GERAND ENGINEERING CO.
11504 K-TEL DRIVE, MINNETONKA, MN 55431 952.374.1320 WWW.GERAND.COM

To Whom This May Concern:

The pages enclosed are copies of the Factory Mutual Approval reports for the Gerand Engineering Co. Fire Pump Test Meters. The 1977 report is for the Model "M" units and the 1986 report is for the Model "K" units with venturis and orifices.

Gerand Engineering Co. was required to supply Factory Mutual all drawings and independent laboratory test reports on all venturis in order to apply for Factory Mutual approval.

The Factory Mutual Approval was issued to Gerand Engineering Co. after the units were tested and met the Approval Standard - Class No. 1046 for Fire Pump Flowmeter Systems. Stated in this standard under II Description, Para. 4.2 Accuracy is that the system must meet an accuracy of ±2%, full scale deflection for the range of flows from 50% to 200% of the rated capacity of the pump for which it is used.

Factory Mutual annually conducts a stringent audit and inspection of all designs and parts used in the Fire Pump Test Meters. This inspection includes the reviewal of all quality control information we maintain on each part as well as a physical measurement of all dimensions of parts and random testing of the gauges.

GERAND ENGINEERING CO.

Cynthia Baier
CEO/CFO

Scott Swenson
President

MODELS GV AND GO

FIRE PUMP FLOW METER SYSTEMS

from

GERAND ENGINEERING COMPANY

4903 S. CEDAR LAKE ROAD

MINNEAPOLIS, MINNESOTA 55416

J.I. 0N5A0.AH
(1046)

NOVEMBER 24, 1986

Factory Mutual System

Factory Mutual Research

1151 Boston-Providence Turnpike
P.O. Box 9102
Norwood, Massachusetts 02062

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1151 Boston-Providence Turnpike
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November 24, 1986

MODELS GV AND GO
FIRE PUMP FLOW METER SYSTEMS

from

GERAND ENGINEERING COMPANY
4903 S. CEDAR LAKE ROAD
MINNEAPOLIS, MINNESOTA 55416

I INTRODUCTION

1.1 Gerand Engineering Company requested approval of their Models GV (venturi) and GO (orifice plate) fire pump flow meter systems as listed in Table I. Both systems use a Model 1516 differential pressure readout gauge made by Orange Instrument. Both systems have a rated working pressure of 500 psi (345 kPa) when furnished with the Orange Instrument gauge.

1.2 The Model GV is also available with a Barton Model 227 differential pressure gauge. It was approved under Serial Number 27341, with approval report dated January 31, 1977. Systems furnished with the Barton gauge have a maximum rated working pressure of 175 psi (1210 kPa).

TABLE I

Pump Rating gal/min (dm^3/min)	Meter Line Size in. (mm)	Model Designation Venturi (1)	Orifice (2)
25 (95)	1-1/4 (31.8)	GV - 25-1-1/4 (616)	---
50 (190)	2 (50.8)	GV - 50-2 (685)	---
100 (380)	2-1/2 (63.5)	GV - 100-2-1/2 (746)	GO - 100-2-1/2 (753)
150 (565)	2-1/2 (63.5)	GV - 150-2-1/2	GO - 150-2-1/2
200 (755)	3 (76.2)	GV - 200-3 (766)	GO - 200-3 (750)
250 (945)	4 (101.6)	GV - 250-4 (744)	GO - 250-4 (745)
300 (1135)	4 (101.6)	GV - 300-4	GO - 300-4
450 (1700)	4 (101.6)	GV - 450-4	GO - 450-4
500 (1890)	5 (127.0)	GV - 500-5	GO - 500-5 (749)

750 (2840)	6 (152.4)	GV - 750-6	GO - 750-6 (785)
1000 (3785)	6 (152.4)	GV - 100-6	GO - 1000-6
1250 (4730)	6 (152.4)	GV - 1250-6	GO - 1250-6
1500 (5675)	8 (203.2)	GV - 1500-8	GO - 1500-8 (743)
2000 (7570)	8 (203.2)	GV - 2000-8	GO - 2000-8
2500 (9460)	8 (203.2)	GV - 2500-8	GO - 2500-8
3000 (11 355)	8 (203.2)	GV - 3000-8	GO - 3000-8
3500 (13 245)	10 (254.0)	GV - 3500-10	GO - 3500-10 (750)
4000 (15 140)	10 (254.0)	GV - 4000-10	GO - 4000-10
4500 (17 035)	10 (254.0)	GV - 4000-10	GO - 4500-10
5000 (18 925)	12 (304.8)	GV - 5000-12	GO - 5000-12 (750)

II DESCRIPTION

2.1 Both models are supplied with either a venturi or orifice plate, a readout meter, the necessary hardware for mounting the meter, valves, and piping to connect the venturi or orifice plate to the readout meter, and installation instructions.

2.2 The working principle for both the venturi and the orifice plate is the same in that the reduction in area in the flow line created by the venturi throat or the orifice plate, produces a pressure differential. This pressure differential is measured between the inlet and throat area of the venturi and between the areas just before and right after the orifice plate by way of pressure taps. This pressure differential is transmitted to a differential pressure gauge which is usually calibrated to give a direct reading in flow quantities of gal/min or dm^3/min.

2.3 The venturis are available from Gerand Engineering with the following end connections:

1 - VS - Brass screwed ends, 1-1/4 through 2-1/2 in. (31.8 through 63.5 m)

1 - VW-B - Steel butt-welded ends, 2-1/2 through 12 in. (63.5 through 304.8 mm)

1 - V-VG - Steel grooved end, 5 through 12 in. (127.0 through 304.8 mm)

2.4 The orifice plates are available with the following end connections:

2 - OW - Steel socket welded ends, 2-1/2 through 12 in. (63.5 through 304.8 mm)

2 - IO - Steel insert type, used between flanges 2-1/2 through 12 in. (63.5 through 304.8 mm)

2.5 The orifice plate is fabricated out of 15/25-C Plate and then furnished with the above described end connections. The venturis are fabricated out of a spun section of 14 gauge low carbon mild steel and then welded to standard weight Schedule 40 pipe sections.

2.6 The Model 1516D - Differential pressure gauge readout meter manufactured by Orange Research, Inc., (an alternate to the Barton gauge for the venturi meter systems only) is fabricated with either an aluminum or stainless steel Class 303 or 316 body, Buna N diaphragm and a face plate calibrated in gal/min or dm^3/min.

III MARKINGS

The following information is provided on an aluminum nameplate attached to the venturi:

- Manufacturer's name
- Pump capacity
- Size
- Meter range
- Rated working pressure
- FM mark of approval

The following information is provided on an aluminum nameplate attached to the meter:

- Manufacturer's name
- Model number
- Rated working pressure
- Serial number

IV INSTALLATION

The venturi or orifice plate must be installed in the proper direction with the directional arrow on the venturi or orifice plate pointing in the same direction as the flow of water. A minimum length of straight pipe equivalent to five pipe diameters, and of the same nominal size as the venturi, must precede the venturi. Also, a minimum length of pipe equivalent to two pipe diameters must follow the venturi or orifice plate. The high pressure side of the meter must be connected to the upstream connection on the venturi and the low pressure side of the meter must be connected to the downstream connection. The position of the taps should neither be pointing

straight up nor straight down, but preferably in a horizontal direction. Also, the venturi can be installed in horizontal, vertical, or inclined pipe lines. The same is true for the orifice plate systems.

V TESTS

5.1 Flow tests were conducted to determine the ability of both flow meter systems to measure flow rates throughout the range of 50 to 200 percent of rated capacity of the fire pump for which the flow meter was used. A sample GV 750-6 venturi system and a sample GO 750-6 orifice plate system were used to conduct flow tests. These systems were designed for a 750 gal/min (2840 dm^3/min) fire pump and 6 in. (152.6 mm) nominal line size. The readout meter Model 1516 was calibrated to read up to 1500 gal/min (5680 dm^3/min). These tests were conducted at Factory Mutual, using calibrated flow nozzles for comparisons. Both systems displayed satisfactory accuracy throughout the ranges of flow rates tested.

5.2 The venturi and orifice plate assembly including fittings and hoses that connect to the readout meter, were tested to 2000 psi (13 800 kPa), 400 percent of the rated working pressure, for five minutes. There was no leakage or permanent distortion as a result of this test.

5.3 The readout meter was hydrostatically tested to 1000 psi (6900 kPa) 200 percent of the rated working pressure, for 5 minutes. There was no leakage or permanent distortion as a result of this test. Flow tests were used to spot check the accuracy of the meter conducted after the hydrostatic tests. Satisfactory results were obtained from these tests.

VI CONCLUSIONS

Gerand Engineering Company Models GV and GO fire pump flow meter systems as described in Table I and Section II of this report meet Factory Mutual approval requirements. Approval is effective when the Manufacturer's Agreement is signed by the manufacturer and received by Factory Mutual.

TESTS BY: F. A. Lague
V. Cirigliano

ORIGINAL DATA: Test Book 86-205

ATTACHED: Primary Materials List

REPORT BY:

V. Cirigliano
Engineer - Hydraulic Section

REVIEWED BY:

R. L. Allard
Manager - Hydraulic Section

VC/mg/ps

Factory Mutual System

Factory Mutual Research

1151 Boston-Providence Turnpike
Norwood, Massachusetts 02062

27341
(1046)

January 31, 1977

FIRE PUMP FLOWMETER SYSTEMS
STYLES VS, VW-B, V-VG AND VI
SIZES 1 1/4 in. THROUGH 10 in. (31.8 mm THROUGH 254.0 mm)

from

GERAND ENGINEERING CO.
4903 SO. CEDAR LAKE ROAD
MINNEAPOLIS, MINNESOTA 55416

I INTRODUCTION

1.1 Gerand Engineering Co. requested an approval examination of the above flowmeter systems to be used in fire protection systems having a maximum rated working pressure of 175 psi (1206.6 kPa).

1.2 Flowmeters are calibrated to measure the fire pump output directly in gal/min. (dm^3/min.). Water from the pump is temporarily directed through the flowmeter to an atmosphere drain or back to the water supply source. In any case, the pump discharge should not be directly connected to the pump suction line.

II DESCRIPTION

Salient features, material specifications, style differentiation, and parts list are as shown in the attached manufacturer's literature and drawings.

III MARKINGS

Aluminum nameplate attached to venturi indicates the following:

- Manufacturer
- Pump Capacity for Venturi
- Size
- Meter Range
- Rated Working Pressure
- FM Mark of Approval

Aluminum nameplate attached to meter indicates the following:

- Manufacturer
- Model Number
- Rated Working Pressure
- Serial Number

IV TESTS

4.1 Operation and Accuracy - Flow tests throughout the functional range of a sample 3 and 6 in. (76.2 and 152.4 mm) flow metering system were conducted. The following are the satisfactory test results:

6 in. (152.4 mm) Metering System

Actual Flow gal/min.	(dm^3/min.)	Meter Reading gal/min.	(dm^3/min.)	Differential gal/min.	(dm^3/min.)
400	(1514.2)	415	(1570.9)	+15	(56.8)
500	(1892.1)	515	(1949.5)	+15	(56.8)
750	(2839.1)	765	(2895.8)	+15	(56.8)
800	(3028.3)	820	(3104.0)	+20	(75.7)
1000	(3785.4)	1010	(3823.3)	+10	(37.9)
1200	(4542.5)	1205	(4561.4)	+5	(18.5)
1400	(5299.6)	1400	(5299.6)	0	(0.0)
1500	(5678.1)	1500	(5678.1)	0	(0.0)

3 in. (76.2 mm) Metering System

Actual Flow gal/min.	(dm^3/min.)	Meter Reading gal/min.	(dm^3/min.)	Differential gal/min.	(dm^3/min.)
82	(310.4)	80	(307.8)	-2	(7.6)
100	(378.5)	100	(378.5)	0	(0.0)
142	(537.5)	150	(567.8)	+8	(30.3)
194	(734.4)	200	(757.1)	+6	(22.7)
245	(927.4)	250	(946.4)	+5	(18.9)
295	(1116.7)	300	(1135.6)	+5	(18.9)
345	(1305.9)	350	(1324.9)	+5	(18.9)
400	(1514.2)	400	(1514.2)	0	(0.0)

4.2 Hydrostatic Tests - The 3 and 6 in. (76.2 and 152.4 mm) venturies were hydrostatically tested to 700 psi (4826.4 kPa) for 5 minutes without any resulting damage. The flowmeters and associated connections for the above two size venturies were also successfully hydrostatically tested to 350 psi (2413.2 kPa) for 5 minutes.

4.3 Friction Loss - The attached manufacturer's friction loss curves were satisfactory spot checked. The 3 and 6 in. (76.2 and 152.4 mm) venturies were subjected to friction loss tests.

4.4 Corrosion Test - The steel venturies are plated with cadmium with a minimum thickness of 0.0005 in. (.013 mm). Surface preparation and the plating process are in accordance with ASTM specifications. However, to verify this, two sample plated venturies were exposed to a 14 day salt spray test (20% salt by weight). At the conclusion of the test, visual inspection revealed no peeling or blistering of the plating.

V EXAMINATION

Important dimensions were checked to the manufacturer's drawings and were found to agree in all cases. A complete set of drawings are kept on file at Factory Mutual.

VI CONCLUSION

Gerand's 1 1/4 through 10 in. (31.8 through 254.0 mm), Styles VS, VW-B, V-VG and VI fire pump flowmetering systems meet Factory Mutual approval requirements. Approval is effective when the Manufacturer's Agreement is signed and returned to Factory Mutual.

JHL/dn

REPORT AND TESTS BY: J. H. Letourneau

ORIGINAL DATA: Notebook No. 443

ATTACHED: Friction Loss Curves
Dwg. No. 1.25-10
Manufacturer's Literature (5 pages)

J. H. Letourneau
Project Engineer

K. R. Zenker
Manager, Hydraulics

FM Approvals

APPROVED PRODUCT/SPECIFICATION-TESTED REVISION REPORT OR ADDRESS/MAIN CONTACT CHANGE REPORT

Manufacturer's Tracking Number:

SENDER: Forward with updated drawings or other appropriate changes to the attention of FM Approvals. Original forms will be returned showing course of action taken.

Additional forms may be obtained by sending a written request to the attention of the FM Approvals stock room.

FORWARD TO:
FM Approvals
1151 Boston-Providence Turnpike
P.O. Box 9102 Norwood, MA 02062 USA
T: +1 (1)781 762 4300 F: +1 (1)781 762 9375
E-mail: approvals@fmglobal.com

FM Approvals Representative: STAN ZIOBRO

Please provide the following information below: Attention of, Company Name, Address, State & Zip Code.

SANDY G. JARRETT
GERAND ENGINEERING CO.
11504 K-TEL DRIVE
MINNETONKA, MN 55343

Phone: 952-374-1320 Fax: 952-374-1758

DATE (MM/DD/YY): 11/6/03

SENDER: SANDY G. JARRETT

TITLE: PRESIDENT

PRODUCT(S): FIRE PUMP FLOWMETERS

MODEL(S) AFFECTED: GV'S & GO'S

DOES THIS REVISION RESULT IN MODEL/TYPE NUMBER CHANGE TO THE CURRENT *APPROVAL GUIDE* LISTING? IF YES, EXPLAIN BELOW OR USE SEPARATE SHEET IF REQUIRED: [X] YES [ ] NO

INDICATE ORIGINAL FM APPROVALS PROJECT IDENTIFICATION: ON5A0.AH
FIRE PUMP FLOWMETER SYSTEMS P63

HAS THE MANUFACTURING LOCATION, LISTING ADDRESS, TELEPHONE NUMBER OR MAIN CONTACT PERSON CHANGED? IF YES, EXPLAIN BELOW: [ ] YES [X] NO

REASON FOR CHANGE(S)/COMMENTS:

ADDING ANOTHER MODEL NUMBER TO SATISFY THE MEASUREMENT OF FLOW THROUGH A 400 GPM FIRE PUMP.

REVISION DETAILS	AFFECTED DRAWING NUMBER	REVISION	NEW DRAWING NUMBER	REVISION
SEE LISTING SHEET GERANDMCF.DOC ADD 400 GPM RANGE BETWEEN 300 & 450 GPM RANGES	ORANGE RESEARCH DIALDRWG LS605 REV. D IS ON FILE			

702-268

FOR FM APPROVALS USE ONLY

COMMENTS:

Master Agreement Implementation Date:

REVISION REPORT #	ACCESS IDENTIFICATION #	CLASS NUMBER
7	4	1046

REVISION ACCEPTED [X] Yes [ ] No [ ] Third Signature Required

	DATE
EXAMINED BY: M. Farrington	11/20/03
REVIEWED BY: Stanley M. Ziobro	11/20/03
APPROVED BY (Third signature required for listing changes only):	11/25/03

PRIMARY MATERIALS LIST

COMPANY NAME: Gerand Engineering Company	JOB IDENTIFIER: 0N5A0.AH
EQUIPMENT CLASSIFICATION(S): Fire Pump Flow Meter Systems	PROJECT ENGINEER: V. Cirigliano
MODEL/TYPE NO.(S) INVOLVED:	DATE: 11/18/86

Model GV - Venturi
Model GO - Orifice Plate

PRIMARY CONTROL DRAWINGS

DESCRIPTION	DRAWING NO.	ASSOCIATED MODEL/TYPE NO.
Style "GO"	GO - 2.5-12	Orifice Plate
Venturi Ass'y Spun Sect. Fabrication	A 12750 Rev. A (5/81)	Venturi

PRIMARY MATERIALS/PARTS DESCRIPTION	MATERIAL/PART NO.	MANUFACTURER	ASSOCIATED MODEL/TYPE NO.

COMMENTS

RECEIVED

MAY 27 1988

APPROVED PRODUCT — REVISION REPORT OR ADDRESS/CONTACT CHANGE REPORT

Factory Mutual System

SENDER: Forward with updated drawings or other appropriate change information to the attention of the **Approvals Division.** Original will be returned showing course of action taken.

Additional forms may be requested by writing to the attention of the **Factory Mutual Stockroom.**

Please type below your Company Name, Address, City, State & Zip Code.

Attention: SANDY G. HABERLE

GERAND ENGINEERING CO.
4903 SO. CEDAR LAKE RD.
MINNEAPOLIS, MN 55416

FORWARD TO:

FACTORY MUTUAL RESEARCH
1151 Boston-Providence Turnpike
P.O. Box 9102
Norwood MA 02062

Attention: ARMAND V. BRANDAO

Date: 5/17/88

FORWARDED BY: SANDY G. HABERLE

TITLE: DIVISION MANAGER

SIGNATURE:

MODEL(S) AFFECTED: GV's & GO's

PRODUCT(S): FIRE PUMP FLOMETERS

IS A FACTORY MUTUAL LISTED MODEL/TYPE NO. REVISED BY THIS CHANGE? IF YES, EXPLAIN (USE SEPARATE SHEET IF REQUIRED): ☒ YES ☐ NO

INDICATE FACTORY MUTUAL JOB IDENTIFICATION(S) AFFECTED: 0N5A0.AH

HAS THE MANUFACTURING LOCATION, LISTING ADDRESS, TELEPHONE NUMBER OR CONTACT PERSON CHANGED? IF YES, EXPLAIN BELOW: ☐ YES ☒ NO

REVISION DETAILS	DWG NO. AFFECTED	NEW DWG. NO.
SEE ATTACHED	DRAWINGS NOT AFFECTED	

REASON FOR CHANGE(S)/COMMENTS:

EXPANSION OF APPLICATION OF FLOWMETER TO MEET NFPA 20 NOMINAL PIPE SIZES AND SPECS REQUIRING LARGER OR SMALLER PIPE SIZES THAN THE STANDARD ONES.

BELOW FOR FACTORY MUTUAL USE

COMMENTS:

REVISION RPT. J.I.	REVISION NOTICE NO	CLASS NO.
None		1046

FORWARD APPROVAL AGREEMENT: ☐ YES ☒ NO

REVISION ACCEPTED: ☒ YES ☐ NO

EXAMINED BY: [signature] DATE: 24 May 88

REVIEWED BY: [signature] DATE: 5/25/88

GERAND ENGINEERING CO.

4903 S. CEDAR LAKE RD.
MINNEAPOLIS, MN 55416

FAX: (612) 374-1758
Telephone: (612) 374-1320

May 16, 1988

Factory Mutual Research
1151 Boston-Providence Turnpike
Norwood, MA 02062

RE: REVISIONS AND ADDITIONS TO FIRE PUMP FLOMETER SYSTEMS LISTED UNDER GERAND ENGINEERING IN FACTORY MUTUAL'S APPROVAL GUIDE

PUMP RATING GPM (dm3/min.)	METER LINE SIZE IN. (mm)	MODEL DESIGNATION VENTURI	MODEL DESIGNATION ORIFICE
200 (755)	3,4 (76,102)	GV-200-3, 200-4	GO-200-3, 200-4
250 (945)	4,5 (102,127)	GV-250-4, 250-5	GO-250-4, 250-5
450 (1705)	4,5 (102,127)	GV-450-4, 450-5	GO-450-4, 450-5
500 (1895)	5,6 (127,152)	GV-500-5, 500-6	GO-500-5, 500-6

GERAND ENGINEERING CO.

11504 K-TEL DRIVE
MINNETONKA, MN 55343

TELEPHONE: 952-374-1320
FAX: 952-374-1758

November 4, 2003

Factory Mutual Approvals
1151 Boston-Providence Turnpike
Norwood, Massachusetts 02062

RE: ADDITION TO THE FIRE PUMP FLOWMETER SYSTEMS LISTED UNDER GERAND EGNINEERING CO. IN THE FACTORY MUTUAL APPROVAL GUIDE

PUMP RATING GPM (dm3/Min.)	METER LINE SIZE IN. (mm)	MODEL DESIGNATION VENTURI	ORIFICE
400 (1515)	4,5 (102, 127)	GV-400-4 GV-400-5	GO-400-4 GO-400-5