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APPROVAL REPORT

Project No:	PR468089
Class:	1920
Product Type:	Gasketed and Non-Gasketed Pipe Fittings for Use with Aboveground Fire Protection Systems
Product Name:	Various Non-Gasketed Pipe Fittings and Model 1F Rigid Coupling, Model 1NH Flexible Coupling, Model 3G Grooved Outlet Mechanical Tee, Model 3J Threaded Outlet Mechanical Tee, Model 3JS Threaded Outlet Mechanical Tee and Model 3L Threaded Outlet U-Bolt Mechanical Tee For Use with Various Aboveground Steel Sprinkler Pipes
Name of Report Holder:	Hebei Dikai Piping Products Co., Ltd
Address of Report Holder:	East Wei San Rd Mengcun Cangzhou, Hebei 061400 China
Customer ID:	145333

Prepared by

Robert Masinda
Advanced Engineer
Fire Protection

Reviewed by

Claude Bosio
AVP, Senior Engineering Specialist
Fire Protection

David B. Fuller
VP, Manager - Fire Protection

11 November 2025
Date of Approval

1 INTRODUCTION

1.1 Hebei Dikai Piping Products Co., Ltd requested an FM Approval examination of their gasketed pipe fittings with rated working pressures in accordance with the following:

Project Scope - Gasketed Pipe Fittings					
Model	**Product Type**	**Nominal Pipe Size** **inch**	**Rated Working Pressure** **psi**	**kPa**	**Pipe**
1F	Rigid Coupling	1, 1-1/4, 1-1/2, 2, 2-1/2, 3, 4, 5, 6, 8	300	2065	Rolled and Cut Groove Schedule 40
1F	Rigid Coupling	1, 1-1/4, 1-1/2, 2, 2-1/2, 3, 4, 5, 6	300	2065	Rolled Groove Schedule 10
1F	Rigid Coupling	8	300	2065	Rolled Groove 0.188 inch (4.78 mm) Wall
1F	Rigid Coupling	1-1/4, 1-1/2, 2, 3, 4, 8 76.1, 139.7, 165.1 mm	300	2065	Rolled Groove GB/T 3091
1F	Rigid Coupling	1-1/4, 1-1/2, 2, 3, 4, 6, 8 76.1, 139.7 mm	300	2065	Rolled and Cut Groove Schedule 40 Equivalent GB/T 8163
1F	Rigid Coupling	1-1/4, 1-1/2, 2, 3, 4, 6 76.1, 139.7 mm	300	2065	Rolled Groove Schedule 10 Equivalent GB/T 8163
1F	Rigid Coupling	8	300	2065	Rolled Groove 5.0 mm GB/T 8163
1F	Rigid Coupling	1, 1-1/4, 1-1/2, 2, 3, 4 76.1, 139.7, 165.1, 216.3 mm	300	2065	Rolled and Cut Groove Schedule 40 Equivalent JIS G3454
1NH	Flexible Coupling	216.3 mm	500	3445	Rolled and Cut Groove Schedule 40 Equivalent JIS G3454
3G	Grooved Outlet Mechanical Tees	2 x 1 8 x 1	300	2065	Schedule 40
3G	Grooved Outlet Mechanical Tees	2 x 1	300	2065	Schedule 10
3G	Grooved Outlet Mechanical Tees	8 x 1	300	2065	0.188 inch (4.78 mm) Wall
3G	Grooved Outlet Mechanical Tees	2 x 1 76.1 mm x 1 139.7 mm x 1 165.1 mm x 1 216.3 mm x 1 8 x 1	300	2065	GB/T 3091

Project Scope - Gasketed Pipe Fittings					
Model	**Product Type**	**Nominal Pipe Size** **inch**	**Rated Working Pressure** **psi**	**kPa**	**Pipe**
3G	Grooved Outlet Mechanical Tees	2 x 1 76.1 mm x 1 139.7 mm x 1 165.1 mm x 1 216.3 mm x 1 8 x 1	300	2065	Schedule 40 Equivalent JIS G3454
3J	Threaded Outlet Mechanical Tees	2-1/2 x 2 3 x 3/4 5 x 3/4, 1 8 x 1	300	2065	Schedule 40
3J	Threaded Outlet Mechanical Tees	2-1/2 x 2 3 x 3/4 5 x 3/4, 1	300	2065	Schedule 10
3J	Threaded Outlet Mechanical Tees	8 x 1	300	2065	0.188 inch (4.78 mm) Wall
3J	Threaded Outlet Mechanical Tees	76.1 mm x 1, 2 3 x 3/4 108 mm x 1 139.7 mm x 1 165.1 mm x 1 8 x 1	300	2065	GB/T 3091
3J	Threaded Outlet Mechanical Tees	76.1 mm x 1, 2 3 x 3/4 139.7 mm x 1 159 mm x 1 165.1 mm x 1 216.3 x 1	300	2065	Schedule 40 Equivalent JIS G3454
3L	Threaded Outlet U-Bolt Mechanical Tees	1 x 1/2, 3/4 3 x 1	200	1375	Schedule 40
3L	Threaded Outlet U-Bolt Mechanical Tees	1 x 1/2, 3/4 3 x 1	200	1375	Schedule 10
3L	Threaded Outlet U-Bolt Mechanical Tees	1 x 1/2, 3/4 3 x 1	200	1375	GB/T 3091
3L	Threaded Outlet U-Bolt Mechanical Tees	1 x 1/2, 3/4 3 x 1	200	1375	Schedule 40 Equivalent JIS G3454
3JS	Threaded Outlet Mechanical Tees	1 x 1/2, 3/4 1-1/4 x 3/4 1-1/2 x 3/4 2 x 3/4 2-1/2 x 3/4 76.1 mm x 3/4	300	2065	Schedule 40

Project Scope - Gasketed Pipe Fittings					
Model	**Product Type**	**Nominal Pipe Size** **inch**	**Rated Working Pressure** **psi**	**kPa**	**Pipe**
3JS	Threaded Outlet Mechanical Tees	1 x 1/2, 3/4 1-1/4 x 3/4 1-1/2 x 3/4 2 x 3/4 2-1/2 x 3/4 76.1 mm x 3/4	300	2065	Schedule 10
3JS	Threaded Outlet Mechanical Tees	1 x 1/2, 3/4 1-1/4 x 3/4 1-1/2 x 3/4 2 x 3/4 76.1 mm x 3/4	300	2065	GB/T 3091

1.2 Hebei Dikai Piping Products Co., Ltd requested an FM Approval examination of their non-gasketed pipe fittings with rated working pressures in accordance with the following:

Project Scope - Non-Gasketed Pipe Fittings			Rated Working Pressure	
Model	**Product Type - Grooved**	**Sizes, inch NPS**	**psi**	**kPa**
Model 90S	90° Elbow	10, 12 267.4, 318.5 mm	300	2065
Model 90RT	90° Reducing Elbow	2-1/2 x 1/2, 3/4, 1 76.1 mm x 1/2, 3/4, 1 3 x 1/2, 3/4, 1	300	2065
Model 90DE	90° Drain Elbow	76.1 mm x 1 139.7 mm x 1 165.1 mm x 1 216.3 mm x 1 8 x 1	300	2065
Model 105	11-1/4° Elbow	1-1/4, 1-1/2, 2, 2-1/2, 3, 4, 5, 6, 8 76.1, 108, 133, 139.7, 159, 165.1, 216.3 mm	300	2065
Model 130	Equal Tee	159 mm	300	2065
Model 130S	Equal Tee	10, 12 267.4, 318.5 mm	300	2065
Model 131	Reducing Tee (Grooved Outlet)	6 x 139.7 mm	300	2065
Model 131N	Reducing Tee (Threaded Outlet)	2 x 3/4	300	2065
Model 180	Equal Cross	2, 2-1/2, 3, 4, 5, 6, 8 76.1, 108, 133, 139.7, 159, 165.1, 216.3 mm	300	2065

1.3 This Report may be freely reproduced only in its entirety and without modification.

1.4 Standards

1.4.1 FM Approvals Standards

Title	Number	Issue Date
Pipe Couplings and Fittings for Aboveground Fire Protection Systems	1920	November, 2007

1.5 Listing

The products will be updated in the Approval Guide, an on-line resource of FM Approvals, as detailed in an attachment at the end of this report. Deletions from any current product listing are shown with strikethroughs and additions to the Approval listing are shown in red text.

2 DESCRIPTION

2.1 Grooved End Non-Gasketed Pipe Fittings

The various grooved end fittings are used to connect cut or roll grooved pipe or fittings to valves or other grooved fittings. The fittings are manufactured from Grade 65-45-12 ASTM A536 ductile iron.

2.2 Grooved x Threaded End Non-Gasketed Pipe Fittings

The various grooved x threaded end fittings are used to connect grooved pipe or fittings to valves or other threaded pipe or fittings. The fittings are manufactured from Grade 65-45-12 ASTM A536 ductile iron and are supplied with ANSI B1.20.1 NPT threads.

2.3 Model 1F Grooved End Rigid Couplings

The Model 1F grooved end rigid couplings are designed to prevent the rotation of the joined ends and provide angular and rotational rigidity upon assembly. These couplings are made using a Grade 65-45-12 ASTM A536 ductile iron split housing, carbon steel bolts and hex nuts and are sealed at the pipe surface with an EPDM elastomer gasket. The Model 1F grooved end rigid couplings are available with the following finishes – painted, epoxy coated or Hot Dip Galvanized per ASTM A153, Class A.

2.4 Model 1NH Grooved End Flexible Couplings

The Model 1NH grooved end flexible couplings are designed to allow for angular or rotational differences between the components being joined after assembly. These couplings provide greater system reliability in situations involving excessive vibration, difficult alignment or seismic activity. The couplings are made using a Grade 65-45-12 ASTM A536 ductile iron split housing, carbon steel bolts and hex nuts and are sealed at the pipe surface with an EPDM elastomer gasket. The Model 1NH grooved end flexible couplings are available with the following finishes – painted, epoxy coated or Hot Dip Galvanized per ASTM A153, Class A.

2.5 Model 3G Grooved Outlet Mechanical Tees

The Model 3G grooved outlet mechanical tees are designed to provide a connection to a pipe line in place of a tee. The pipe is pre-drilled and the Grade 65-45-12 ASTM A536 ductile iron

saddle is placed over the hole so that the EPDM mechanical tee gasket encircles the hole. These mechanical tees have a second piece, manufactured out of Grade 65-45-12 ASTM A536 ductile iron that loops around the pipe and allows for the saddle to be drawn tight against the pipe surface with carbon steel bolts and hex nuts. The Model 3G grooved outlet mechanical tees are available with the following finishes – painted, epoxy coated or Hot Dip Galvanized per ASTM A153, Class A.

2.6 Model 3J Threaded Outlet Mechanical Tees

The Model 3J threaded outlet mechanical tees are designed to provide a connection to a pipe line in place of a tee. The pipe is pre-drilled and the Grade 65-45-12 ASTM A536 ductile iron saddle is placed over the hole so that the EPDM mechanical tee gasket encircles the hole. These mechanical tees have a second piece, manufactured out of Grade 65-45-12 ASTM A536 ductile iron that loops around the pipe and allows for the saddle to be drawn tight against the pipe surface with carbon steel bolts and hex nuts. The Model 3J threaded outlet mechanical tees are available with the following finishes – painted, epoxy coated or Hot Dip Galvanized per ASTM A153, Class A.

2.7 Model 3JS Threaded Outlet Mechanical Tees

The Model 3JS threaded outlet mechanical tees are designed to provide a connection to a pipe line in place of a tee. The pipe is pre-drilled and the Grade 65-45-12 ASTM A536 ductile iron saddle is placed over the hole so that the EPDM mechanical tee gasket encircles the hole. These mechanical tees have a second piece, manufactured out of Grade 65-45-12 ASTM A536 ductile iron that loops around the pipe and allows for the saddle to be drawn tight against the pipe surface with carbon steel bolts and hex nuts. The Model 3JS threaded outlet mechanical tees are available with the following finishes – painted, epoxy coated or Hot Dip Galvanized per ASTM A153, Class A.

2.8 Model 3L Threaded Outlet U-Bolt Mechanical Tees

The Model 3L threaded outlet u-bolt mechanical tees are designed to provide a connection to a pipe line in place of a tee. The pipe is pre-drilled and the Grade 65-45-12 ASTM A536 ductile iron saddle is placed over the hole so that the EPDM mechanical tee gasket encircles the hole. These mechanical tees have a second piece, manufactured out of carbon steel that loops around the pipe and allows for the saddle to be drawn tight against the pipe surface with carbon steel bolts and hex nuts. The Model 3L threaded outlet u-bolt mechanical tees are available with the following finishes – painted, epoxy coated or Hot Dip Galvanized per ASTM A153, Class A.

3 EXAMINATIONS AND TESTS

3.1 Samples were submitted for examination and testing. The samples were considered to be representative of the product line and were examined, tested, and compared to the manufacturer's drawings. All data remains on file at FM Approvals along with other documents and correspondence applicable to this program.

3.2 All testing and analysis considered appropriate was conducted and verified to be in compliance with the standards defined in Section 1.4.

3.3 Detailed analysis of the examination and testing can be found as an attachment at the end of this Report.

4 MARKING

4.1 The following information appears on each non-gasketed pipe fitting discussed in this Report in raised cast letters and meets Standard requirements:

- Manufacturer's Name or Trademark
- Product Model Number
- Nominal Pipe Size
- Date Code
- Heat Code
- FM Approvals Certification Mark

4.2 The following information appears on each mechanical tee discussed in this Report in raised cast letters and meets Standard requirements:

- Manufacturer's Name or Trademark
- Product Model Number
- Nominal Pipe Size
- Date Code
- Heat Code
- FM Approvals Certification Mark

4.3 The following information appears on each grooved coupling discussed in this Report in raised cast letters and meets Standard requirements:

- Manufacturer's Name or Trademark
- Product Model Number
- Nominal Pipe Size
- FM Approvals Certification Mark

4.4 The following markings appear on the inside of the grooved couplings:

- Heat Code
- Date Code

5 REMARKS

5.1 The FM Global Property Loss Prevention Data Sheets should be strictly adhered to when installing this product.

5.2 Installations shall comply with the latest edition of the manufacturer's instruction manual.

5.3 Tampering and/or replacement with non-factory components may adversely affect the safe use of the product.

6 SURVEILLANCE AUDIT

The design and manufacturing facilities at the following locations are subject to follow-up audit inspections. The facilities and quality control procedures in place have been found to be satisfactory to manufacture product identical to that examined and tested as described in this Report. A revision request form shall be submitted to FM Approvals for requesting any additional manufacturing facilities which are not listed below. The Products discussed in this Report are FM Approved only when designed and manufactured in the following facility:

Design and Manufacturing

Hebei Dikai Piping Products Co Ltd
East Wei San Rd Mengcun
Cangzhou, Hebei 061400
China

7 MANUFACTURER'S RESPONSIBILITIES

7.1 Documentation considered critical to this Approval is on file at FM Approvals and is listed in the Documentation File, Section 8, of this Report. No changes of any nature shall be made unless notice of the proposed change has been given and written authorization obtained from FM Approvals. The revision request form shall be forwarded to FM Approvals as notice of proposed changes.

7.2 The manufacturer is responsible for control of the product marking and installation instructions for the product.

7.3 The manufacturer shall provide installation, operating, and maintenance manual(s) with each system.

7.4 The manufacturer is responsible for performing the Manufacturing and Production Tests specified in the Standard defined in Section 1.4 of this Approval Report.

8 DOCUMENTATION FILE

All pertinent Report documents are outlined in the ATTACHMENTS list below.

9 CONCLUSION

The Products described in Section 1 of this Report meet FM Approvals requirements when manufactured at the facility detailed in Section 6 of this Report. Since a duly signed Master Agreement is on file for this manufacturer, Approval is effective the date of this report.

PROJECT DATA RECORD: PR468089

ATTACHMENTS:	Appendix A	Non-Gasketed Pipe Fitting Approval Guide Listing
	Appendix B	Mechanical Tee, Approval Guide Listing
	Appendix C	Grooved Coupling Approval Guide Listings
	Appendix D	Detailed Analysis
	Appendix E	Critical Document List (CDL)

APPROVAL GUIDE LISTING

Non-Gasketed Pipe Fittings

Fire Protection – Automatic Sprinkler Systems – Pipes and Fittings for Aboveground – Pipe Fittings – Pipe Fittings

Hebei Dikai Piping Products Co Ltd
East Wei San Rd Mengcun, Cangzhou, Hebei 061400, China

Model No	Description	Nominal Pipe Size, in	Rated Working Pressure		Remarks
			psi	(kPa)	
90	90 Degree Elbow	1, 1 1/4, 1 1/2, 2, 2 1/2, 3, 4, 5, 6, 8, 10, 12 76.1, 108, 139.7, 159, 165.1, 216.3, 267.4, 318.5 mm	300	(2065)	a, b, e
90DE	90 Degree Drain Elbow	2 x 1 2-1/2 x 1 76.1 mm x 1 3 x 1 4 x 1 139.7 mm x 1 5 x 1 165.1 mm x 1 6 x 1 216.3 mm x 1 8 x 1	300	(2065)	a, b, d, e
90RT	90° Reducing Elbow	1 1/4 x 1/2, 3/4, 1 1 1/2 x 1/2, 3/4, 1 2 x 1/2, 3/4, 1 2-1/2 x 1/2, 3/4, 1 76.1 mm x 1/2, 3/4, 1 3 x 1/2, 3/4, 1	300	(2065)	a, b, e
90S	Short Radius 90 Degree Elbow	2, 2 1/2, 3, 4, 5, 6, 8, 10, 12 76.1, 108, 139.7, 159, 165.1, 216.3, 267.4, 318.5 mm	300	(2065)	a, b, e
105	11.25 Degree Elbow	1 1/4, 1 1/2, 2, 2 1/2, 3, 4, 5, 6, 8 76.1, 108, 133, 139.7, 159, 165.1, 216.3 mm	300	(2065)	a, b, e
110	22.5 Degree Elbow	1, 1 1/4, 1 1/2, 2, 2 1/2, 3, 4, 5, 6, 8, 10, 12 76.1, 108, 133, 139.7, 159, 165.1, 216.3, 267.4, 318.5 mm	300	(2065)	a, b, e
120	45 Degree Elbow	1, 1 1/4, 1 1/2, 2, 2 1/2, 3, 4, 5, 6, 8, 10, 12 76.1, 108, 133, 139.7, 159, 165.1, 216.3, 267.4, 318.5 mm	300	(2065)	a, b, e

Model No	Description	Nominal Pipe Size, in	Rated Working Pressure		Remarks
			psi	(kPa)	
130	Equal Tee	1, 1 1/4, 1 1/2, 2, 2 1/2, 3, 4, 5, 6, 8, 10, 12 76.1, 139.7, 159, 165.1, 216.3, 267.4, 318.5 mm	300	(2065)	a, b, e
130S	Short Radius Equal Tee	2, 2 1/2, 3, 4, 5, 6, 8, 10, 12 76.1, 108, 133, 139.7, 159, 165.1, 216.3, 267.4, 318.5 mm	300	(2065)	a, b, e
131	Reducing Tee (Grooved Outlet)	2 x 1, 1-1/4, 1-1/2 2 1/2 x 1, 1 1/4, 1 1/2, 2 76.1 mm x 1, 1-1/4, 1-1/2, 2 3 x 1, 1 1/4, 1 1/2, 2, 2 1/2, 76.1 mm 108 mm x 2, 76.1 mm, 3 4 x 1, 1 1/4, 1 1/2, 2, 2 1/2, 76.1 mm, 3 133 mm x 2, 76.1 mm, 3, 108 mm 139.7 mm x 1, 1-1/4, 1-1/2, 2, 76.1 mm, 3, 4 5 x 1, 1 1/4, 1 1/2, 2, 2 1/2, 3, 4 159 mm x 2, 76.1 mm, 3, 108 mm, 4, 133 mm 165.1 mm x 1, 1-1/4, 1-1/2, 2, 76.1 mm, 3, 108 mm, 4, 139.7 mm 6 x 1, 1 1/4, 1 1/2, 2, 2 1/2, 76.1 mm, 3, 4, 139.7 mm, 5 216.3 mm x 1, 1-1/4, 1-1/2, 2, 76.1 mm, 3, 4, 139.7 mm, 165.1 mm 8 x 1, 1 1/4, 1 1/2, 2, 2 1/2, 76.1 mm, 3, 4, 139.7 mm, 5, 165.1 mm, 6 267.4 mm x 4, 139.7 mm, 165.1 mm, 216.3 mm 10 x 4, 139.7 mm, 5, 159 mm, 165.1 mm, 6, 8 318.5 mm x 4, 139.7 mm, 165.1 mm, 216.3 mm, 267.4 mm 12 x 4, 139.7 mm, 5, 165.1 mm, 6, 8, 10	300	(2065)	a, b, e
131N	Reducing Tee (Threaded Outlet)	2 x 3/4, 1, 1-1/4, 1-1/2 2-1/2 x 1, 1-1/4, 1-1/2, 2 76.1 mm x 1, 1-1/4, 1-1/2, 2 3 x 1, 1-1/4, 1-1/2, 2, 2-1/2, 76.1 mm 108 mm x 1, 1-1/4, 1-1/2, 2, 76.1 mm 4 x 1, 1-1/4, 1-1/2, 2, 2-1/2, 76.1 mm, 3 133 mm x 1, 1-1/4, 1-1/2, 2, 76.1 mm 139.7 mm x 1, 1-1/4, 1-1/2, 2, 76.1 mm, 3 5 x 1, 1-1/4, 1-1/2, 2, 2-1/2, 3 159 mm x 1, 1-1/4, 1-1/2, 2, 76.1 mm, 3 165.1 mm x 1, 1-1/4, 1-1/2, 2, 76.1 mm, 3	300	(2065)	a, b, d, e

Model No	Description	Nominal Pipe Size, in	Rated Working Pressure		Remarks
			psi	(kPa)	
		6 x 1, 1-1/4, 1-1/2, 2, 2-1/2, 76.1 mm, 3 216.3 mm x 1, 1-1/4, 1-1/2, 2, 76.1 mm, 3 8 x 1, 1-1/4, 1-1/2, 2, 2-1/2, 76.1 mm, 3			
180	Equal Cross	1, 1-1/4, 1-1/2, 2, 2-1/2, 3, 4, 5, 6, 8, 10, 12 76.1, 108, 133, 139.7, 159, 165.1, 216.3, 267.4, 318.5 mm	300	(2065)	a, b, e
180S	Short Radius Equal Cross	2, 2 1/2, 3, 4, 5, 6, 8 76.1, 108, 133, 139.7, 159, 165.1, 216.3 mm	300	(2065)	a, b, e
230	Eccentric Reducer	2-1/2 x 1-1/4, 1-1/2, 2 76.1 mm x 1-1/4, 1-1/2, 2 3 x 2, 2-1/2, 76.1 mm 4 x 2, 2-1/2, 76.1 mm, 3 139.7 mm x 2, 76.1 mm, 3, 4 5 x 2, 2-1/2, 3, 4 165.1 mm x 2, 76.1 mm, 3, 4, 139.7 mm 6 x 2, 2-1/2, 76.1 mm, 3, 4, 5 216.3 mm x 3, 4, 139.7 mm, 165.1 mm 8 x 3, 4, 139.7 mm, 5, 165.1 mm, 6 267.4 mm x 4, 139.7 mm, 165.1 mm, 216.3 mm 10 x 4, 139.7 mm, 5, 165.1 mm, 6, 8 318.5 mm x 4, 139.7 mm, 165.1 mm, 216.3 mm, 267.4 mm 12 x 4, 139.7 mm, 5, 165.1 mm, 6, 8, 10	300	(2065)	a, b, e
240	Concentric Reducer	1 1/4 x 1 1 1/2 x 1, 1 1/4 2 x 1, 1 1/4, 1 1/2 2 1/2 x 1, 1 1/4, 1 1/2, 2 76.1 mm x 1, 1-1/4, 1-1/2, 2 3 x 1, 1 1/4, 1 1/2, 2, 2 1/2, 76.1 mm 108 mm x 2, 76.1 mm, 3 4 x 1, 1 1/4, 1 1/2, 2, 2 1/2, 76.1 mm, 3 139.7 mm x 1, 1-1/4, 1-1/2, 2, 76.1 mm, 3, 4 5 x 1, 1 1/4, 1 1/2, 2, 2 1/2, 3, 4 159 mm x 2, 76.1 mm, 3, 108 mm, 4, 133 mm 165.1 mm x 1, 1-1/4, 1-1/2, 2, 76.1 mm, 3, 4, 139.7 mm 6 x 1, 1 1/4, 1 1/2, 2, 2 1/2, 76.1 mm, 3, 4, 5 216.3 x 1, 1 1/4, 1 1/2, 2, 76.1 mm, 3, 4, 139.7 mm, 165.1 mm	300	(2065)	a, b, e

Model No	Description	Nominal Pipe Size, in	Rated Working Pressure		Remarks
			psi	(kPa)	
		8 x 1, 1 1/4, 1 1/2, 2, 2 1/2, 76.1 mm, 3, 4, 139.7 mm, 5, 165.1 mm, 6 267.4 mm x 4, 139.7 mm, 165.1 mm, 216.3 mm 10 x 4, 139.7 mm, 5, 165.1 mm, 6, 8 318.5 mm x 4, 139.7 mm, 165.1 mm, 216.3 mm, 267.4 mm 12 x 4, 139.7 mm, 5, 165.1 mm, 6, 8, 10			
240N	Concentric Reducer (Threaded Outlet)	1-1/4 x 1 1-1/2 x 1, 1-1/4 2 x 1, 1-1/4, 1-1/2 2-1/2 x 1, 1-1/4, 1-1/2, 2 76.1 mm x 1, 1-1/4, 1-1/2, 2 3 x 1, 1-1/4, 1-1/2, 2, 2-1/2, 76.1 mm 108 mm x 1, 1-1/4, 1-1/2, 2, 76.1 mm, 3 4 x 1, 1-1/4, 1-1/2, 2, 2-1/2, 76.1 mm, 3 133 mm x 1, 1-1/4, 1-1/2, 2, 76.1 mm, 3 139.7 mm x 1, 1-1/4, 1-1/2, 2, 76.1 mm, 3 5 x 1, 1-1/4, 1-1/2, 2, 2-1/2, 3 159 mm x 1, 1-1/4, 1-1/2, 2, 76.1 mm, 3 165.1 mm x 1, 1-1/4, 1-1/2, 2, 76.1 mm, 3 6 x 1, 1-1/4, 1-1/2, 2, 2-1/2, 76.1 mm, 3 216.3 mm x 1, 1-1/4, 1-1/2, 2, 76.1 mm, 3 8 x 1, 1-1/4, 1-1/2, 2, 2-1/2, 76.1 mm, 3	300	(2065)	a, b, d, e
300	End Cap	1, 1 1/4, 1 1/2, 2, 2 1/2, 3, 4, 5, 6, 8, 10, 12 76.1, 108, 133, 139.7, 159, 165.1, 216.3, 267.4, 318.5 mm	300	(2065)	a, b, e
300H1	Concentric Drain End Cap	2 x 1, 1-1/4, 1-1/2 2-1/2 x 1, 1-1/4, 1-1/2 76.1 mm x 1, 1-1/4, 1-1/2 3 x 1, 1-1/4, 1-1/2 4 x 1, 1-1/4, 1-1/2 139.7 mm x 1, 1-1/4, 1-1/2 5 x 1, 1-1/4, 1-1/2 165.1 mm x 1, 1-1/4, 1-1/2 6 x 1, 1-1/4, 1-1/2 216.3 mm x 1, 1-1/4, 1-1/2 8 x 1, 1-1/4, 1-1/2	300	(2065)	a, b, d, e
300H2	Eccentric Drain End Cap	2 x 1, 1-1/4, 1-1/2 2-1/2 x 1, 1-1/4, 1-1/2, 2	300	(2065)	a, b, d, e

Model No	Description	Nominal Pipe Size, in	Rated Working Pressure		Remarks
			psi	(kPa)	
		76.1 mm x 1, 1-1/4, 1-1/2, 2 3 x 1, 1-1/4, 1-1/2, 2 4 x 1, 1-1/4, 1-1/2 139.7 x 1, 1-1/4, 1-1/2, 2 5 x 1, 1-1/4, 1-1/2, 2 165.1 mm x 1, 1-1/4, 1-1/2, 2 6 x 1, 1-1/4, 1-1/2, 2 216.3 mm x 1, 1-1/4, 1-1/2 8 x 1, 1-1/4, 1-1/2, 2			
321G	Flange Adapter (Grooved Outlet)	2, 2 1/2, 3, 4, 5, 6, 8, 10, 12 76.1, 108, 133, 139.7, 159, 165.1, 216.3, 267.4, 318.5 mm	300	(2065)	a, b, c, e

Remarks:

a. Ductile Iron according to ASTM A536

b. Available with Cut Grooves

c. Supplied with Class 150 Flanges

d. Supplied with NPT Threads

e. Available in either a Red Painted, ASTM A153, Class A Hot Dip Galvanized or Epoxy Powder Coated surface finish

APPROVAL GUIDE LISTING

Mechanical Tee

Fire Protection – Automatic Sprinkler Systems – Pipes and Fittings for Aboveground – Pipe Fittings – Fittings, Side Outlet, Rigid

Hebei Dikai Piping Products Co Ltd
East Wei San Rd Mengcun, Cangzhou, Hebei 061400, China

Model No	Description	Nominal Pipe Size, in	Rated Working Pressure		Remarks
			psi	(kPa)	
3L	U-bolt Mechanical Tee, Threaded Outlet	1 x 1/2, 3/4 1 1/4 x 1/2, 3/4, 1 1 1/2 x 1/2, 3/4, 1 2 x 1/2, 3/4, 1 2 1/2 x 1/2, 3/4, 1 3 x 1	200	(1375)	a, b, c, d, g, h
3J	Mechanical Tee, Threaded Outlet	2 x 1, 1 1/4, 1 1/2 2 1/2 x 1, 1 1/4, 1 1/2, 2 3 x 3/4, 1, 1 1/4, 1 1/2, 2 108 mm x 1-1/4, 1-1/2, 2, 76.1 mm, 3 4 x 1, 1 1/4, 1 1/2, 2, 2 1/2, 76.1 mm, 3 133 mm x 1-1/4, 1-1/2, 2, 76.1 mm, 3 5 x 3/4, 1, 1-1/4, 1-1/2, 2, 2-1/2, 3 159 mm x 1-1/4, 1-1/2, 2, 76.1 mm, 3 6 x 1, 1 1/4, 1 1/2, 2, 2 1/2, 76.1 mm, 3 8 x 1, 1-1/4, 1-1/2, 2, 2 1/2, 76.1 mm, 3, 4	300	(2065)	a, b, c, d, h
3J	Mechanical Tee, Threaded Outlet	76.1 mm x 1, 1-1/4, 1-1/2, 2 108 mm x 1, 1-1/4, 1-1/2, 2, 76.1 mm, 3 133 mm x 1-1/4, 1-1/2, 2, 76.1 mm, 3 139.7 mm x 1, 1-1/4, 1-1/2, 2, 76.1 mm, 3 159 mm x 1, 1-1/4, 1-1/2, 2, 76.1 mm, 3 165.1 mm x 1, 1 1/4, 1-1/2, 2, 76.1 mm, 3	300	(2065)	a, b, f, h
3J	Mechanical Tee, Threaded Outlet	216.3 mm x 1, 1-1/4, 1-1/2, 2, 76.1 mm, 3	300	(2065)	a, b, g, h

Model No	Description	Nominal Pipe Size, in	Rated Working Pressure		Remarks
			psi	(kPa)	
3JS	Mechanical Tee, Threaded Outlet	1 x 1/2, 3/4 1-1/4 x 1/2, 3/4 1-1/2 x 1/2, 3/4 2 x 1/2, 3/4 2-1/2 x 1/2, 3/4 76.1 mm x 1/2, 3/4 3 x 1-1/4	300	(2065)	a, b, c, d, f, h
3G	Mechanical Tee, Grooved Outlet	2 x 1, 1 1/4, 1 1/2 2 1/2 x 1, 1 1/4, 1 1/2 3 x 1, 1 1/4, 1 1/2, 2 108 mm x 2, 76.1 mm, 3 4 x 1, 1 1/4, 1 1/2, 2, 2 1/2, 76.1 mm, 3 133 mm x 2, 76.1 mm, 3 5 x 1, 1-1/4, 1-1/2, 2, 2-1/2, 3 159 mm x 2, 76.1 mm, 3 6 x 1, 1-1/4, 1 1/2, 2, 2 1/2, 76.1 mm, 3, 4 8 x 1, 1-1/4, 1-1/2, 2, 2 1/2, 76.1 mm, 3, 4	300	(2065)	a, b, c, d, h
3G	Mechanical Tee, Grooved Outlet	76.1 mm x 1, 1-1/4, 1-1/2 108 mm x 2, 76.1 mm, 3 133 mm x 2, 76.1 mm, 3 139.7 mm x 1, 1-1/4, 1-1/2, 2, 76.1 mm, 3 159 mm x 2, 76.1 mm, 3 165.1 mm x 1, 1-1/4, 1-1/2, 2, 76.1 mm, 3	300	(2065)	a, b, f, g, h
3G	Mechanical Tee, Grooved Outlet	216.3 mm x 1, 1-1/4, 1-1/2, 2, 76.1 mm, 3	300	(2065)	a, b, g, h

Remarks:

a. Ductile Iron according to ASTM A536

b. EPDM Gasket

c. Min schedule cut groove pipe to be joined: 6 in. or smaller - Schedule 40; 8 in. or larger - Schedule 30

d. Min schedule rolled groove pipe to be joined: 6 in. or smaller - Schedule 10S; and larger 0.188 in. (5 mm) wall

f. Approved for Use with Rolled and Cut Groove GB/T 3091 pipe with comparable wall thicknesses to ASME B36.10M Schedule 40

g. Approved for Use with Rolled and Cut Groove Schedule 40 Equivalent JIS G3454 pipe

h. Available in either a Red Painted, ASTM A153, Class A Hot Dip Galvanized or Epoxy Powder Coated surface finish

APPROVAL GUIDE LISTING

Rigid Grooved End Coupling

Fire Protection – Automatic Sprinkler Systems – Pipes and Fittings for Aboveground – Grooved Couplings or Fittings – Grooved Couplings, Standard-Rigid

Hebei Dikai Piping Products Co Ltd
East Wei San Rd Mengcun, Cangzhou, Hebei 061400, China

Pipe Description	Rated Working Pressures for Model 1F Rigid Coupling by Pipe [a, b, c, d]																			
	Nominal Pipe Size																			
	1 (33.4)	1-1/4 (42.2)	1-1/2 (48.3)	2 (60.3)	2-1/2 (73.0)	(76.1)	3 (88.9)	(108)	4 (114.3)	(133)	(139.7)	5 (141.3)	(159)	(165.1)	6 (168.3)	(216.3)	8 (219.1)	(267.4)	10 (273.0)	(318.5)	12 (323.9)
Schedule 40, Cut Groove	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)		300 (2065)		300 (2065)			300 (2065)			300 (2065)		300 (2065)				
Schedule 40, Roll Groove	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)		300 (2065)		300 (2065)			300 (2065)			300 (2065)		300 (2065)				
Schedule 30, Cut Groove																					
Schedule 30, Rolled Groove																					
Thinwall Pipes, Rolled Groove																					
Schedule 10, Rolled Groove	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)		300 (2065)		300 (2065)			300 (2065)			300 (2065)						
0.188” Wall, Rolled Groove																	300 (2065)				
Lightwall Pipes, Rolled Groove																					
Schedule 5 Pipe, Rolled Groove																					
GB/T 3091, Rolled Groove		300 (2065)	300 (2065)	300 (2065)		300 (2065)	300 (2065)		300 (2065)		300 (2065)			300 (2065)			300 (2065)				
Schedule 40 Equivalent GB/T 8163, Cut Groove		300 (2065)	300 (2065)	300 (2065)		300 (2065)	300 (2065)		300 (2065)		300 (2065)				300 (2065)		300 (2065)				
Schedule 40 Equivalent GB/T 8163, Rolled Groove		300 (2065)	300 (2065)	300 (2065)		300 (2065)	300 (2065)		300 (2065)		300 (2065)				300 (2065)		300 (2065)				
Schedule 10 Equivalent GB/T 8163, Rolled Groove		300 (2065)	300 (2065)	300 (2065)		300 (2065)	300 (2065)		300 (2065)		300 (2065)				300 (2065)						
5.0 mm GB/T 8163, Rolled Groove																	300 (2065)				

Pipe Description	Rated Working Pressures for Model 1F Rigid Coupling by Pipe [a, b, c, d]																			
	Nominal Pipe Size																			
	1 (33.4)	1-1/4 (42.2)	1-1/2 (48.3)	2 (60.3)	2-1/2 (73.0)	(76.1)	3 (88.9)	(108)	4 (114.3)	(133)	(139.7)	5 (141.3)	(159)	(165.1)	6 (168.3)	(216.3)	8 (219.1)	(267.4)	10 (273.0)	(318.5)	12 (323.9)
Schedule 40 Equivalent JIS G3454, Cut Groove	300 (2065)	300 (2065)	300 (2065)	300 (2065)		300 (2065)	300 (2065)		300 (2065)		300 (2065)			300 (2065)		300 (2065)					
Schedule 40 Equivalent JIS G3454, Rolled Groove	300 (2065)	300 (2065)	300 (2065)	300 (2065)		300 (2065)	300 (2065)		300 (2065)		300 (2065)			300 (2065)		300 (2065)					
Remarks:	a.) Minimum schedule cut groove pipe to be joined: 6 inch or smaller, Schedule 40; 8 inch or larger, Schedule 30 b.) Minimum schedule rolled groove pipe to be joined: 6 inch or smaller, Schedule 10; 8 or 10 inch - 0.188 inch (5 mm) wall; 12 inch – 0.250 in. wall c.) All couplings in table above, Approved when supplied with a Grade E EDPM gasket using standard gasket lubricant d.) All couplings in table above, Approved when available with the following finishes – painted, epoxy coated or Hot Dip Galvanized per ASTM A153, Class A																			

APPROVAL GUIDE LISTING

Flexible Grooved End Coupling

Fire Protection – Automatic Sprinkler Systems – Pipes and Fittings for Aboveground – Grooved Couplings or Fittings – Grooved Couplings, Standard-Flexible

Hebei Dikai Piping Products Co Ltd
East Wei San Rd Mengcun, Cangzhou, Hebei 061400, China

Pipe Description	*Rated Working Pressures for Model 1NH Flexible Coupling by Pipe* [a, b, c, e]																		
	Nominal Pipe Size																		
	1 (33.4)	*1-1/4 (42.4)*	*1-1/2 (48.3)*	*2 (60.3)*	*2/-1/2 (73.1)*	*(76.1)*	*3 (88.9)*	*(108)*	*4 (114.3)*	*(133)*	*(139.7)*	*5 (141.3)*	*(159)*	*(165.1)*	*6 (168.3)*	*(216.3)*	*8 (219.1)*	*10 (273)*	*12 (323.9)*
Schedule 40, Cut Groove	500 (3445)	500 (3445)	500 (3445)	500 (3445)	500 (3445)		500 (3445)		500 (3445)			500 (3445)			500 (3445)	500 (3445)	500 (3445)	500 (3445)	500 (3445)
Schedule 40, Roll Groove	500 (3445)	500 (3445)	500 (3445)	500 (3445)	500 (3445)		500 (3445)		500 (3445)			500 (3445)			500 (3445)	500 (3445)	500 (3445)	500 (3445)	500 (3445)
Schedule 30, Cut Groove																			
Schedule 30, Rolled Groove																			
Thinwall Pipes, Rolled Groove																			
Lightwall Pipes, Rolled Groove																			
Schedule 5 Pipe, Rolled Groove																			
GB/T 3091[d], Cut Groove						500 (3445)					500 (3445)			500 (3445)					
GB/T 3091[e], Rolled Groove						500 (3445)					500 (3445)			500 (3445)					
Schedule 40 Equivalent JIS G3454, Cut Groove																500 (3445)			
Schedule 40 Equivalent JIS G3454, Rolled Groove																500 (3445)			
Remarks:	*a.) Minimum schedule cut groove pipe to be joined: 6 inch or smaller, Schedule 40; 8 inch or larger, Schedule 30* *b.) Minimum schedule rolled groove pipe to be joined: 6 inch or smaller, Schedule 10; 8 or 10 inch - 0.188 inch (5 mm) wall; 12 inch – 0.250 in. wall* *c.) All couplings in table above, Approved when supplied with a Grade E EDPM gasket using standard gasket lubricant* *d.) FM Approved for use with GB/T3091-2008 steel sprinkler pipe with comparable wall thicknesses to Schedule 40 steel sprinkler pipe per ASME B36.10-2004 specifications* *e.) Available in either a Red Painted, ASTM A153, Class A Hot Dip Galvanized or Epoxy Powder Coated surface finish*																		

DETAILED ANALYSIS

1 EXAMINATION

1.1 The manufacturer provided samples of their gasketed pipe fittings as detailed below for examination and testing. The samples were considered to be representative of the product line and were examined, tested, and compared to the manufacturer's drawings. All data is on file at FM Approvals along with other documents and correspondence applicable to this program.

FM 1920	**Sample Requirements - Gasketed Fittings**						**Samples Required by Test**									
NOTES: a) use hydrostatic strength test sample for bending moment resistance test. b) use vacuum test sample for leakage - assembly w/o gasket test. c) for products other than mechanical tees, the recommended overall length of sample assembly is 4-1/2 feet. d) for mechanical tees, the minimum overall length of run pipe is 2 feet and the minimum overall length of branch pipe is 1 foot. e) Supply test sample with one end of run pipe open with a roll groove and the other end of the run pipe shall be closed. No branch pipe required							**Hydrostatic Strength**	**Bending Moment Resistance**	**Rot. Bending Moment Resistance**	**Vibration Resistance**	**Cycling Pressure Resistance**	**Vacuum Resistance**	**Hot Gasket**	**Cold Gasket**	**Leakage – Assembly w/o Gasket**	**Friction Loss Determination**	**TOTALS**
Model	**Product Type**	**Surface Finish**	**Pipe Used**	**Size** NPS	**X**	**Tee** NPS	c,d	c,d	c,d								
1F	Rigid Coupling	RG Sch. 10	Epoxy	1-1/4			1	1			1						3
		RG Sch. 10	Painted	1-1/2			1	1		1							3
		RG Sch. 10	Galvanized	2			1	1		1							3
		RG Sch. 10	Painted	3			1	1					1	1			4
		RG Sch. 10	Epoxy	4			1	1				1			1		4
		RG Sch. 10	Galvanized	6			1	1			1						3
		RG GB/T 3091	Painted	8			1	1			1		1	1			5
3G	Grooved Outlet Mechanical Tees	RG Sch. 10	Painted	2	X	1										1	1
3J	Threaded Outlet Mechanical Tees	RG Sch. 10	Painted	2-1/2	X	2	1		1								2
		RG Sch. 10	Galvanized	3	X	3/4										1	1
3L	Threaded Outlet U-Bolt Mechanical Tees	RG Sch. 10	Painted	1	X	1/2										1	1
		RG Sch. 10	Painted	1	X	3/4										1	1
		RG Sch. 10	Epoxy	3	X	1	1		a		1						2

FM 1920 Sample Requirements - Gasketed Fittings							Samples Required by Test									
NOTES: a) use hydrostatic strength test sample for bending moment resistance test. b) use vacuum test sample for leakage - assembly w/o gasket test. c) for products other than mechanical tees, the recommended overall length of sample assembly is 4-1/2 feet. d) for mechanical tees, the minimum overall length of run pipe is 2 feet and the minimum overall length of branch pipe is 1 foot. e) Supply test sample with one end of run pipe open with a roll groove and the other end of the run pipe shall be closed. No branch pipe required							Hydrostatic Strength	Bending Moment Resistance	Rot. Bending Moment Resistance	Vibration Resistance	Cycling Pressure Resistance	Vacuum Resistance	Hot Gasket	Cold Gasket	Leakage – Assembly w/o Gasket	Friction Loss Determination	TOTALS
Model	**Product Type**	**Surface Finish**	**Pipe Used**	**Size** NPS	**X**	**Tee** NPS	c,d	c,d	c,d							e	
3JS	Threaded Outlet Mechanical Tees	RG Sch. 10	Painted	1	X	1/2		X								1	1
		RG Sch. 10	Painted	1	X	3/4		X								1	1
						Total:	9	7	2	2	4	1	2	2	1	6	

1.2 The manufacturer provided samples of their non-gasketed pipe fittings as detailed below for examination and testing. The samples were considered to be representative of the product line and were examined, tested, and compared to the manufacturer's drawings. All data is on file at FM Approvals along with other documents and correspondence applicable to this program.

FM 1920 Sample Requirements - Non-Gasketed Pipe Fittings		
Provide one sample of each size listed below		
Model	**Product Type - Grooved**	**Sizes, inch NPS**
Model 90S	90° Elbow	10, 12
Model 130S	Equal Tee	10, 12
Model 180	Equal Cross	2, 4, 8

2 DESCRIPTION

2.1 Hydrostatic Strength – Gasketed Pipe Fittings

Samples as detailed above were assembled to short lengths of steel sprinkler pipe with the ends capped. The assembly was filled with water and all air was vented out. The assembly was then subjected to four times its rated working pressure for 5 minutes. There were no signs of cracking or permanent distortion of the assembly as a result of this test. These results are considered satisfactory.

2.2 Hydrostatic Strength – Non-Gasketed Pipe Fittings

The samples detailed above were assembled into similar sized assemblies and were subjected to hydrostatic strength testing. All test assemblies were filled with water while

venting all internal air out of the assemblies. One of the capped ends was connected to a hydrostatic pressure pump. The internal pressure was then increased to four times the desired rated working pressure for the grooved end fittings for five minutes. There was no evidence of fracture, distortion or cracking in any of the assemblies. These results are considered satisfactory.

2.3 Bending Moment Resistance

Samples as detailed above were assembled to two short lengths of steel sprinkler pipe with the ends capped. The assembly was filled with water, cleared of all entrapped air, and subjected to its rated working pressure. The assembly was centered in a fixture that provided support at a spacing of 24 inches (0.6 m) and was subjected to the required bending moment. The bending moment was calculated based on water filled schedule 40 steel sprinkler pipe, maximum hanger spacing [12 or 15 ft (3.6 or 4.6 m) depending on pipe size], the assumption of a missing hanger and a safety factor of two. There was no observed evidence of leakage, cracking, or rupture as a result of this test. These results are considered satisfactory.

2.4 Rotational Bending Moment Resistance

Samples as detailed above were assembled to two short lengths of steel sprinkler run pipe with the ends capped. A length of pipe was installed in the branch of the mechanical tee and capped. The tee-shaped assembly was filled with water, cleared of all entrapped air, and subjected to its rated working pressure. With the run pipe securely restrained, the assembly was subjected to a rotational bending moment in two directions; one tending to rotate the fitting around the centerline of the run pipe, and the other coplanar with the axis of the run pipe. The bending moment was calculated based on water filled schedule 40 steel sprinkler pipe, a maximum hanger spacing of 12 or 15 ft (3.6 or 4.6 m) depending on pipe size, the assumption of a missing hanger and a safety factor of two. There was no observed evidence of leakage, cracking, or rupture as a result of this test. These results are considered satisfactory.

2.5 Vibration Resistance

Samples as detailed above were assembled to two short lengths of steel sprinkler run pipe with the ends capped. The assembly was filled with water, cleared of all entrapped air, and subjected to an internal pressure of 80 psi (550 kPa) which was maintained throughout the vibration test sequence. The assembly was then subjected to the following vibration conditions:

Amplitude, inch (mm)	Total Displacement, inch (mm)	Frequency, Hz	Time, hours
0.020 (0.51)	0.040 (1.02)	18 – 37 (Variable)	5
0.035 (0.90)	0.070 (1.78)	18 – 37 (Variable)	5
0.010 (0.25)	0.020 (0.51)	28	5
0.020 (0.51)	0.040 (1.02)	28	5
0.075 (1.91)	0.150 (3.81)	28	5

After the completion of the vibration sequence, the assembly was subjected to 4 times its rated working pressure for 5 minutes. There was no observed evidence of leakage, cracking, or rupture as a result of this test. These results are considered satisfactory.

2.6 Cycling Pressure Resistance

Samples as detailed above were assembled to short lengths of steel sprinkler pipe and capped at each end. The assembly was filled with water, cleared of all entrapped air, and subjected to its rated working pressure for 5 minutes. The assembly was then connected to a cycling test apparatus which increased the internal pressure to the rated working pressure, and then released the pressure. This pressure profile was repeated for 20,000 cycles. At the conclusion of the pressure cycling sequence, the assembly was subjected to four times its rated working pressure for 5 minutes. There was no observed evidence of leakage, cracking, or rupture as a result of this test. These results are considered satisfactory.

2.7 Vacuum Resistance

Samples as detailed above were assembled with the joint of interest in the center of short lengths of steel sprinkler pipe, capped at each end. The assembly was filled with water, cleared of all entrapped air, and subjected to its rated working pressure for 5 minutes. The assembly was then drained and subjected to an internal vacuum of 25 inHg (85 kPa) for 5 minutes. Following the vacuum test, the assembly was pneumatically pressurized from zero to 50 psi (354 kPa) while submerged in a water bath. There was no observed evidence of leakage or permanent deformation as a result of this test. These results are considered satisfactory.

2.8 Hot Gasket Test

Samples as detailed above were assembled to short lengths of steel sprinkler pipe and capped at each end. The assembly was filled with water, cleared of all entrapped air, and subjected to its rated working pressure for 5 minutes. The assembly was then drained and placed in an air oven at a temperature of 275°F (135°C) for a period of 45 days. Following the exposure period, the assembly was removed from the oven, allowed to cool to room temperature, and then pneumatically pressurized from zero to 50 psi (354 kPa) while submerged in a water bath. There was no observed evidence of leakage as a result of this test. The assembly was then disassembled and the gasket was removed. The gasket was squeezed so that the opposite sides touched, squeezed again in an orientation 90 degrees from the first, twisted into a figure eight shape, and checked for signs of cracking or tearing. There was no observed evidence of cracking or tearing as a result of this test. These results are considered satisfactory.

2.9 Cold Gasket Test

Samples as detailed above were assembled to short lengths of steel sprinkler pipe and capped at each end. The assembly was filled with water, cleared of all entrapped air, and subjected to its rated working pressure for 5 minutes. The assembly was then drained and placed in a freezer at a temperature of -40°F (-40°C) for a period of 4 days. Following the exposure period, the assembly was removed from the freezer, and then pneumatically pressurized from zero to 50 psi (354 kPa) while submerged in a bath of -40°F (-40°C) anti-freeze. There was no observed evidence of leakage as a result of this test. The assembly was then disassembled and the gasket was removed. The gasket was squeezed so that the

opposite sides touched, squeezed again in an orientation 90 degrees from the first, twisted into a figure eight shape, and checked for signs of cracking or tearing. There was no observed evidence of cracking or tearing as a result of this test. These results are considered satisfactory.

2.10 Leakage Test – Assembly without Gasket

Samples as detailed above were assembled, without a gasket, to short lengths of steel sprinkler pipe and subjected to a hydrostatic pressure of 30 psi (205 kPa). Leakage from the assembly did not exceed 32 gal/min (120 L/min). These results are considered satisfactory.

2.11 Friction Loss Determination

Samples as detailed above were installed in a k-factor test fixture and subjected to increasing and decreasing internal pressures from 15 to 50 psi (105 to 345 kPa) in increments of 5 psi (35 kPa), 60 to 100 psi (415 to 690 kPa) in increments of 10 psi (70 kPa) and 125, 150 and 175 psi (860, 1035 and 1205 kPa). The inlet pressure and waterflow were measured, and the discharge coefficient was calculated at each test pressure. The collected data was compared to the applicable values in the following table:

Nominal Pipe Size Outlet inch (mm)	**Minimum Discharge Coefficient "K" Factor**	
	gal/min/(psi)$^{1/2}$	**L/min/(bar)$^{1/2}$**
1/2 (15)	11.7	168
3/4 (20)	17.6	254
1 (25)	26.5	382

The calculated discharge coefficient was greater than the minimum required. These results are considered satisfactory.

3 Conclusion

Based on the above results, no additional tests were deemed necessary.

CRITICAL DOCUMENT LIST (CDL)

The following drawings describe the various gasketed and non-gasketed pipe fittings discussed in this Report and are filed under the project identification number 3049837.

Drawing No.	Description	Rev. Level
DKD-FCG1-33.7	1F-1” Quick Coupling Gasket	0
DKD-1F-33.7	1F-1” Quick Install Coupling	0
DKD-FCG1-42.4	1F-1-1/4” Quick Coupling Gasket	0
DKD-1F-42.4	1F-1-1/4” Quick Install Coupling	0
DKD-FCG1-48.3	1F-1-1/2” Quick Coupling Gasket	0
DKD-1F-48.3	1F-1-1/2” Quick Install Coupling	0
DKD-FCG1-60.3	1F-2” Quick Coupling Gasket	0
DKD-1F-60.3	1F-2” Quick Install Coupling	0
DKD-FCG1-73.0	1F-2-1/2” Quick Coupling Gasket	0
DKD-1F-73.0	1F-2-1/2” Quick Install Coupling	0
DKD-FCG1-76.1	1F-76.1 mm Quick Coupling Gasket	0
DKD-1F-76.1	1F-76.1 mm Quick Install Coupling	0
DKD-FCG1-88.9	1F-3” Quick Coupling Gasket	0
DKD-1F-88.9	1F-3” Quick Install Coupling	0
DKD-90DE-ME-E	90DE 90 Degree Drain Elbow	A/0
DKD-90RT-MA-E1	90RT 90 Degree Reducing Elbow	A/0
DKD-90S-MA-E	90S 90 Degree Elbow	A/0
DKD-105-MA-E	105 11.25 Degree Elbow	A/0
DKD-FCG1-114.3	1F-4” Quick Coupling Gasket	0
DKD-1F-114.3	1F-4” Quick Install Coupling	0
DKD-130-MA-E1	130 Tee	A/0
DKD-130S-MA-E	130S Tee	A/0
DKD-131-MA-E3	131 (Grooved x Grooved) Reducing Tee	A/0
DKD-131N-MA-E3	131N (Grooved x Threaded) Reducing Tee	A/0
DKD-FCG1-139.7	1F-139.7 mm Quick Coupling Gasket	0
DKD-1F-139.7	1F-139.7 mm Quick Install Coupling	0
DKD-FCG1-141.3	1F-5” Quick Coupling Gasket	0
DKD-1F-141.3	1F-5” Quick Install Coupling	0
DKD-FCG1-165.1	1F-165.1 mm Quick Coupling Gasket	0
DKD-1F-165.1	1F-165.1 mm Quick Install Coupling	0
DKD-FCG1-168.3	1F-6” Quick Coupling Gasket	0
DKD-1F-168.3	1F-6” Quick Install Coupling	0
DKD-180-MA-E	180 The Long Cross	A/0
DKD-FCG1-216.3	1F-216.3 mm Quick Coupling Gasket	0
DKD-1F-216.3	1F-216.3 mm Quick Install Coupling	0
DKD-FCG1-219.1	1F-8” Quick Coupling Gasket	0
DKD-1F-219.1	1F-8” Quick Install Coupling	0
DKD-3G-60x33MA-E	3G-2”x1” Mechanical Tee	A/0
DKD-3G-76x33MA-E	3G-3OD(76.1mm)x1” Mechanical Tee	A/0

Drawing No.	Description	Rev. Level
DKD-3G-140x33MA-E	3G-5-1/2OD(139.7mm)x1" Mechanical Tee	A/0
DKD-3G-165x33MA-E	3G-6-1/2OD(165.1mm)x1" Mechanical Tee	A/0
DKD-3G-216x33MA-E	3G-JIS 8" (216.3mm)x1" Mechanical Tee	A/0
DKD-3G-219x33MA-E	3G-8"x1" Mechanical Tee	A/0
DKD-MG1-27-33-E	3/4"-1" Outlet Mechanical Tee Rubber Gasket	A/0
DKD-3J-73x60MA-E	3J-2-1/2"x2" Threaded Outlet Mechanical Tee Housing	A/0
DKD-3J-76x33MA-E	3J-3OD(76.1mm)x1" Threaded Outlet Mechanical Tee	A/0
DKD-3J-76x60MA-E	3J-3OD(76.1mm)x2" Threaded Outlet Mechanical Tee	A/0
DKD-3J-89x27MA-E	3J-3"x3/4" Threaded Outlet Mechanical Tee Housing	A/0
DKD-3J-108x33MA-E	3J-4-1/4OD(108mm)x1" Threaded Outlet Mechanical Tee	A/0
DKD-3J-140x33MA-E	3J-5-1/2OD(139.7mm)x1" Threaded Outlet Mechanical Tee	A/0
DKD-3J-141x27MA-E	3J-5"x3/4" Threaded Outlet Mechanical Tee	A/0
DKD-3J-141x33MA-E	3J-5"x1" Threaded Outlet Mechanical Tee	A/0
DKD-3J-159x33MA-E	3J-6-1/4OD(159mm)x1" Threaded Outlet Mechanical Tee	A/0
DKD-3J-165x33MA-E	3J-6-1/2OD(165.1mm)x1" Threaded Outlet Mechanical Tee	A/0
DKD-3J-216x33MA-E	3J-JIS 8" (216.3mm)x1" Mechanical Tee	A/0
DKD-3J-219x33MA-E	3J-8"x1" Threaded Outlet Mechanical Tee	A/0
DKD-3JS-33x21MC-E	3JS-1"x1/2" Mechanical Tee	0
DKD-3JS-33x27MC-E	3JS-1"x3/4" Mechanical Tee	0
DKD-3JS-42x27MC-E	3JS-1-1/4"x3/4" Mechanical Tee	0
DKD-3JS-48x27MC-E	3JS-1-1/2"x3/4" Mechanical Tee	0
DKD-3JS-60x27MC-E	3JS-2"x3/4" Mechanical Tee	0
DKD-3JS-73x27MC-E	3JS-2-1/2"x3/4" Mechanical Tee	0
DKD-3JS-76x27MC-E	3JS-3ODx3/4" Mechanical Tee	0
DKD-3JS-33CA-E	3JS-1" Mechanical Tee Bottom	0
DKD-3JS-42CA-E	3JS-1-1/4" Mechanical Tee Bottom	0
DKD-3JS-48CA-E	3JS-1-1/2" Mechanical Tee Bottom	0
DKD-3JS-60CA-E	3JS-2" Mechanical Tee Bottom	0
DKD-3JS-73CA-E	3JS-2-1/2" Mechanical Tee Bottom	0
DKD-3JS-76CA-E	3JS-3OD Mechanical Tee Bottom	0
DKD-3JS-89CA-E	3JS-3" Mechanical Tee Bottom	0
DKD-JSG-33-E	3JS-1" Mechanical Tee Rubber Gasket	0
DKD-JSG-42-48-E	3JS-1-1/4" & 1-1/2" Mechanical Tee Rubber Gasket	0
DKD-JSG-60-E	3JS-2" Mechanical Tee Rubber Gasket	0
DKD-JSG-73-76-E	3JS-2-1/2" Mechanical Tee Rubber Gasket	0
DKD-JSG-60x33-E	3JS-3"x1" Mechanical Tee Rubber Gasket	0
DKD-3L-33x21MC-E	3L-1x1/2" Mechanical Tee	A/0
DKD-3L-33x27MC-E	3L-1x3/4" Mechanical Tee	A/0
DKD-3L-89x33MC-E	3L-3x1" Mechanical Tee	A/0
DKD-UG3-E	2-1/2"x1" U-Bolt Mechanical Tee Rubber Gasket	A/0
DKD-1NH-216CA-E	1NH-JIS 8" Flexible Coupling	A/0
DKD-CG1-216-E	8" Coupling Rubber Gasket	A/0