TEK screw inserted through (1) wall of 1-1/2" pipe			Tested	14	2,000	17	3,500
1/4" TEK screw inserted through (1) wall of 2" pipe			Tested	14	2,080	17	

*Capacity is based upon a 2:1 factor of safety.

This chart is to be used as a guideline for general design. If your system is subject to dramatic loads, we suggest testing parts with specific pipe used for project.

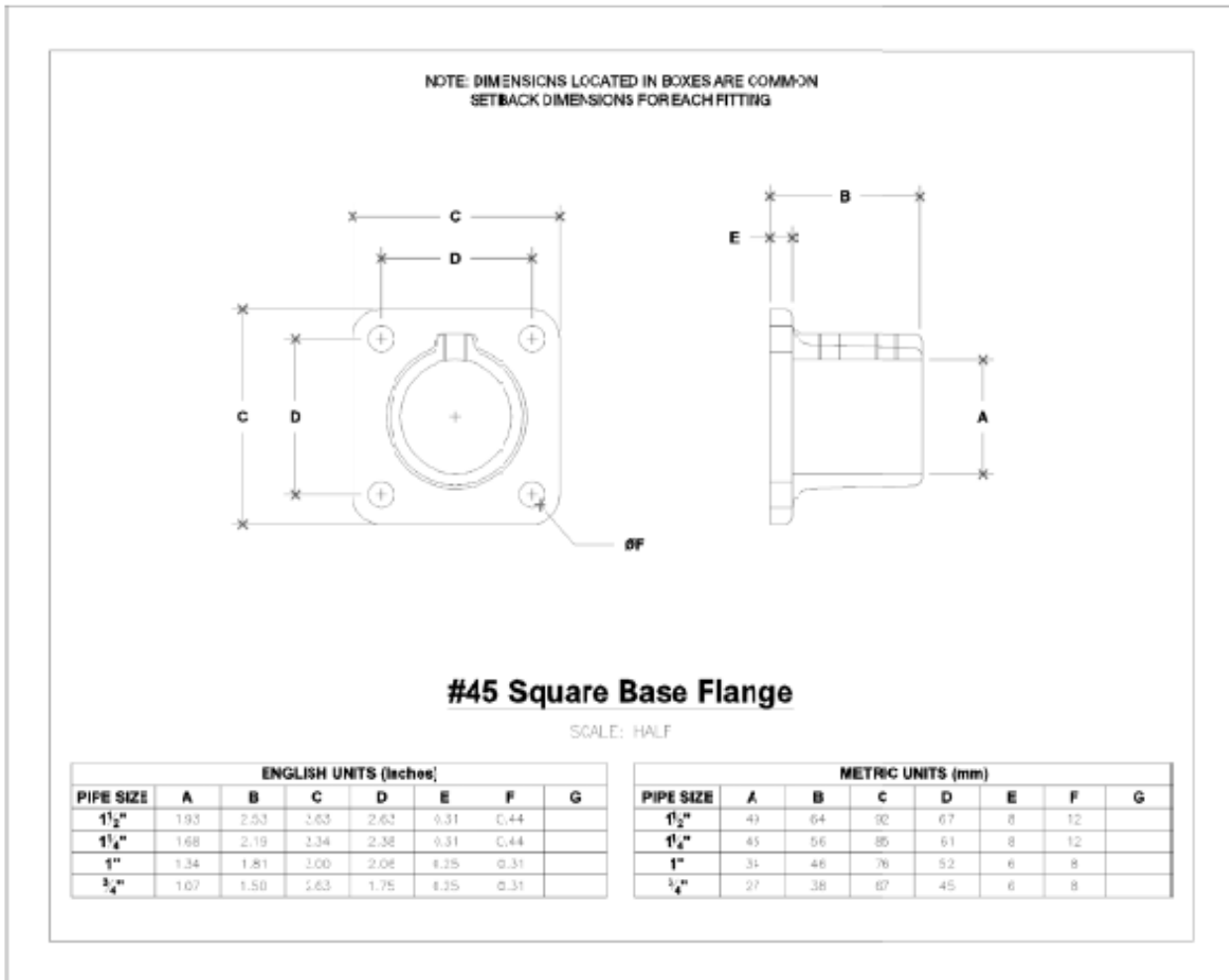
Significant variations in pipe strength and hardness can have substantial effect on performance.

Any pipe or tube other than A53 Sch. 40 steel pipe should get engineering approval.

[^] - Torque values applied to fittings not to exceed 30% of value specified.

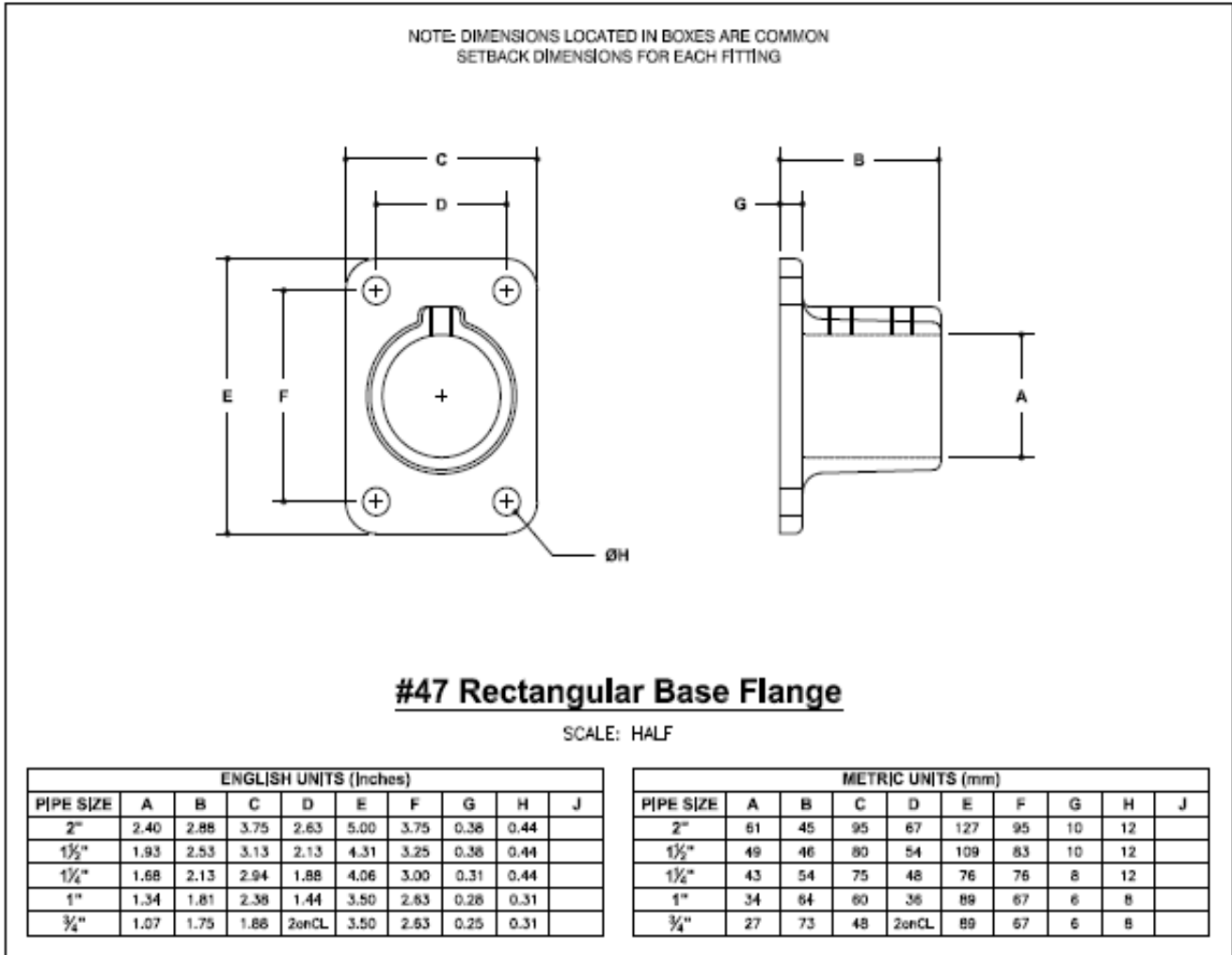
7.0 Illustrations

Illustration 10 - 45 Square Base Flange



7.0 Illustrations

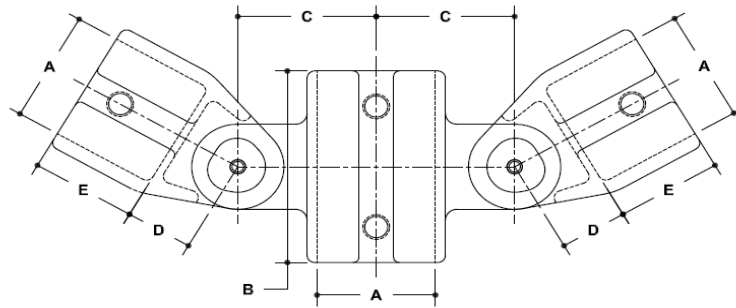
Illustration 11 - 47 Rectangle Base Flange



7.0 Illustrations

Illustration 12 - 19 Adjustable Cross Assembly

NOTE: DIMENSIONS LOCATED IN BOXES ARE COMMON
 SETBACK DIMENSIONS FOR EACH FITTING



#19 Adjustable Cross Assembly

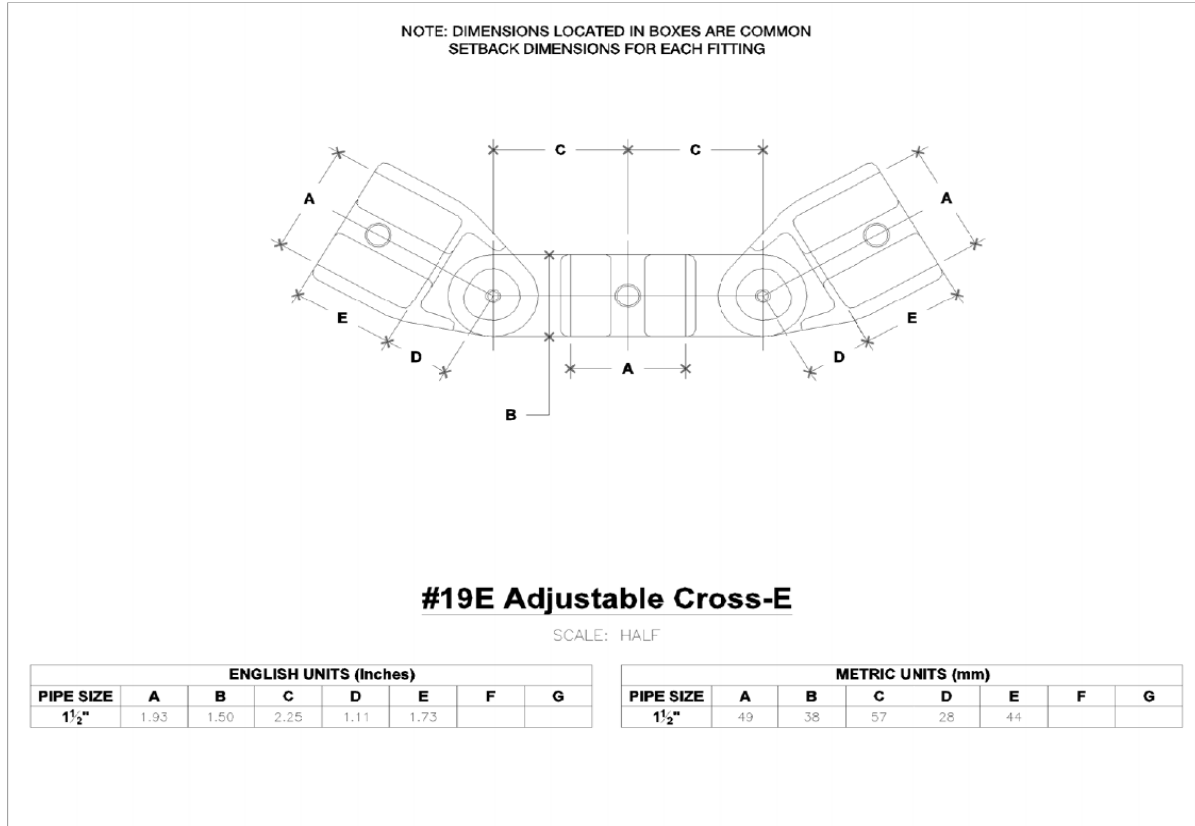
SCALE: HALF

ENGLISH UNITS (Inches)							
PIPE SIZE	A	B	C	D	E	F	G
2"	2.40	3.88	2.63	1.25	2.13		
1½"	1.93	3.38	2.25	1.11	1.73		
1¼"	1.68	2.75	1.94	1.13	1.44		
1"	1.33	2.38	1.63	0.86	1.14		
¾"	1.07	2.00	1.31	0.97	0.97		

METRIC UNITS (mm)							
PIPE SIZE	A	B	C	D	E	F	G
2"	61	99	67	32	54		
1½"	49	86	57	28	44		
1¼"	43	70	49	29	37		
1"	34	60	41	22	29		
¾"	27	51	33	25	25		

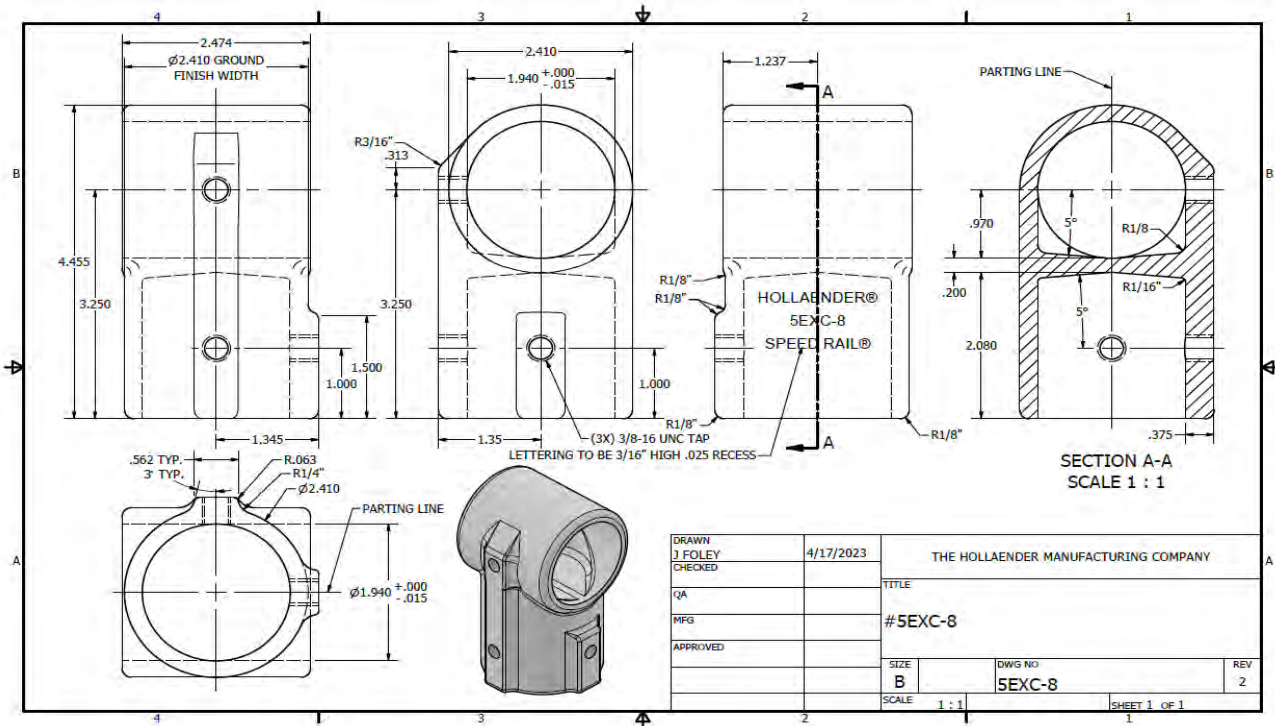
7.0 Illustrations

Illustration 13 - 19E Adjustable Cross



7.0 Illustrations

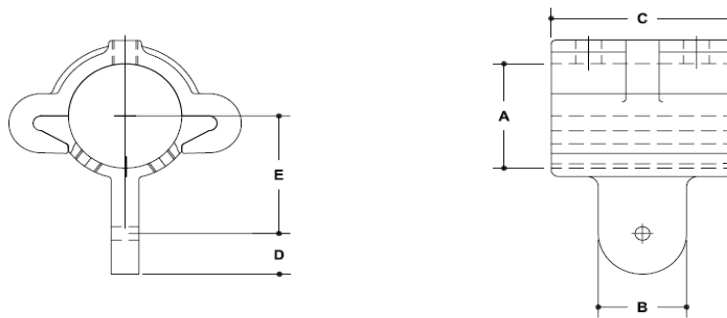
Illustration 14 - 5EXC-8



7.0 Illustrations

Illustration 15 - 17SM Module Male Assembly

NOTE: DIMENSIONS LOCATED IN BOXES ARE COMMON
 SETBACK DIMENSIONS FOR EACH FITTING



#17SM Modular Male Assembly

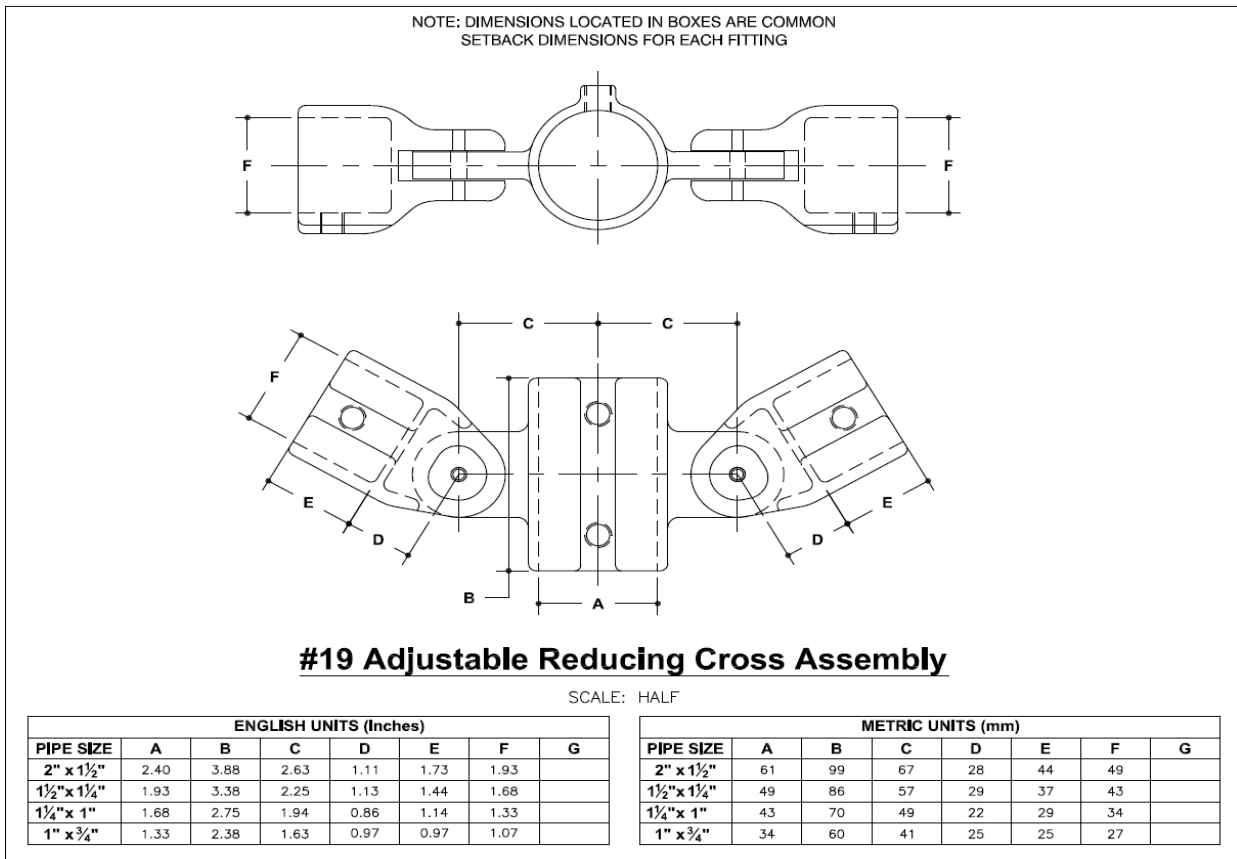
SCALE: HALF

ENGLISH UNITS (Inches)							
PIPE SIZE	A	B	C	D	E	F	G
2"	-	-	-	-	-	-	-
1½"	1.93	1.50	3.10	0.75	2.17	-	-
1¼"	-	-	-	-	-	-	-
1"	-	-	-	-	-	-	-
¾"	-	-	-	-	-	-	-

METRIC UNITS (mm)							
PIPE SIZE	A	B	C	D	E	F	G
2"	-	-	-	-	-	-	-
1½"	49	38	79	19	55	-	-
1¼"	-	-	-	-	-	-	-
1"	-	-	-	-	-	-	-
¾"	-	-	-	-	-	-	-

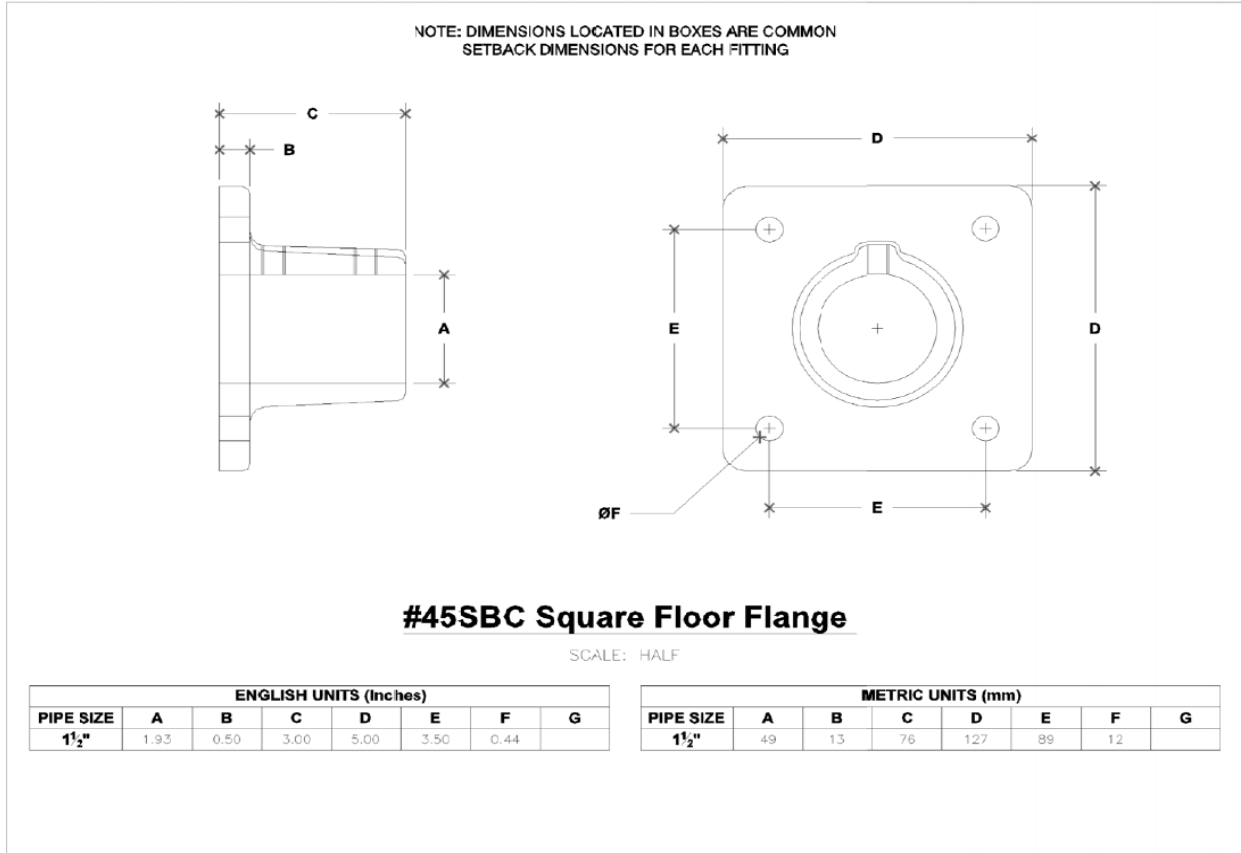
7.0 Illustrations

Illustration 16 - 19 Adjustable Reducing Cross Assembly



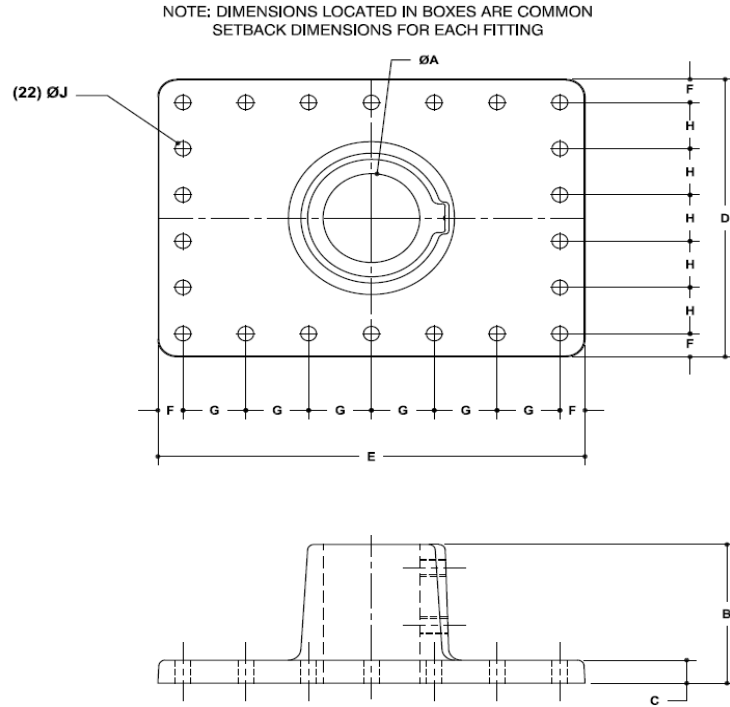
7.0 Illustrations

Illustration 17 - 45SBC Square Floor Flange



7.0 Illustrations

Illustration 18 - 47R Roof Flange



#47R ROOF FLANGE

SCALE: HALF

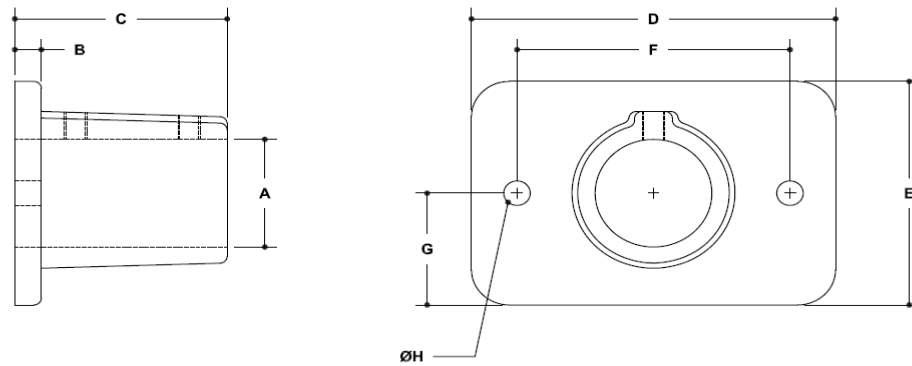
ENGLISH UNITS (Inches)									
PIPE SIZE	A	B	C	D	E	F	G	H	ØJ
1½"	1.93	3.00	0.50	6.00	8.50	0.50	1.25	1.00	0.31

METRIC UNITS (mm)									
PIPE SIZE	A	B	C	D	E	F	G	H	ØJ
1½"	49	76	13	152	216	13	32	25	8

7.0 Illustrations

Illustration 19 - 48 Heavy-Duty Base Flange (2-Hole)

NOTE: DIMENSIONS LOCATED IN BOXES ARE COMMON
 SETBACK DIMENSIONS FOR EACH FITTING



#48 Heavy-Duty Base Flange (2-Hole)

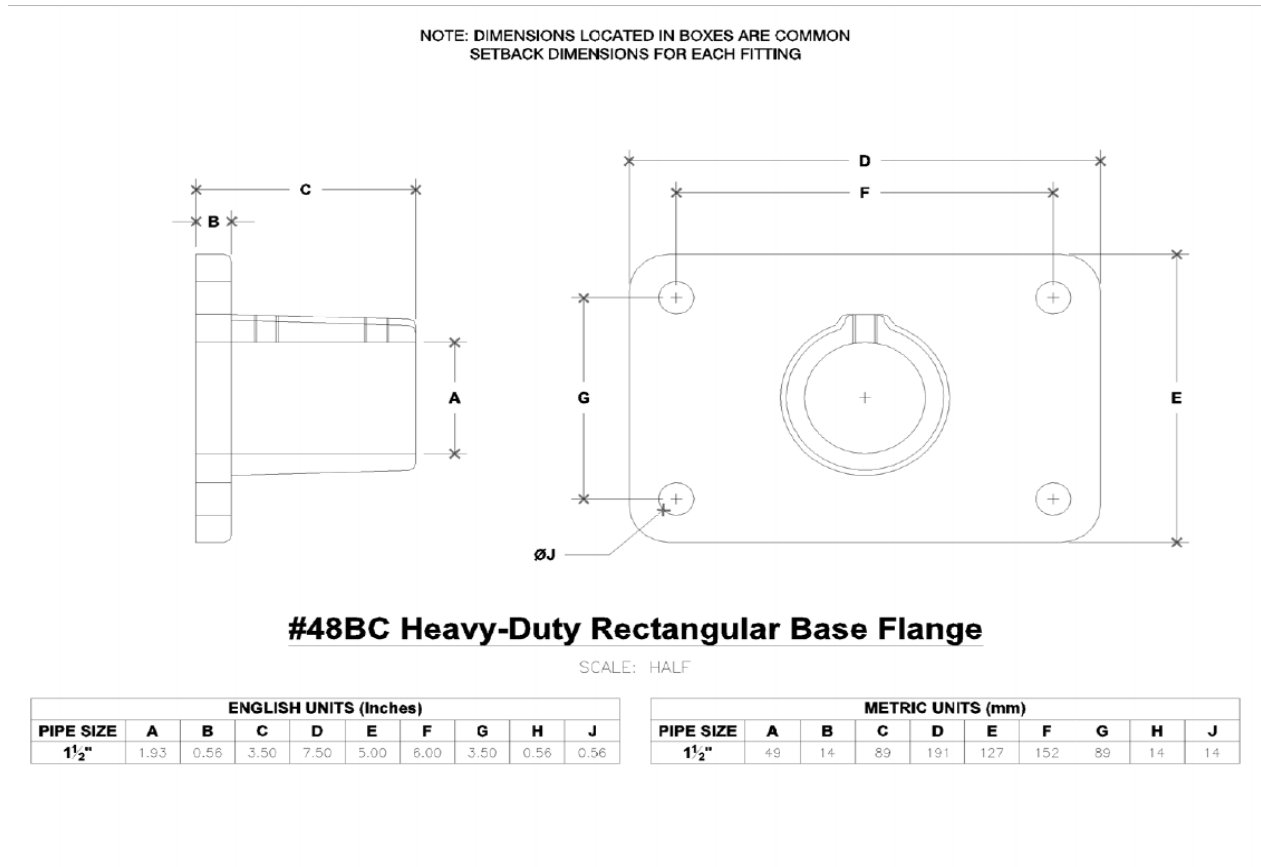
SCALE: HALF

ENGLISH UNITS (Inches)									
PIPE SIZE	A	B	C	D	E	F	G	H	J
2"	2.40	0.56	3.50	8.00	5.00	5.50	2.50	0.56	
1½"	1.93	0.44	3.50	6.00	4.00	4.50	2.00	0.56	

METRIC UNITS (mm)									
PIPE SIZE	A	B	C	D	E	F	G	H	J
2"	61	14	89	203	127	140	64	14	
1½"	49	11	89	152	102	114	51	14	

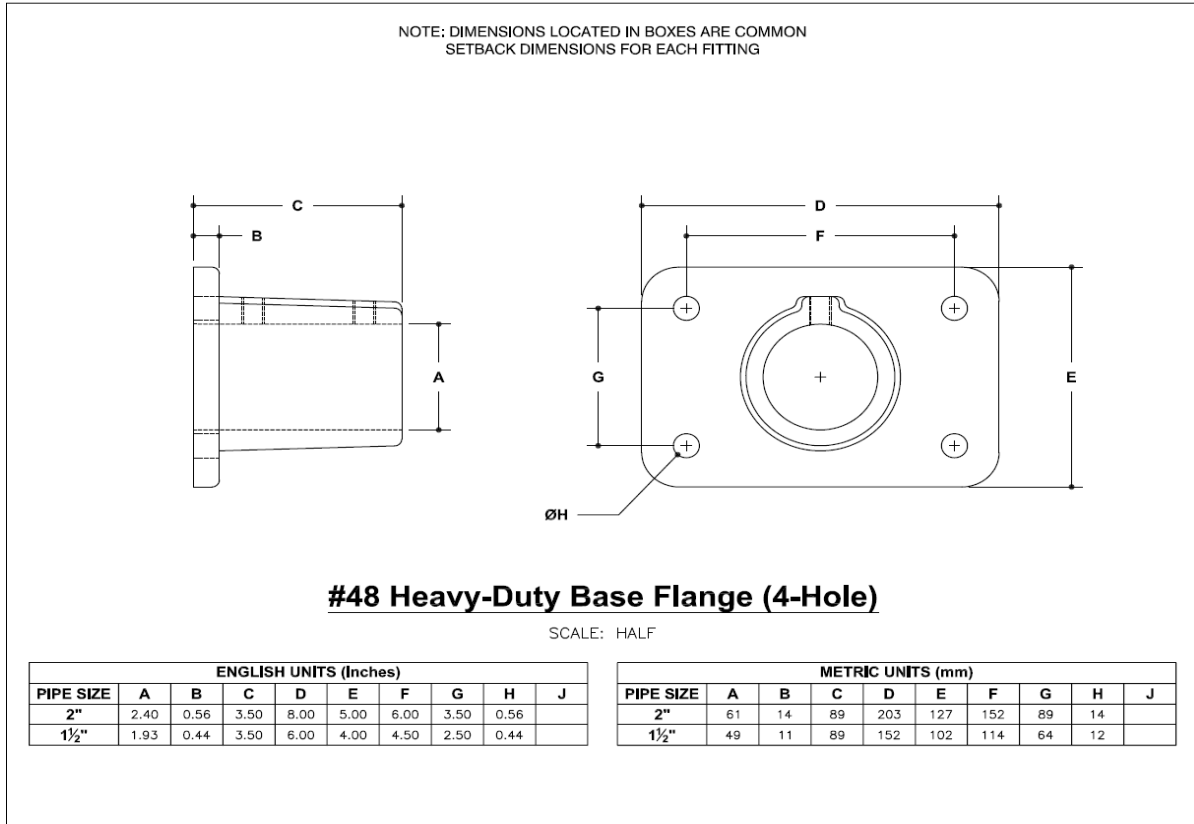
7.0 Illustrations

Illustration 20 - 48BC Heavy-Duty Rectangular Base Flange



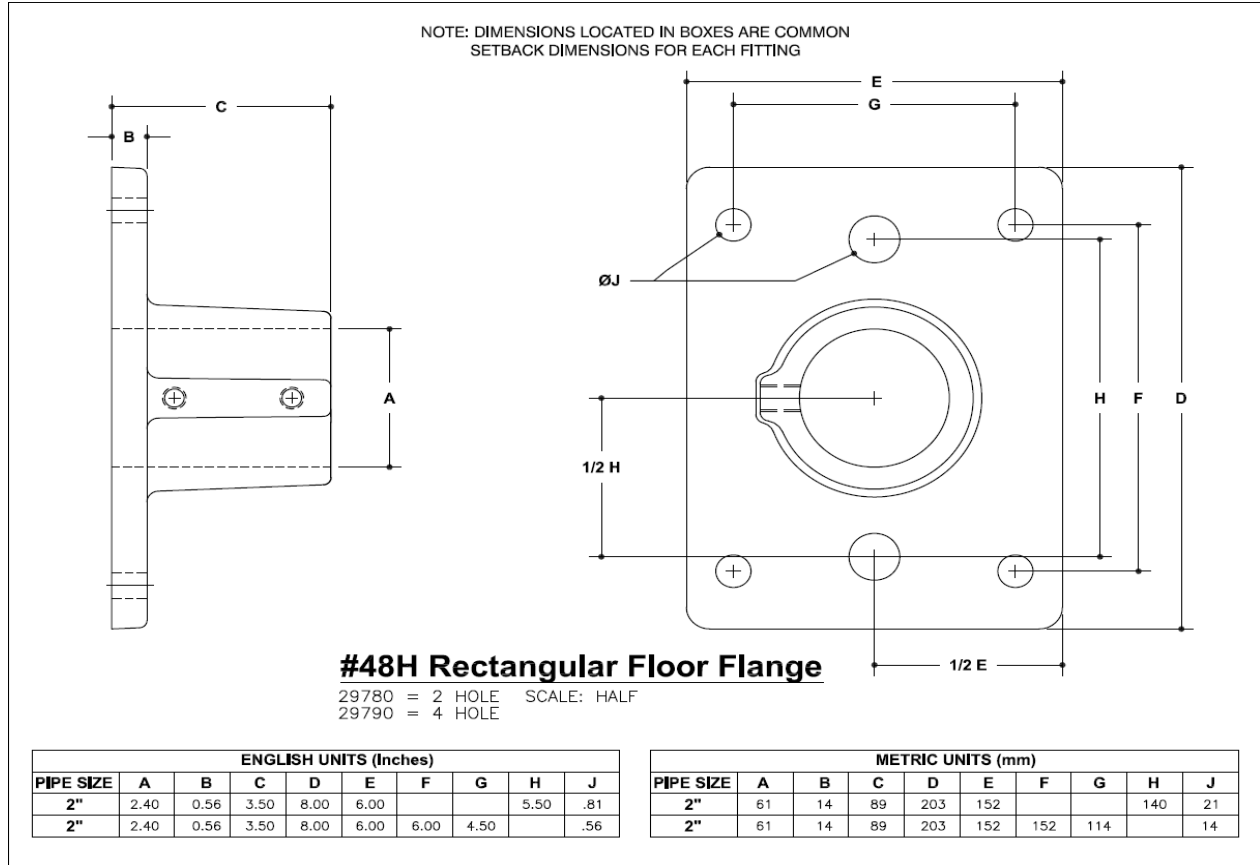
7.0 Illustrations

Illustration 21 - 48 Heavy-Duty Base Flange (4-Hole)



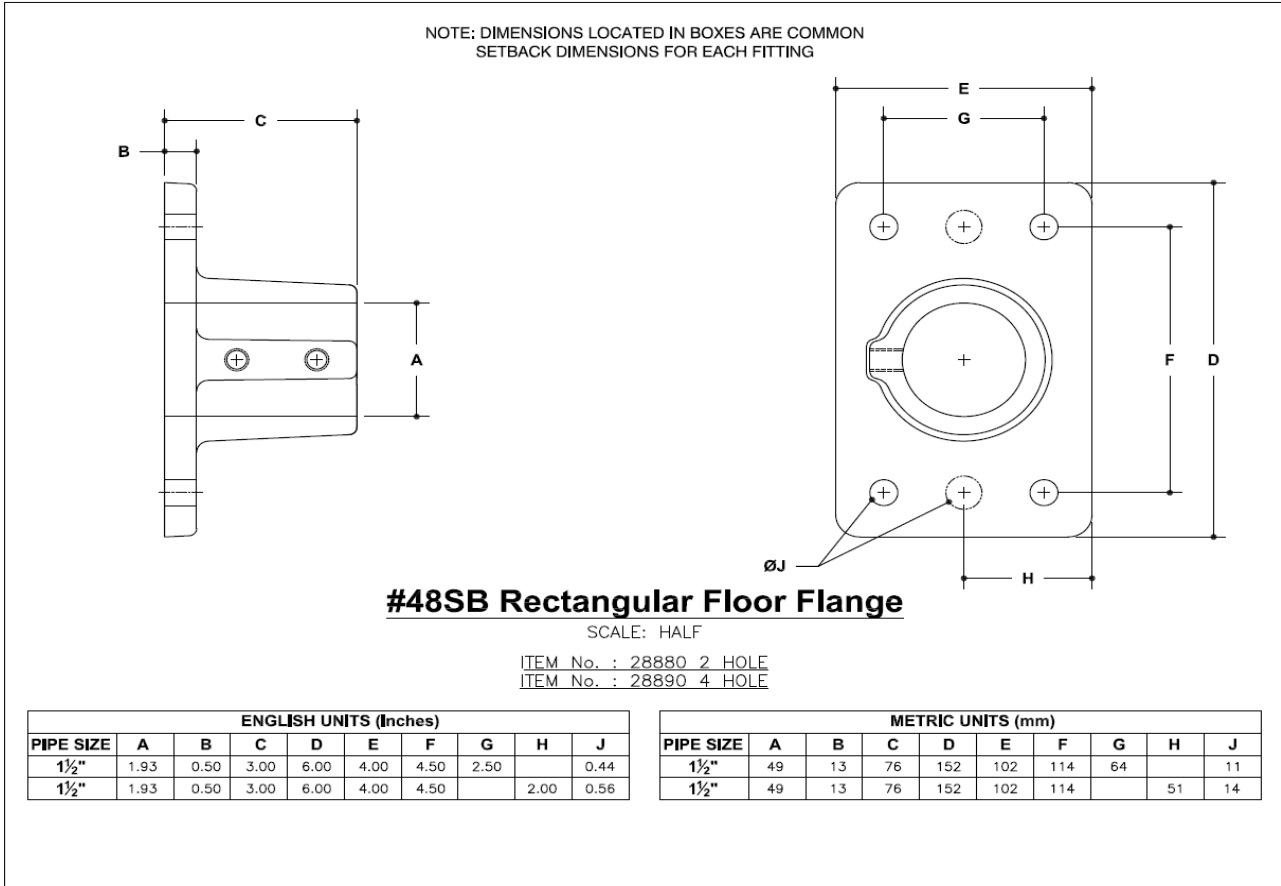
7.0 Illustrations

Illustration 22 - 48H Rectangular Floor Flange



7.0 Illustrations

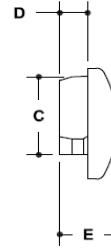
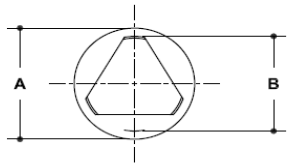
Illustration 23 - 48SB Rectangular Floor Flange



7.0 Illustrations

Illustration 24 - 62 Mac. Plug Sch. 40 (OD Pipe)

NOTE: DIMENSIONS LOCATED IN BOXES ARE COMMON
 SETBACK DIMENSIONS FOR EACH FITTING



#62 Mach. Plug Sch.40 (OD PIPE)

SCALE: HALF

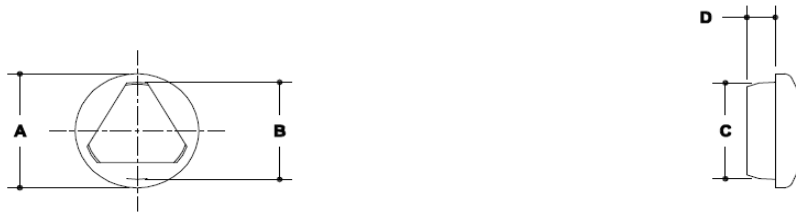
ENGLISH UNITS (Inches)							
PIPE SIZE	ØA	ØB	C	D	E	F	G
2"	2.38	2.08	1.68	.44	.84		
1½"	1.90	1.64	1.35	.44	.78		
1¼"	1.66	1.40	1.19	.44	.76		
1"	1.32	1.06	.86	.44	.72		
¾"	1.05	.84	.70	.44	.70		

METRIC UNITS (mm)							
PIPE SIZE	A	B	C	D	E	F	G
2"	60	53	43	11	21		
1½"	48	42	34	11	20		
1¼"	42	36	30	11	19		
1"	34	27	22	11	18		
¾"	27	21	18	11	18		

7.0 Illustrations

Illustration 25 - 65 Mach. Plug Sch. 80 (OD Pipe)

NOTE: DIMENSIONS LOCATED IN BOXES ARE COMMON
 SETBACK DIMENSIONS FOR EACH FITTING



#65 Mach. Plug Sch.80 (OD Pipe)

SCALE: HALF

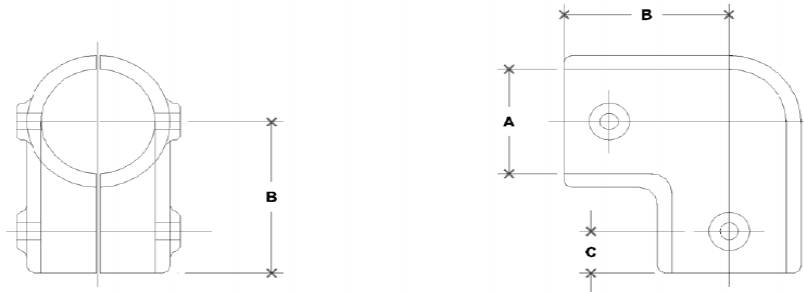
ENGLISH UNITS (Inches)							
PIPE SIZE	A	B	C	D	E	F	G
2"	2.38	2.03	2.00	.44			
1½"	1.90	1.56	1.50	.44			
1¼"	1.66	1.30	1.25	.44			

METRIC UNITS (mm)							
PIPE SIZE	A	B	C	D	E	F	G
2"	60	52	51	11			
1½"	48	40	38	11			
1¼"	42	33	32	11			

7.0 Illustrations

Illustration 26 - 300 Mend-A-Rail Elbow

NOTE: DIMENSIONS LOCATED IN BOXES ARE COMMON
 SETBACK DIMENSIONS FOR EACH FITTING



#300 Mend-A-Rail Elbow

SCALE: HALF

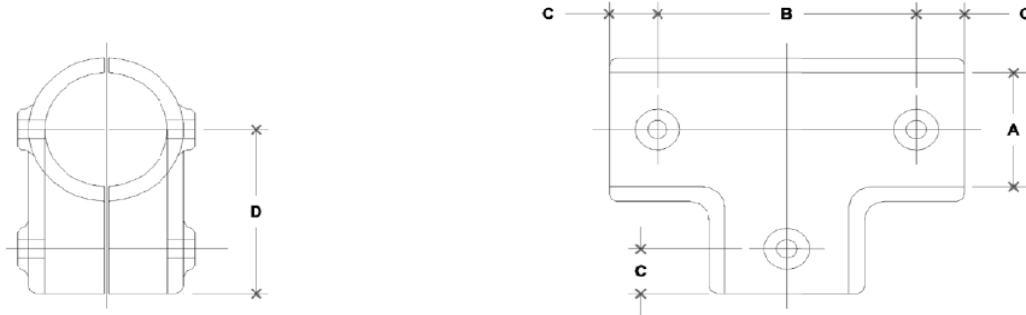
ENGLISH UNITS (Inches)							
PIPE SIZE	A	B	C	D	E	F	G
2"	-	-	-	-	-	-	-
1½"	1.93	2.75	1.50	-	-	-	-
1¼"	-	-	-	-	-	-	-
1"	-	-	-	-	-	-	-
¾"	-	-	-	-	-	-	-

METRIC UNITS (mm)							
PIPE SIZE	A	B	C	D	E	F	G
2"	-	-	-	-	-	-	-
1½"	49	69	38	-	-	-	-
1¼"	-	-	-	-	-	-	-
1"	-	-	-	-	-	-	-
¾"	-	-	-	-	-	-	-

7.0 Illustrations

Illustration 27 - 500 Mend-A-Rail Tee

NOTE: DIMENSIONS LOCATED IN BOXES ARE COMMON
 SETBACK DIMENSIONS FOR EACH FITTING



#500 Mend-A-Rail Tee

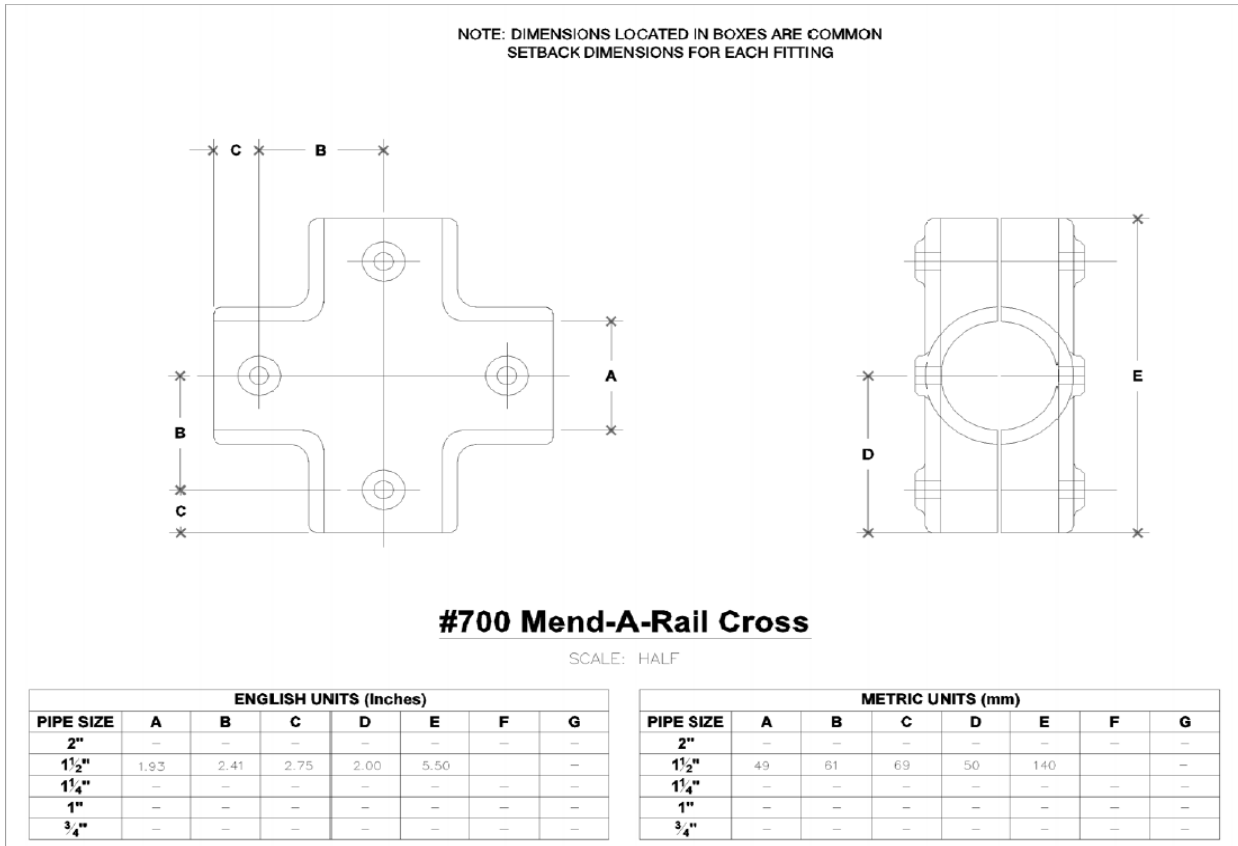
SCALE: HALF

ENGLISH UNITS (Inches)							
PIPE SIZE	A	B	C	D	E	F	G
2"	-	-	-	-	-	-	-
1½"	1.93	4.00	.75	2.75	-	-	-
1¼"	-	-	-	-	-	-	-
1"	-	-	-	-	-	-	-
¾"	-	-	-	-	-	-	-

METRIC UNITS (mm)							
PIPE SIZE	A	B	C	D	E	F	G
2"	-	-	-	-	-	-	-
1½"	49	101.2	19	69	-	-	-
1¼"	-	-	-	-	-	-	-
1"	-	-	-	-	-	-	-
¾"	-	-	-	-	-	-	-

7.0 Illustrations

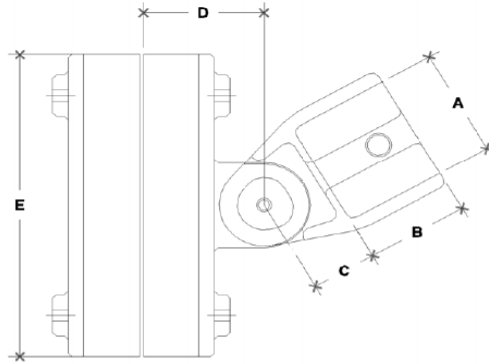
Illustration 28 - 700 Mend-A-Rail Cross



7.0 Illustrations

Illustration 29 - 1700 Mend-A-Rail Elbow Adjustable Elbow or Tee

NOTE: DIMENSIONS LOCATED IN BOXES ARE COMMON
 SETBACK DIMENSIONS FOR EACH FITTING



#1700 Mend-A-Rail Elbow Adjustable Elbow or Tee

SCALE: HALF

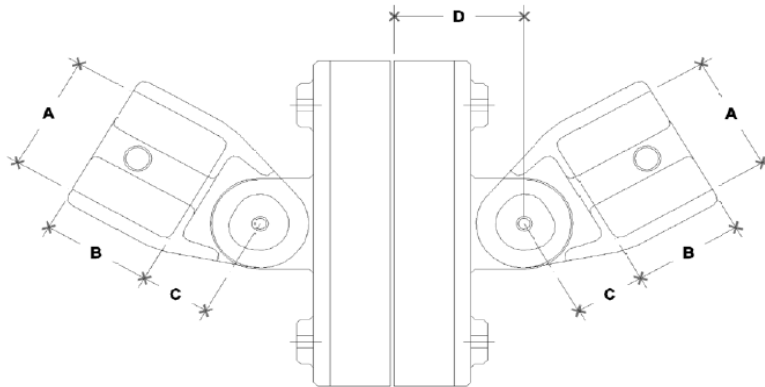
ENGLISH UNITS (Inches)							
PIPE SIZE	A	B	C	D	E	F	G
2"	-	-	-	-	-	-	-
1½"	1.93	1.75	1.11	2	5.50	-	-
1¼"	-	-	-	-	-	-	-
1"	-	-	-	-	-	-	-
¾"	-	-	-	-	-	-	-

METRIC UNITS (mm)							
PIPE SIZE	A	B	C	D	E	F	G
2"	-	-	-	-	-	-	-
1½"	49	44	28	51	140	-	-
1¼"	-	-	-	-	-	-	-
1"	-	-	-	-	-	-	-
¾"	-	-	-	-	-	-	-

7.0 Illustrations

Illustration 30 - 1900 Mend-A-Rail Elbow Adjustable Elbow or Tee

NOTE: DIMENSIONS LOCATED IN BOXES ARE COMMON
 SETBACK DIMENSIONS FOR EACH FITTING



#1900 Mend-A-Rail Adjustable Cross

SCALE: HALF

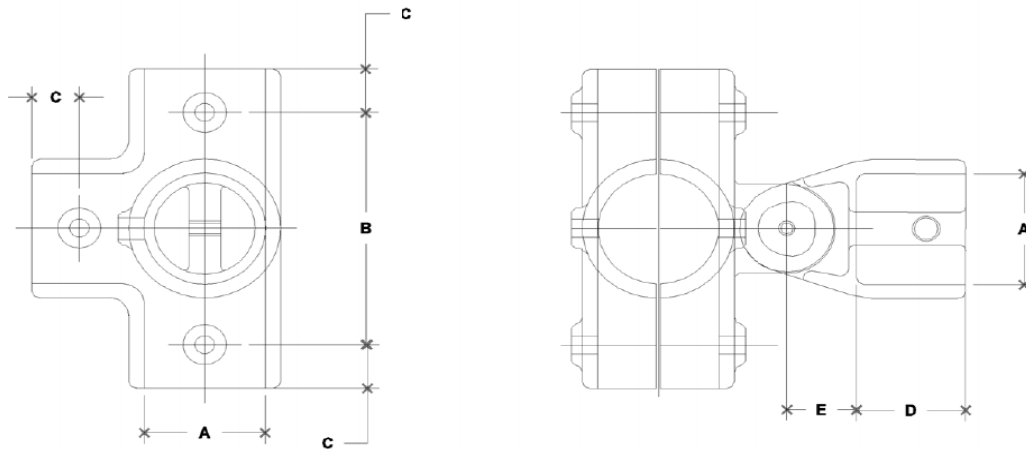
ENGLISH UNITS (Inches)							
PIPE SIZE	A	B	C	D	E	F	G
2"	-	-	-	-	-	-	-
1½"	1.93	1.75	1.11	2	-	-	-
1¼"	-	-	-	-	-	-	-
1"	-	-	-	-	-	-	-
¾"	-	-	-	-	-	-	-

METRIC UNITS (mm)							
PIPE SIZE	A	B	C	D	E	F	G
2"	-	-	-	-	-	-	-
1½"	49	44	28	51	-	-	-
1¼"	-	-	-	-	-	-	-
1"	-	-	-	-	-	-	-
¾"	-	-	-	-	-	-	-

7.0 Illustrations

Illustration 31 - 2500 Mend-A-Rail Side Outlet Elbow or Tee

NOTE: DIMENSIONS LOCATED IN BOXES ARE COMMON
 SETBACK DIMENSIONS FOR EACH FITTING



#2500 Mend-A-Rail Side Outlet Elbow or Tee

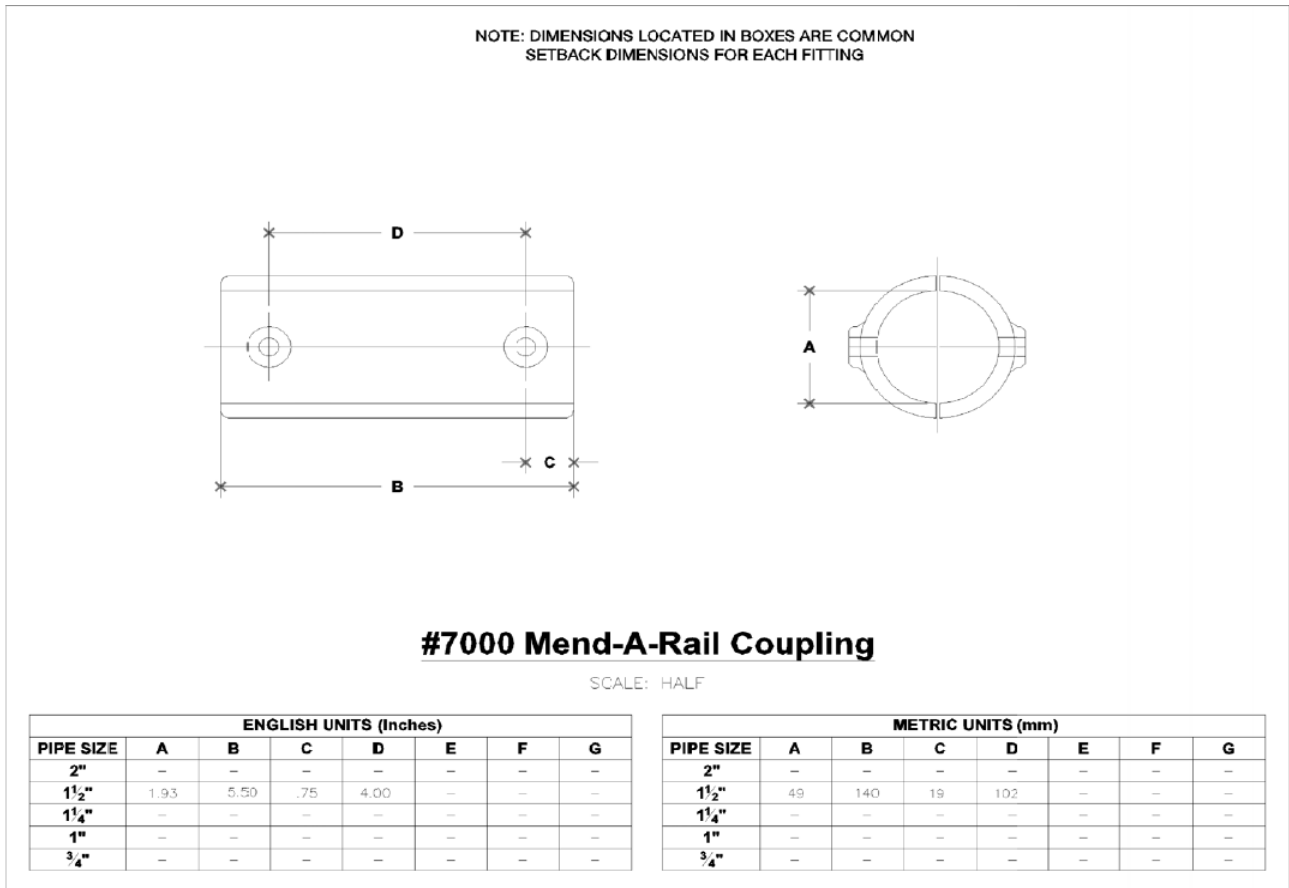
SCALE: HALF

ENGLISH UNITS (Inches)							
PIPE SIZE	A	B	C	D	E	F	G
2"	-	-	-	-	-	-	-
1½"	1.93	1.75	.75	1.75	1.11	-	-
1¼"	-	-	-	-	-	-	-
1"	-	-	-	-	-	-	-
¾"	-	-	-	-	-	-	-

METRIC UNITS (mm)							
PIPE SIZE	A	B	C	D	E	F	G
2"	-	-	-	-	-	-	-
1½"	49	44	19	44	28	-	-
1¼"	-	-	-	-	-	-	-
1"	-	-	-	-	-	-	-
¾"	-	-	-	-	-	-	-



7.0 Illustrations

Illustration 32 -7000 Mend-A-Rail Coupling



8.0 Test Summary			
Evaluation Period	6/01/2016- 11/14/2016		Project No. G102505248
Sample Rec. Date	29-Apr-2016	Condition Production	Sample ID. LAN1604291139
Test Location	25791 Commercentre Drive, Lake Forest, CA 92630 USA		
Test Procedure	Testing Lab		
Determination of the result includes consideration of measurement uncertainty from the test equipment and methods. The product was tested as indicated below with results in conformance to the relevant test criteria.			
The following tests were performed:			
Test Description	UL 2703		
Bonding Path Resistance Test	13		
Thermal Cycling 200	17		
Humidity Test	18		
Evaluation Period	3/20/2022 - 06/27/2022		Project No. G104969520
Due to the previous testing performed under Intertek Report 102505248LAX-001 no additional testing was necessary per the applicable requirements of Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels [UL 2703:2015 Ed.1+R:24Mar2021].			

Evaluation Period	11/5/2025 - 02/24/2026		Project No. G106386691
Sample Rec. Date	10-Nov-2025	Condition Production	Sample ID. MID2511101312-001
Test Location	8431 Murphy Drive, Middleton, WI 5352 USA		
Test Procedure	Testing Lab		
Determination of the result includes consideration of measurement uncertainty from the test equipment and methods. The product was tested as indicated below with results in conformance to the relevant test criteria.			
The following tests were performed:			
Test Description	UL 2703:2015 Ed.1+R:11Jul2024		
Cyclic Salt Mist Test	19		

8.1 Signatures			
A representative sample of the product covered by this report has been evaluated and found to comply with the applicable requirements of the standards indicated in Section 1.0.			
Completed by:	Patricia Mendizabal	Reviewed by:	Franco Ortega
Title:	Engineer	Title:	Reviewer
Signature:		Signature:	

9.0 Correlation Page For Multiple Listings

The following products, which are identical to those identified in this report except for model number and Listee name, are authorized to bear the ETL label under provisions of the Intertek Multiple Listing Program.

BASIC LISTEE	The Hollaender Manufacturing Co.
Address	10285 Wayne Avenue Cincinnati OH 45215
Country	USA
Product	PV Bonding Devices

MULTIPLE LISTEE 1	None
Address	
Country	
Brand Name	

ASSOCIATED MANUFACTURER	
Address	
Country	

MULTIPLE LISTEE 1 MODELS	BASIC LISTEE MODELS

MULTIPLE LISTEE 2	None
Address	
Country	
Brand Name	

ASSOCIATED MANUFACTURER	
Address	
Country	

MULTIPLE LISTEE 2 MODELS	BASIC LISTEE MODELS

MULTIPLE LISTEE 3	None
Address	
Country	
Brand Name	

ASSOCIATED MANUFACTURER	
Address	
Country	

MULTIPLE LISTEE 3 MODELS	BASIC LISTEE MODELS

10.0 General Information

The Applicant and Manufacturer have agreed to produce, test and label ETL Listed products in accordance with the requirements of this Report. The Manufacturer has also agreed to notify Intertek and to request authorization prior to using alternate parts, components or materials.

COMPONENTS

Components used shall be those itemized in this Intertek report covering the product, including any amendments and/or revisions.

LISTING MARK

The ETL Listing mark applied to the products shall either be separable in form, such as labels purchased from Intertek, or on a product nameplate or other media only as specifically authorized by Intertek. Use of the mark is subject to the control of Intertek.

The mark must include the following four items:

- 1) applicable country identifiers "US" and/or "C" or "US", "C" and "EU"
- 2) the word "Listed" or "Classified" or "Recognized Component" (whichever is appropriate)
- 3) a control number issued by Intertek
- 4) a product descriptor that identifies the standards used for certification. Example:

For US standards, the words, "Conforms to" shall appear with the standard number along with the word, "Standard" or "Std." Example: "Conforms to ANSI/UL Std. XX."

For Canadian standards, the words "Certified to CAN/CSA Standard CXX No. XX." shall be used, or abbreviated, "Cert. to CAN/CSA Std. CXX No. XX."

Can be used together when both standards are used.

If all standards on the ATM have the same standard title, the shared title or its abbreviation may be used in place of the examples above. Example: "Medical Electrical Equipment" or "MEE"; "Information Technology Equipment" or "ITE"; "Audio/Video Information And Communication Technology Equipment" or "A/V ICTE".

Note: A facsimile must be submitted to Intertek, Attn: Follow-up Services for approval prior to use.

The facsimile need not have a control number. A control number will be issued **after signed Certification Agreements** have been received by the Follow-up Services office, approval of the facsimile of your proposed Listing Mark, satisfactory completion of the Listing Report, and scheduling of a factory assessment in your facility.

MANUFACTURING AND PRODUCTION TESTS

Manufacturing and Production Tests shall be performed as required in this Report.

FOLLOW-UP SERVICE

Periodic unannounced audits of the manufacturing facility (and any locations authorized to apply the mark) shall be scheduled by Intertek. An audit report shall be issued after each visit. Special attention will be given to the following:

1. Conformance of the manufactured product to the descriptions in this Report.
2. Conformance of the use of the ETL mark with the requirements of this Report and the Certification Agreement.
3. Manufacturing changes.
4. Performance of specified Manufacturing and Production Tests.

In the event that the Intertek representative identifies non-conformance(s) to any provision of this Report, the Applicant shall take one or more of the following actions:

1. Correct the non-conformance.
2. Remove the ETL Mark from non-conforming product.
3. Contact the issuing product safety evaluation center for instructions.

10.1 Evaluation of Unlisted Components

Because Unlisted Components are uncontrolled, and they do not fall under a third party follow up program, Intertek may require these components to be tested and/or evaluated at least once annually, more often for certain components, as part of the independent certification process. The Unlisted Components in Section 5.0 require testing and/or evaluation as indicated.

The Applicant will be notified, in writing, via the applicable contact methods, as defined in Section 1.0, when these components must be selected and sent to Component Evaluation Center (CEC) for re-evaluation.

Due to particular testing requirements, some components may be requested to be shipped to specific labs. Thus, specific shipment destination(s) for each sample will be provided in the written notification.

Managing CEC Location:
Intertek Testing Services NA Inc.
ETL Component Evaluation Center
1717 Arlingate Ln.
Columbus, Ohio 43228 USA
Attn: CEC Safety

Sample Disposition: Due to the destructive nature of the testing, all samples will be discarded at the conclusion of testing unless, the manufacturer specifically requests the return of the samples. The request for return must accompany the initial component shipment.

11.0 Manufacturing and Production Tests


The manufacturer agrees to conduct the following Manufacturing and Production Tests as specified:

Required Tests

None

12.0 Revision Summary						
The following changes are in compliance with the declaration of Section 8.1:						
Date/ Proj # Site ID	Project Handler/ Reviewer	Section	Item	Description of Change		
27-Jun-2022	F. Ortega A. Prakash	1	-	Updated Standard from "UL2703 - Standard for Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels. First Edition: January 28, 2015." to "Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels [UL 2703:2015 Ed.1+R:24Mar2021]"		
G104969520LAX						Updated Applicant Contact from "Ron Crebo" to "Todd Zureick, Mike Hall"
						Updated Applicant Phone Number from "(513) 772-8800 ext. 131" to "513/772-8800 x160, 513/772-8800 x186"
						Updated Applicant Email from "ronc@hollaender.com" to "toddz@hollaender.com, mikeh@hollaender.com"
						Updated Manufacturer 1 Contact from "Dan Halcomb" to "Todd Zureick, Mike Hall"
						Updated Applicant Phone Number from "(513) 772-8800 ext. 185" to "513/772-8800 x160, 513/772-8800 x186"
						Updated Applicant Email from "danh@hollaender.com" to "toddz@hollaender.com, mikeh@hollaender.com"
				2	-	Updated Model Similarity from "19 indicates cross adjustable brace fitting (See Illustration XXX)" to "19 indicates cross adjustable brace fitting (See Illustration 12)"
				7	8	Updated Illustration 8 - Installation Instructions Page 1
					9	Updated Illustration 9 - Installation Instructions Page 2
				8	-	Added evaluation period 3/20/2022 - 06/27/2022
24-Feb-2026				1	-	Updated FROM "Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels [UL 2703:2015 Ed.1+R:24Mar2021]" TO "Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels [UL 2703:2015 Ed.1+R:11Jul2024]"
				2	-	Updated Models FROM "5, 5E, 5EXT, 5SR, 5X, 17, 17E, 17X, 19, 19E, 45, 47" TO "5EXC-8, 17SM, 45SBC, 47R, 48, 48BC, 48H-2H, 48H-9, 48SB, 62, 65, 300, 500, 700, 1700, 1900, 2500, 7000" This revision has been completed to resolve variances raised during the inspection dated 31-07-2025 under order number O#5006568.
				Added Model: "5EXC-8"		
	1			Updated Technical data and securement means FROM "ALMAG 535 Aluminum Magnesium Alloy Fitting with 3/8" - 16 x 7/16" long Zinc-Alloy JS600 Zinc-plated set screws. See Illustrations 1-5 for model dimensions." TO "ALMAG 535 Aluminum Magnesium Alloy Fitting with 3/8" -16 x 7/16" long Zinc-Alloy JS600 Zinc-plated set screws. See Illustrations 1-5, & 14 for model dimensions."		
				Added Model: "17SM"		

12.0 Revision Summary				
The following changes are in compliance with the declaration of Section 8.1:				
Date/ Proj # Site ID	Project Handler/ Reviewer	Section	Item	Description of Change
			2	Updated Technical data and securement means FROM "ALMAG 535 Aluminum Magnesium Alloy Adjustable Fitting with 3/8" -16 x 7/16" long Zinc-Alloy JS600 Zinc-plated set screws. Hinge created by a 1/4" steel drive pin, Stainless Steel AISI 303. See Illustrations 6, 7, 12, & 13 for model dimensions." TO "ALMAG 535 Aluminum Magnesium Alloy Adjustable Fitting with 3/8" -16 x 7/16" long Zinc-Alloy JS600 Zinc-plated set screws. Hinge created by a 1/4" steel drive pin, Stainless Steel AISI 303. See Illustrations 6, 7, 12, 13, 15 & 16 for model dimensions."
			3	Added the following Models: "45SBC", "47R", "48", "48BC", "48H-2H", "48H-9", "48SB" Updated Technical data and securement means FROM "ALMAG 535 Aluminum Magnesium Alloy Adjustable Fitting with 3/8" -16 x 7/16" long Zinc-Alloy JS600 Zinc-plated set screws. See Illustrations 10 & 11 for model dimensions." TO "ALMAG 535 Aluminum Magnesium Alloy Adjustable Fitting with 3/8" -16 x 7/16" long Zinc-Alloy JS600 Zinc-plated set screws. See Illustrations 10, 11, & 17-23 for model dimensions."
			4	Added Critical Component: "Plugs (not pictured)" Added the following Models: "62" & "65" Added Technical data and securement means "ALMAG 535 Aluminum Magnesium pipe plug for galvanized steel or aluminum pipes. See Illustrations 24 & 25 for model dimensions."
			5	Added Critical Component: "Mend-A-Rail Elbow (not pictured)" Added Model: "300" Added Technical data and securement means "ALMAG 535 Aluminum Magnesium Alloy pipe elbow with 3/8" -16 x 7/16" long Zinc-Alloy JS600 Zinc-plated set screws. See Illustration 26 for model dimensions."
		4	6	Added Critical Component: "Mend-A-Rail Tee (not pictured)" Added Model: "500" Added Technical data and securement means "ALMAG 535 Aluminum Magnesium Alloy Tee-fitting secured with 3/8" -16 x 7/16" long Zinc-Alloy JS600 Zinc-plated set screws. See Illustration 27 for model dimensions"
			7	Added Critical Component: "Mend-A-Rail Cross (not pictured)" Added Model: "700" Added Technical data and securement means "ALMAG 535 Aluminum Magnesium Alloy cross-fitting secured with 3/8" -16 x 7/16" long Zinc-Alloy JS600 Zinc-plated set screws. See Illustration 28 for model dimensions"

12.0 Revision Summary						
The following changes are in compliance with the declaration of Section 8.1:						
Date/ Proj # Site ID	Project Handler/ Reviewer	Section	Item	Description of Change		
G106386691LAX	P. Mendizabal  F. Ortega		8	Added Critical Component: "Mend-A-Rail Elbow Adjustable Elbow or Tee (not pictured)"		
				Added Model: "1700"		
				Added Technical data and securement means "ALMAG 535 Aluminum Magnesium Alloy adjustable elbow or tee fitting secured with 3/8" -16 x 7/16" long Zinc-Alloy JS600 Zinc-plated set screws. See Illustration 29 for model dimensions"		
			9	Added Critical Component: "Mend-A-Rail Adjustable Cross (not pictured)"		
				Added Model: "1900"		
				Added Technical data and securement means "ALMAG 535 Aluminum Magnesium Alloy adjustable cross-fitting secured with 3/8" -16 x 7/16" long Zinc-Alloy JS600 Zinc-plated set screws. See Illustration 30 for model dimensions"		
			10	Added Critical Component: "Mend-A-Rail Adjustable Cross (not pictured)"		
				Added Model: "2500"		
				Added Technical data and securement means "ALMAG 535 Aluminum Magnesium Alloy side outlet elbow or tee secured with 3/8" -16 x 7/16" long Zinc-Alloy JS600 Zinc-plated set screws. See Illustration 31 for model dimensions"		
			11	Added Critical Component: "Mend-A-Rail Coupling (not pictured)"		
				Added Model: "7000"		
				Added Technical data and securement means "ALMAG 535 Aluminum Magnesium Alloy coupling secured with 3/8" -16 x 7/16" long Zinc-Alloy JS600 Zinc-plated set screws. See Illustration 32 for model dimensions"		
			6	2	Updated FROM "Mechanical Assembly - Hollaender Speed Rail Fittings (Flange, Tee, Adjustable Tee) are mounted to the Solar Racking Pipe as described in section 2 by using provided set screws and torque values specified by installation instructions (see illustration 9)" TO "Mechanical Assembly - Hollaender Speed Rail Fittings (Flange, Tee, Adjustable Tee, Mend-A-Rail, Reducing Fittings) are mounted to the Solar Racking Pipe as described in section 2 by using provided set screws and torque values specified by installation instructions (see illustration 9)"	
					1	Updated "Illustration 1 - 5E Tee Drawing"
					6	Updated "Illustration 6 - 17E Adjustable Tee Assembly Drawing"
7	Updated "Illustration 7 - 17 Adjustable Tee Assembly Drawing"					
8	Updated "Illustration 8 - Installation Instructions Page 1"					
9	Updated "Illustration 9 - Installation Instructions Page 2"					
12	Updated "Illustration 12 - 19 Adjustable Cross Assembly"					

12.0 Revision Summary				
The following changes are in compliance with the declaration of Section 8.1:				
Date/ Proj # Site ID	Project Handler/ Reviewer	Section	Item	Description of Change
		7	13	Updated "Illustration 13 - 19E Adjustable Cross"
			14	Added "Illustration 14 - 5EXC-8"
			15	Added "Illustration 15 - 17SM Module Male Assembly"
			16	Added "Illustration 16 - 19 Adjustable Reducing Cross Assembly"
			17	Added "Illustration 17 - 45SBC Square Floor Flange"
			18	Added "Illustration 18 - 47R Roof Flange"
			19	Added "Illustration 19 - 48 Heavy-Duty Base Flange (2-Hole)"
			20	Added "Illustration 20 - 48BC Heavy-Duty Rectangular Base Flange"
			21	Added "Illustration 21 - 48 Heavy-Duty Base Flange (4-Hole)"
			22	Added "Illustration 22 - 48H Rectangular Floor Flange"
			23	Added "Illustration 23 - 48SB Rectangular Floor Flange"
			24	Added "Illustration 24 - 62 Mac. Plug Sch. 40 (OD Pipe)"
			25	Added "Illustration 25 - 65 Mach. Plug Sch. 80 (OD Pipe)"
			26	Added "Illustration 26 - 300 Mend-A-Rail Elbow"
		27	Added "Illustration 27 - 500 Mend-A-Rail Tee"	
		28	Added "Illustration 28 - 700 Mend-A-Rail Cross"	
		29	Added "Illustration 29 - 1700 Mend-A-Rail Elbow Adjustable Elbow or Tee"	
		30	Added "Illustration 30 - 1900 Mend-A-Rail Elbow Adjustable Elbow or Tee"	
		31	Added "Illustration 31 - 2500 Mend-A-Rail Side Outlet Elbow or Tee"	
		32	Added "Illustration 32 - 7000 Mend-A-Rail Coupling"	
		8	-	Added test block for project "G106386691"