



RAM-0006

Request for Approval of Material

Contract 8078	FA Number _____	SR I-5	Date 2/3/11
Section I-5 Columbia River Bridge (WA 0.3 to OR MP 308)		County WA AND OR states	
Contractor AMERICAN CONSTRUCTION COMPANY, INC.		Subcontractor _____	

This form shall be completed prior to submittal. If this form is not complete at time of submittal it may be returned for information that was omitted.
For assistance in completing, see Instructions and Example

For WSDOT Use Only	
RAM #	6
Bid Item No.	Material or Product/Type
Name and Location of Fabricator, Manufacturer or Pit Number	Specification Reference
PE/QPL Code	Hdqtr./QPL Code

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2&3	FURNISH MANIFOLD FOR BOTH CONFINED AND UNCONFINED BUBBLE CURTAINS	RCM Industries, Inc. 110 Mason circle Concord, CA 94520	SPECIAL PROVISIONS page 98	7	
2.11	FLOWMETERS	www.flo-gage.com			
3.11					

Project Engineer Nicki Peppers for Frank Green	Date 2/3/11	State Materials Engineer	Date
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Acceptance Action Codes for use by Project Engineer and State Materials Laboratory

- 1. Acceptance Criteria: Acceptance based upon 'Satisfactory' Test Report for samples of materials to be incorporated into project.
- 2. Acceptance Criteria: Mfg. Cert. of Compliance for 'Acceptance' prior to use of material.
- 3. Acceptance Criteria: Catalog Cuts for 'Acceptance' prior to use of material. Catalog Cut Approved Yes No
- 4. Acceptance Criteria: Submit Shop Drawings for 'Approval' prior to fabrication of material.
- 5. Acceptance Criteria: Only 'Approved for Shipment', 'WSDOT Inspected' or 'Fabrication Approved Decal' material shall be used.
- 6. Acceptance Criteria: Submit Certificate of Materials Origin to Project Engineer Office.
- 7. Acceptance Criteria: Request Transmitted to State Materials Laboratory for Approval Action.
- 8. Source Approved:

- 9. Approval Withheld: Submit samples for preliminary evaluation.
- 10. Approval Withheld:
- 11. Miscellaneous Acceptance Criteria.

Remarks:

cc: American Construction, Peppers

Project Engineer Distribution		State Materials Engineer Distribution	
<input type="checkbox"/> Contractor	<input type="checkbox"/> Region Materials	<input type="checkbox"/> General File	<input type="checkbox"/> Signing Inspection
<input type="checkbox"/> Region Operations Engineer	<input type="checkbox"/> State Materials Lab M/S 47365	<input type="checkbox"/> Other	
<input type="checkbox"/> Fabrication Inspection			

FLO-GAGE

CAT-0005

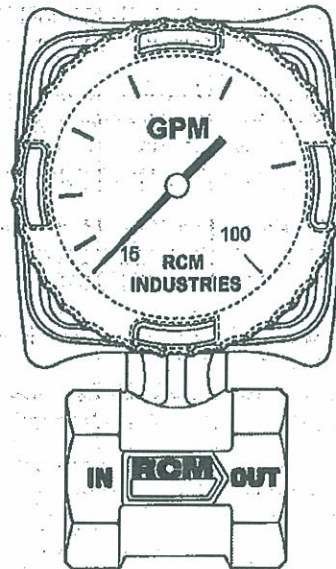
Description

The **RCM Flo-Gage™** is a direct reading flow meter with a large, easy to read dial calibrated in engineering units (GPM, SCFM, l/min, etc.). The **Flo-Gage™** measures flow based on a pressure differential created across a built-in calibrated nozzle. The flow meter is self contained and complete. It does not require external power connections, separate orifices, or blocking, purging or equalizing valves.

The **Flo-Gage™** is suitable for measuring **water, oil and most other low viscosity liquids** which do not deposit out and which are compatible with the materials of construction.

The **Flo-Gage™** is also suitable for measuring **compressed air, oxygen, carbon dioxide, and many other nontoxic compressed gases** (specify option I). **Saturated steam** can also be measured up to 120 psig (specify option K).

The **Flo-Gage™** can be fitted with 2 or 4 wire transmitters to provide a current output for remote indication, recording or totalization, or with reed switch contacts for signaling high or low flows.



Features and Benefits

- Sturdy in-line metal construction to withstand piping stresses without breaking
- Black on white dial won't crack glaze or become hard to read with age
- Expanded 3.5" (90mm) 270° analog dial for reading at a glance
- Suitable for use with opaque and clear fluids.
- Measures 6:1 range with $\pm 3\%$ F.S. accuracy
- Dial and case factory configured for quick installation – but easily field re-configured if needed
- Liquid flow ranges from 4 GPH (15 l/h) in 1/2" flow meter to 3000 GPM (12000 l/m) in 8" flow meter
- Gas flow ranges from 40 SCFH (1 Nm³/h) in 1/2" flow meter to 20,000 SCFM (600 Nm³/m) in 8" flow meter.

Applications

The **Flo-Gage™** flow meter has been developed for industrial applications where durability and reliability are important considerations in the monitoring flow. The **Flo-Gage™** has accuracy for most industrial processes and is particularly suited for applications where compactness, low cost, minimal maintenance and resistance to accidental damage are important factors. Typical application include: lube oil monitoring, blending processes, cooling water, reverse osmosis systems, and compressed air measurement.

Specifications

	Standard	Options
Housing	Polycarbonate	Aluminum
Body	Bronze	Monel 316 SS
Bellows	Bronze	Monel 316 SS Inconel
Seals	Buna-N	Viton EPR Teflon
Crystal	Polycarbonate	Glass Plastic
Gear Movement	Bronze	316 SS
Accuracy	$\pm 3\%$ F.S.	
Repeatability	$\pm 1\%$ F.S.	
Pressure		
Maximum	180 psig	400 psig
Minimum	10 psig	10 psig
Temperature		
Maximum	212°F	350°F
Minimum	-30 °F	-80 °F

Specifications (continued)

Transmitter Option	W,X,Y,Z (4-wire)	W2,W3 (2-wire)
Accuracy		
Horizontal	± 3% F.S.	± 3% F.S.
Vertical	± 5% F.S.	± 3% F.S.
Minimum Flow Rate		
	± 30% F.S.	± 15% F.S.
Ambient Temp Limit		
	120°F, 50°C	120°F, 50°C
Current Output	4-20mA	4-20mA
Ohms-max	800Ω	650Ω 350Ω (RW-3)
Contact Rating (Hi / Lo)	3.0 amp @ 24V 1.0 amp @ 117V 0.5 amp @ 230V	
Frequency Output	1000 Hz F.S. 5V Peak 270 ms on time	
Electrical Rating	General Purpose	
Power Input (customer furnished)	100mA 24Vdc	25mA 24Vdc
Reed Switches	1S2, 2S2	
Setability	± 5% F.S.	
Hysteresis	7-13% F.S.	
Contact Rating	10 watts	
Voltage	175Vdc max 125Vac max	
Switching	350mA max	
Carry	1.0 amp max	

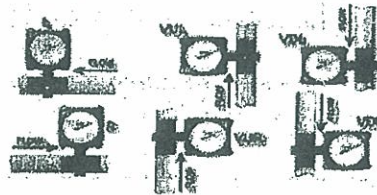
Table of Options

A	Viton Seals	R3	Remote Readout, 316 SS (Mechanical Indication)
B	EPR Seals	T	Expanded Temperature (-80°F to 350°F max.)
B2	Teflon Seals	V	High Viscosity Service (5-500 cps)
C	Calibrated for Specific Gravity	W	TRANSMITTERS
D	Gasketed Case	W2	4-20mA DC 4-Wire Transmitter
D2	Gasketed Case with Condulet	W3	4-20mA DC 2-Wire Transmitter
E	Non-Standard Flow Rate	RW3	4-20mA DC 2-Wire Transmitter (output only)
ES	Low Flow Rate (Below 2 GPM)	X	Digital Display Readout (Rate and Total)
F	Aluminum Housing with Plastic Dial Crystal	Y	Hi / Lo Alarm Relays
F2	Aluminum Housing with Glass Dial Crystal	Z	0-1000 Hz Frequency Transmitter
G	Custom Scales and Dials		Combination of Options W, X, & Y
H	High Pressure Service (400 psig max.)		REED SWITCHES
I	Compressed Gas Service	-1S2	1 Single Pole Double Throw Reed Switch
J	Peak Flow Indicator	-2S2	2 Single Pole Double Throw Reed Switches
K	Saturated Steam Service (120 psig max.)	-LED	Light Emitting Diodes Coming Soon!
N	Ammonia Service		APPROVALS
P	Panel Mount	-EM	Electromagnetic Compatibility 89/336/EEC
R2	Remote Readout, Brass (Mechanical Indication)	-IS	Intrinsically Safe 94/9/EC

How to order

Select a) body size, b) series, c) body material, d) direction of flow, e) full scale flow rate, f) options (if required) and g) switches.

- BODY SIZE** – The pipe size at the meter inlet.
- SERIES** – End Connections
 - 7 – Threaded units provided with FNPT connections standard. FBSP parallel connection bronze and monel
 - 8 – Wafer unit mount between 150 or 300 class flanges
- MATERIALS**
 - 1 = Bronze
 - 2 = Monel
 - 3 = Stainless Steel 316
- FLOW DIRECTION (L, R, VUL, VUR, VDL, VDR)**



- FLOW RATE** (full scale GPM for liquid meters, SCFM for compressed gas meters) – Prefix full scale with "M" for metric units. Non-standard flow rates use option "E"
- OPTIONS** (if required) – Select from "Table of Options" below.
- SWITCHES** (if required) 1S2 or 2S2 Option

Example below is the catalog model number for a 3/4" FNPT series 7000, material is Bronze (1), flow direction left to right (R), flow range of 20 GPM full scale, optional Viton seals (A), and gasketed case option (D) and optional reed switch 1S2.

Example 3/4 - 71 - R - 20 - AD - 1S2
 a bc d e f g

Standard Flow Rates & Body Sizes Series 7000 (Threaded) and 8000 (Wafer)

Size		Full Scale Flow Range				
		Liquids		Gas		Steam
In	mm	GPM	l/m	SCFM	Nm ³ /h	#/h
1/4	08	2	8	10	15	40
		3	15	20	30	60
		4	25	30	50	80
1/2	15	2	8	10	15	40
		3	10	20	30	60
		4	15	30	50	80
		6	25	40	80	120
		10	40	60	100	200
3/4	20	6	25	60	100	120
		10	40	100	150	200
		15	60	150	200	300
		20	80	200	300	400
1	25	15	60	150	250	300
		20	80	200	300	400
		30	120	300	500	600
		40	150	400	600	800
1 1/2	40	30	120	300	500	600
		40	150	400	600	800
		60	240	600	1000	1000
		100	400	800	1200	2000
2	50	40	150	400	600	800
		60	240	600	1000	1000
		100	400	800	1200	2000
		150	600	1000	1500	3000
		200	800	1200	2000	4000
3	80	200	800	1000	1500	4000
		300	1000	2000	3000	6000
		400	1500	3000	5000	8000
		500	2000	4000	6000	10000

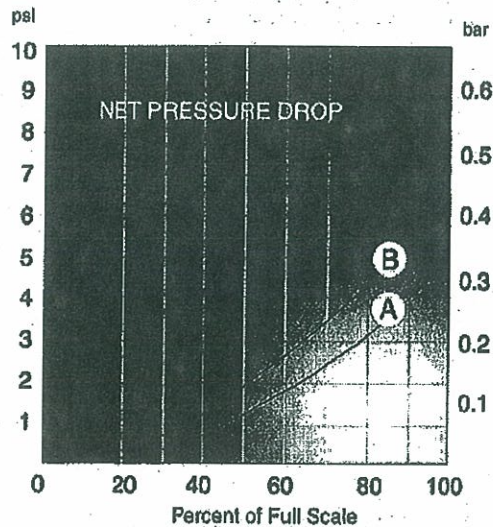
Optional low Flow Range (option ES)

Size		Full Scale Flow Range				
		Liquids		Gas		
In	mm	GPH	l/h	cc/m	SCFH	Nm ³ /h
1/2	15	4	15	200	40	1
		6	20	300	60	2
		10	40	400	100	3
		15	60	600	150	4
		20	80	1000	200	6
		30	120	2000	300	8
		40	150	3000	400	10
		60	240	4000		
100	400	6000				

Series 8000 (Wafer)

Size		Full Scale Flow Range				
		Liquids		Gas		Steam
In	mm	GPM	l/m	SCFM	Nm ³ /h	#/h
2 1/2	65	60	240	600	1000	1000
		100	400	800	1200	2000
		150	600	1000	1500	3000
		200	800	1200	2000	4000
4	100	300	1000	1500	50	6000
		400	1500	3000	100	8000
		600	2400	5000	150	10000
		800	3000	6000	200	15000
5	125	300	1000	1500	50	6000
		400	1500	3000	100	8000
		600	2400	5000	150	10000
		800	3000	6000	200	15000
6	150	600	2400	3000	100	10000
		800	3000	5000	150	15000
		1000	4000	8000	250	20000
		2000	8000	15000	400	40000
8	200	600	2400	5000	100	10000
		1000	4000	8000	150	20000
		2000	8000	15000	400	40000
		3000	12000	20000	600	60000

Pressure Drop Characteristics



Curve A - Bronze Bellows
Curve B - Monel, SS, Inconel Bellows

Selecting Meters for Liquid Service

The Flo-Gage™ can be used to meter flow rates of a wide variety of liquids including water, fuel oils (#2 through #6), lubricants, solvents and many chemical compounds.

For best accuracy, select a flow rate which will permit normal operation in the upper half of the meter scale.

To choose the proper meter, select pipe size and full scale flow rate from the chart of "Standard Flow Rates and Body Sizes".

Selecting Meters for Compressed Gas Service

The Flo-Gage™ can be used to measure flow rates of various gases such as air, nitrogen, oxygen, carbon dioxide, hydrogen, propane, methane (natural gas), argon, helium, sulfur dioxide, etc.

To insure satisfactory operation, pressure should be not less than 10 psig at the meter inlet.

Minimum Flow Rates

The minimum flow rate which can be read is approximately 15% of the full scale flow rate for all meters. For best accuracy, select a flow rate which will permit normal operation in the upper half of the meter scale.

Installation Guidelines

Provide 10 diameters of straight pipe in front of meter. Install control valves or solenoid valves downstream of meter if possible.

Services Not Recommended

Flo-Gages are not recommended for the following kinds of service:

- Resins, paints or monomers which can form solid deposits in the piping system.
- "Super-solvents" which attack most available elastomers.
- Sulfuric acid in any concentration.
- Foams which tend to have inconsistent densities.
- Toxic substances requiring hermetically sealed enclosures.
- Fluids with viscosity above 500 centipoise.
- Pumping systems using piston pumps which produce non-steady flow conditions.
- Gravity-fed systems having less head than the pressure loss across the meter at normal operating conditions.

RCM Industries, Inc.

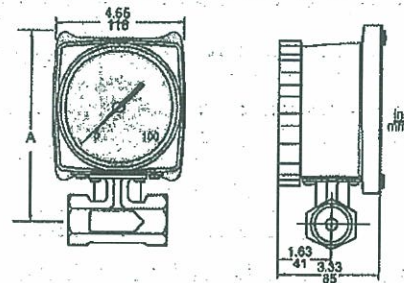
110 Mason Circle Concord, CA 94520-1238 USA
 Ph. 925.687.8363 Toll Free 888-flo-gage Fax 925.671.9636
 e-mail: sales@flo-gage.com <http://www.flo-gage.com>

Dimensions

Nominal Size		Series 7000 A		Series 8000 A	
in	mm	in	mm	in	mm
1/4	08	5.95	151	n/a	n/a
1/2	15	5.95	151	6.62	168
3/4	20	5.95	151	7.06	179
1	25	6.07	154	7.25	184
1-1/2	40	6.39	162	7.81	198
2	50	6.80	172	8.00	203
2-1/2	65	n/a	n/a	8.54	217
3	80	7.48	190	8.87	225
4	100	n/a	n/a	9.95	252
5	125	n/a	n/a	10.36	263
6	150	n/a	n/a	11.05	280
8	200	n/a	n/a	12.30	311

Note: Dimensions are based on bronze meter.

Series 7000 Flo-Gage



Series 8000 Flo-Gage

