FM Approvals

Not to be distributed outside of FM Approvals and its affiliates except by Customer

APPROVAL REPORT

Project No:	PR467251
Class:	1920
Product Name:	Model 91 Rigid Coupling For Use With Various Aboveground Steel Sprinkler Pipes
Product Type:	Gasketed Pipe Fittings for Use with Aboveground Fire Protection Systems
Name of Listing Company:	Weifang 100tong Casting Co Ltd
Address of Listing Company:	1919 Jichang South Rd Weichang District, Weifang City Shandong Sheng 261052 China
Customer ID:	104639-1

Prepared by

Steven Lucier
Engineer
Fire Protection

Reviewed by

Brian MacDonald
AVP, Technical Team Manager
Fire Protection

David B. Fuller
VP, Manager - Fire Protection

8 January 2026
Date of Approval

FM Approvals
One Technology Way
PO Box 9102
Norwood, MA 02062

1 INTRODUCTION

1.1 Weifang 100tong Casting Co Ltd requested an FM Approval examination of their gasketed pipe fittings with rated working pressures in accordance with the following:

Model	Product Type	Nominal Pipe Size inch	Rated Working Pressure psi	Rated Working Pressure kPa	Pipe
91	Rigid Coupling	1, 1-1/4, 1-1/2, 2, 2-1/2, 3, 4, 5, 6, 8, 10, 12	300	2065	Rolled and Cut Groove Schedule 40
		1, 1-1/4, 1-1/2, 2, 2-1/2, 3, 4, 5, 6	300	2065	Rolled Groove Schedule 10
		8, 10, 12	300	2065	Rolled Groove 0.188 inch (4.78 mm) Wall
		1, 1-1/4, 1-1/2, 2	175	1205	Rolled Groove Schedule 5
		3, 4, 6, 8, 10, 12 139.7 mm	300	2065	Rolled Groove ISO 4200 - Thickness D
		1-1/4, 1-1/2, 2, 3, 4, 6, 8, 10, 12 76.1, 139.7 mm	300	2065	Rolled Groove ISO 4200 - Thickness E
		1-1/4, 2, 3, 4, 6, 8, 10, 12	300	2065	Rolled and Cut Groove ISO 4200 - Thickness F
		1, 1-1/2 76.1, 139.7 mm	300	2065	Rolled Groove ISO 4200 - Thickness F
		1, 1-1/4, 1-1/2, 2, 3, 4, 6, 8, 10, 12 76.1, 139.7 mm	300	2065	Rolled and Cut Groove ISO 4200 - Thickness G
		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 mm	300	2065	Rolled and Cut Groove Schedule 40 Equivalent EN 10217 & EN 10220
		1, 1-1/4, 1-1/2, 2, 2-1/2, 3, 4, 5, 6 76.1, 108, 133, 139.7, 159, 165.1	300	2065	Rolled and Cut Groove Schedule 10 Equivalent EN 10217 & EN 10220
		8, 10, 12	300	2065	Rolled and Cut Groove EN 10217 & EN 10220 with a wall thickness of 0.188 inch (4.78 mm)
		1, 1-1/4, 1-1/2, 2, 3, 4 76.1, 139.7, 165.1, 216.3, 267.4, 318.5 mm	300	2065	Rolled Groove KSD 3507
		1-1/4, 1-1/2, 2, 2-1/2, 3, 4	300	2065	Rolled Groove Bull Moose Tube EDDY-Flow Non-Threadable Lightwall
		1-1/4, 1-1/2, 2, 2-1/2, 3, 4	300	2065	Rolled Groove Wheatland Tube Mega-Flow Non-Threadable Lightwall
		1-1/2, 2, 2-1/2, 3, 4	300	2065	Rolled Groove Youngstown Tube Fire-Flo Non-Threadable Lightwall

Model	Product Type	Nominal Pipe Size inch	Rated Working Pressure psi	Rated Working Pressure kPa	Pipe
91	Rigid Coupling	2, 2-1/2, 3, 4	300	2065	Rolled Groove Nucor Schedule 7 Non-Threadable Lightwall
		165.1 mm	300	2065	Rolled Groove GB/T 3091

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

1.3 Standards

1.3.1 FM Approvals Standards

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

1.4 Listing

The product 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 Model 91 Grooved End Rigid Couplings

The Model 91 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 QT-450 GB/T 1348 ductile iron split housing, carbon steel bolts and hex nuts and are sealed at the pipe surface with an EPDM elastomer gasket. The Model 91 rigid grooved end couplings are available with the following finishes – Red Painted, Epoxy, Dacromet, 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 1.3.

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 product discussed in this Report in raised cast letters and meets Standard requirements:

- Manufacturer's Name or Trademark
- Product Model Number
- Manufacturing Source Code
- Nominal pipe Size
- Date Code / Heat Code
- Pressure Rating
- FM Approvals Certification Mark

4.2 The following markings appear on the inside of the gasketed couplings:

- Cavity Number
- Date Code / Heat 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

Weifang 100tong Casting Co Ltd
1919 Jichang South Rd
Weichang District,
Weifang City Shandong Sheng 261052
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 1.3 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: PR467251

ATTACHMENTS:	Appendix A	Grooved Coupling Approval Guide Listings
	Appendix B	Detailed Analysis
	Appendix C	Critical Document List (CDL)

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

Weifang 100tong Casting Co Ltd
1919 Jichang South Rd, Weichang District, Weifang City Shandong, 261052, China

Pipe Description	*Rated Working Pressures for Model 91 Rigid Coupling by Pipe* [a, b, c, d, e, f]																			
	Nominal Pipe Size																			
	1 (33.7)	*1-1/4 (42.7)*	*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)*	*(267.4)*	*10 (273)*	*(318.5)*	*12 (323.9)*
Rolled and Cut Groove Schedule 40	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)		300 (2065)		300 (2065)			300 (2065)			300 (2065)		300 (2065)		300 (2065)		300 (2065)
Rolled Groove Schedule 10	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)		300 (2065)		300 (2065)			300 (2065)			300 (2065)						
Rolled Groove 0.188 inch (4.78 mm) Wall																	300 (2065)		300 (2065)		300 (2065)
Rolled Groove Schedule 5	175 (1205)	175 (1205)	175 (1205)																		
Rolled Groove ISO 4200 - Thickness D							300 (2065)		300 (2065)		300 (2065)				300 (2065)		300 (2065)		300 (2065)		300 (2065)
Rolled Groove ISO 4200 - Thickness E		300 (2065)	300 (2065)	300 (2065)		300 (2065)	300 (2065)		300 (2065)		300 (2065)				300 (2065)		300 (2065)		300 (2065)		300 (2065)
Rolled and Cut Groove ISO 4200 - Thickness F		300 (2065)	300 (2065)	300 (2065)			300 (2065)		300 (2065)						300 (2065)		300 (2065)		300 (2065)		300 (2065)
Rolled Groove ISO 4200 - Thickness F	300 (2065)		300 (2065)			300 (2065)					300 (2065)										
Rolled and Cut Groove ISO 4200 - Thickness G	300 (2065)	300 (2065)	300 (2065)	300 (2065)		300 (2065)	300 (2065)		300 (2065)		300 (2065)				300 (2065)		300 (2065)		300 (2065)		300 (2065)
Rolled and Cut Groove Schedule 40 Equivalent EN 10217 & EN 10220	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)		300 (2065)		300 (2065)
Rolled and Cut Groove Schedule 10 Equivalent EN 10217 & EN 10220	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)	300 (2065)						
Rolled and Cut Groove EN 10217 & EN 10220 with a wall thickness of 0.188 inch (4.78 mm)																	300 (2065)		300 (2065)		300 (2065)
Rolled Groove KSD 3507	300 (2065)	300 (2065)	300 (2065)	300 (2065)		300 (2065)	300 (2065)		300 (2065)		300 (2065)			300 (2065)		300 (2065)		300 (2065)		300 (2065)	

Pipe Description	Rated Working Pressures for Model 91 Rigid Coupling by Pipe [a, b, c, d, e, f]																			
	Nominal Pipe Size																			
	1 (33.7)	1-1/4 (42.7)	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)	(267.4)	10 (273)	(318.5)	12 (323.9)
Lightwall Pipes, Rolled Groove																					
Bull Moose Tube EDDY-Flow		300 (2065)	300 (2065)	300 (2065)	300 (2065)		300 (2065)		300 (2065)												
Wheatland Tube Mega-Flow		300 (2065)	300 (2065)	300 (2065)	300 (2065)		300 (2065)		300 (2065)												
Youngstown Tube Fire-Flo			300 (2065)	300 (2065)	300 (2065)		300 (2065)		300 (2065)												
Nucor Schedule 7				300 (2065)	300 (2065)		300 (2065)		300 (2065)												
Rolled Groove GB/T 3091														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 are Approved when supplied with an EDPM gasket
d.) Product is marked with acceptable trade name of either “100TONG” or “100T”
e.) Available with a Painted Finish
f.) Available with a Galvanized, Epoxy or Dacromet Finish

Company Name:	Weifang 100tong Casting Co Ltd
Company Address:	No. 1919 Jinchang South Rd, Weicheng District, Weifang, 261052 Shandong, China
Company Website:	http://100t.cc
Listing Country:	China
Certification Type:	FM Approved
Class of Work:	1920-Coupling & Fitting, All Type

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.							**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								
91	Rigid Coupling	Galvanized	RG Sch. 5	1-1/4			1	a									**1**
		Painted	RG Sch. 5	2			1	a		1	1						**3**
		Epoxy	RG Mega-Flow	1-1/4			1	a			1						**2**
		Galvanized	RG Mega-Flow	2			1	a		1			1	1			**4**
		Dacromet	RG Mega-Flow	4			1	a			1	1			1		**4**
		Painted	RG Sch. 10	6			1	a									**1**
		Galvanized	RG 0.188" Wall	8			1	a			1		1	1			**4**
		Epoxy	RG 0.188" Wall	10			1	a			1						**2**
		Dacromet	RG 0.188" Wall	12			1	a			1						**2**
						Total:	**9**	**9**	**0**	**2**	**6**	**1**	**2**	**2**	**1**	**0**	

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 Bending Moment Resistance

2.2.1 Schedule 10 Assemblies

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 48 inches (1.2 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.

2.2.2 Non-Threadable Lightwall Assemblies

The sample detailed above was 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 48 inches (1.2 m) and was subjected to the required bending moment. The bending moment was calculated based on a water filled hybrid sprinkler system comprised of both Schedule 10 and 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. This result is considered satisfactory.

2.3 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.

2.4 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.

2.5 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.

2.6 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.

2.7 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.

2.8 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.

3 Conclusion

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

CRITICAL DOCUMENT LIST (CDL)

The following drawings describe the various gasketed pipe fittings discussed in this Report and are filed under the project identification numbers detailed below.

Drawing No.	Description	Rev. Level
Gasketed Pipe Fitting Drawings – Filed under Project ID 467251		
91-89	RIGID COUPLING (assembly drawing)	A
91-89 ASSEMBLY	RIGID COUPLING	A
CJ-9192-89	Coupling Gasket	A