

GRCC

Monzeglio, Hope, NMENV

From: Jim Lieb [jlieb@giant.com]
Sent: Thursday, August 24, 2006 2:32 PM
To: Monzeglio, Hope, NMENV; Chavez, Carl J, EMNRD
Cc: Ed Riege; Cote Edward L.; Steve Morris
Subject: Water Flow Meter Final Engineering Design
Attachments: diagrams flow_meter.pdf; MultiMag Brochure.pdf

Carl, Hope:

Attached is the engineering design provided by our waste water consultant Hubel, Roth and Clark, Inc. for the flow metering system Giant is planning to install in the aeration lagoons area and for the boiler plant water.

We are planning to use Hach Company flow meters in the lagoons area for this study. Hach is a recognized manufacturer of high quality flow meters for waste water and storm water monitoring applications. We are planning to use the Hach Sigma Model 910 Area Velocity type meter for the Storm water flow into the Old API Separator. Four (4) Hach Sigma Model 950 AV Bubbler flow meters with one each for the Pilot Station effluent, Benzene Stripper effluent, AL2 to EVP1, and EVP1 to EVP2 locations. Hach literature on these meters is provided in the binder I mailed to you. Totalizers will be included. See the attached HRC Figures 2 and 4 for descriptions of the locations.

We will use a magnetic type meter for the boiler plant water. The boiler plant meter will be installed at the boiler plant.

The area velocity and bubbler type flow meters accuracies are on par with the ultrasonic type flow meter if not better. The ultrasonic type meter is subject to ice condensation fouling in winter and so is not a good fit for our application.

The area velocity and the bubbler type flow meters will be installed in trapezoidal type flumes (made by Tracom). This type of flume is described in the Tracom literature at the end of the binder I mailed to you. The trapezoidal flume is more accurate than the Palmer-Bowlus type flume at lower flows and is less prone to fouling and clogging. The trapezoidal flumes are commonly used in storm water monitoring applications so they are ideal for our use. The trapezoidal flumes that will be placed in permanent concrete vaults for security and ensuring that the flumes will be absolutely level. Steel grate will be placed over each flume to keep out debris and allow for access to the flumes and meters. Figure 3 shows the construction details of the flumes.

The magnetic flow meter will be placed into the discharge pipe from the boiler plant at a location near the boiler plant as the piping is readily accessible at this location. We will likely be using a Multi-Mag Magmeter made by Marsh McBirney rather than the Yamatake unit. Our vendor (Water Technology Group, Inc. of Mesa, Arizona) has recommended this unit rather than the Yamatake unit. I have included the manufacturer's literature on this model. The Multi-Mag meter is less prone to inaccuracies from turbulence than other mag meters.

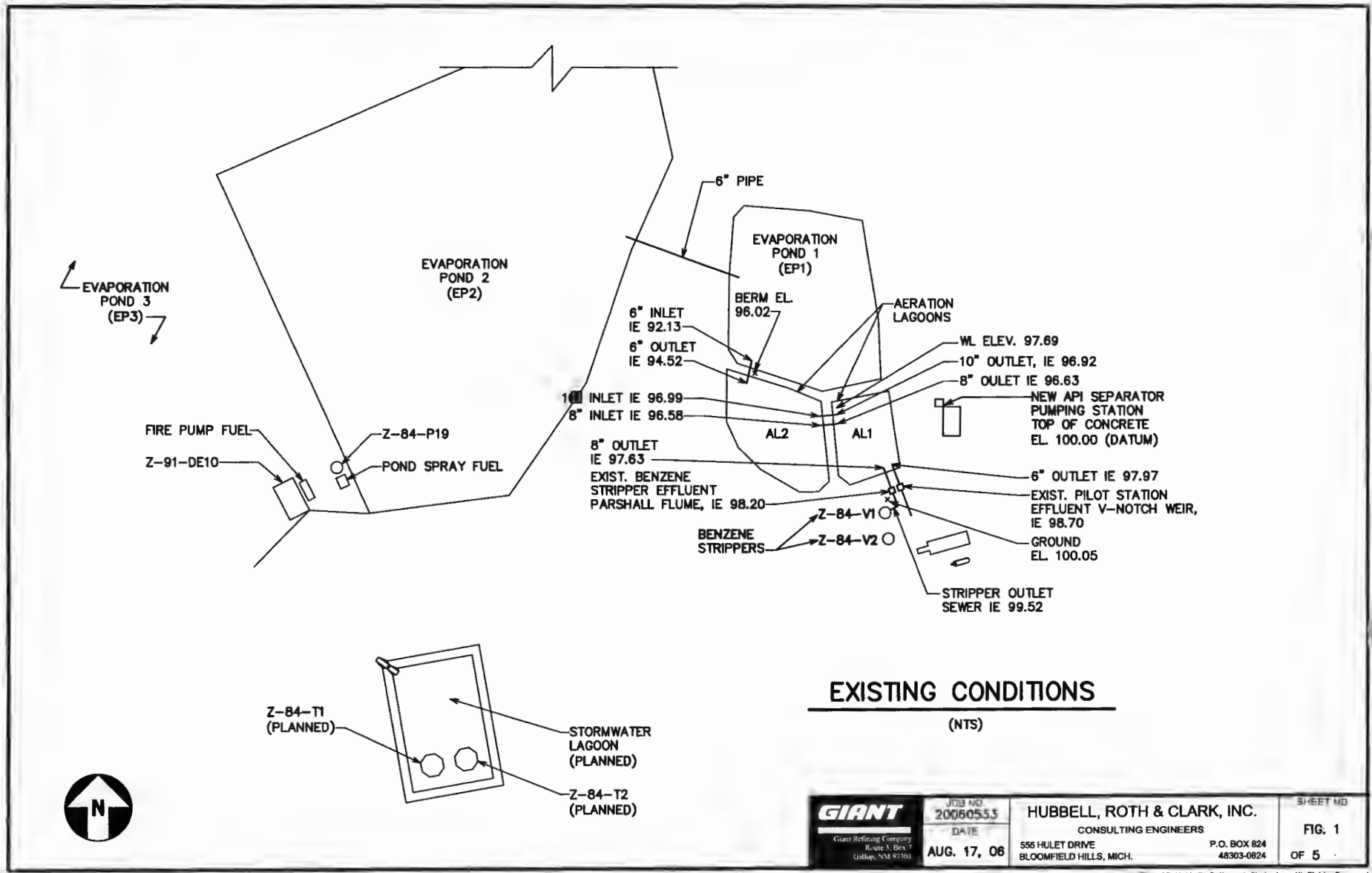
If you have any questions, please email or contact me at (505) 722-0227. I will be out tomorrow but back in the office on Monday.

Sincerely,

Jim Lieb
Environmental Engineer
Giant Industries, Inc.
Ciniza Refinery
I-40, Exit 39
Jamestown, NM 87347
(505) 722-0227
fax (505) 722-0210
jlieb@giant.com

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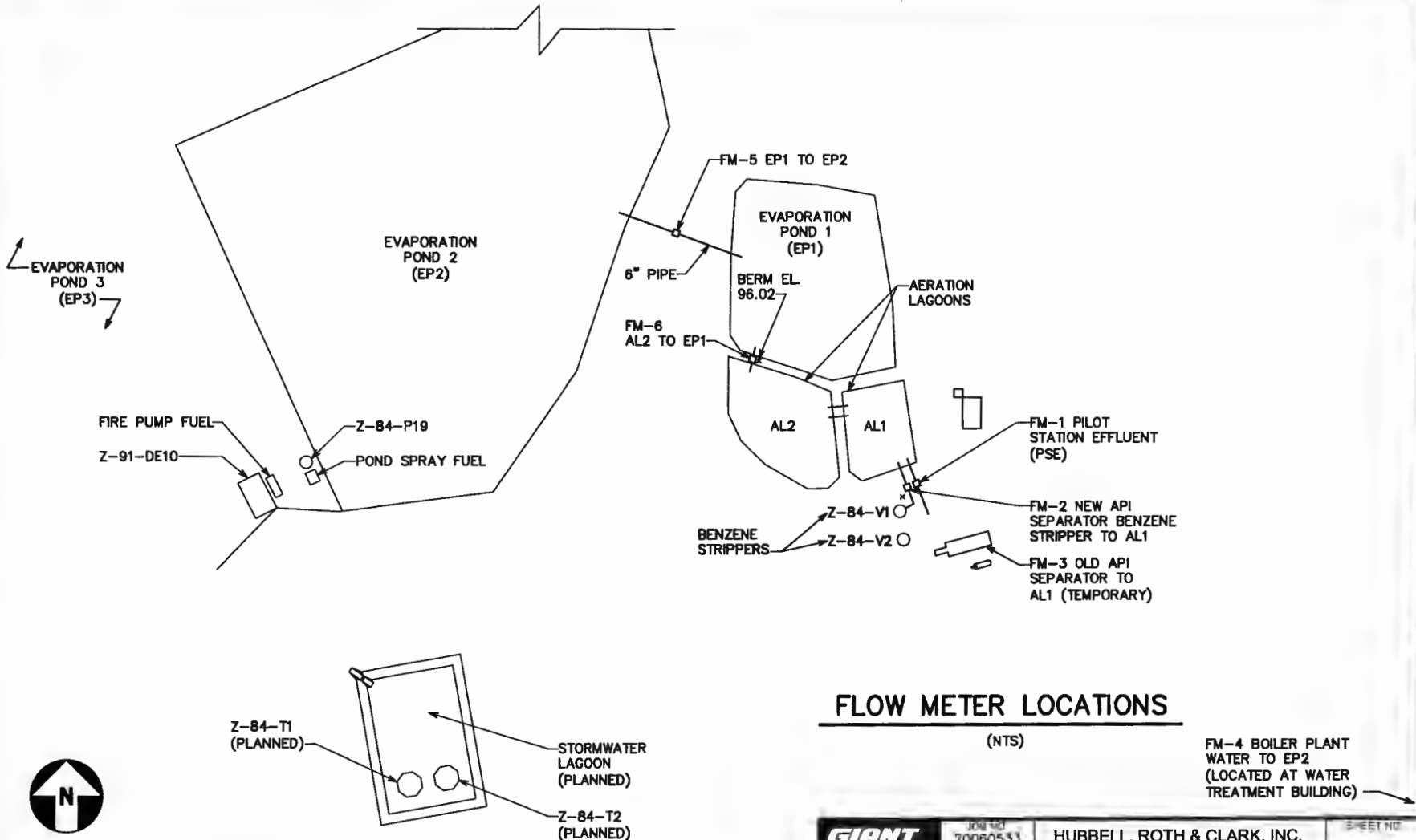
F:\200605\20060533\FIG1_PLOT.dwg, 8/24/2006 12:35:42 PM, mmeredith, Adobe PDF



GIANT <small>Client Refining Company Route 3, Box 7 Gallop, NM 87301</small>	JOB NO. 20060533	HUBBELL, ROTH & CLARK, INC. CONSULTING ENGINEERS		SHEET NO. FIG. 1
	DATE AUG. 17, 06	555 HULET DRIVE BLOOMFIELD HILLS, MICH.		P.O. BOX 824 48303-0824 OF 5

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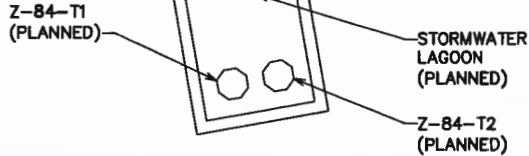
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FLOW METER LOCATIONS

(NTS)

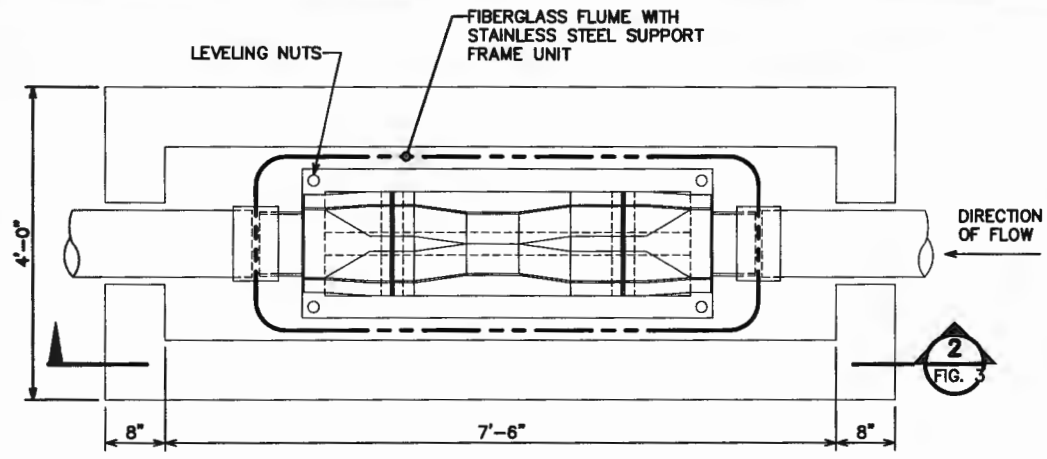
FM-4 BOILER PLANT WATER TO EP2 (LOCATED AT WATER TREATMENT BUILDING)



GIANT <small>Giant Refining Company Route 3, Box 7 Colfax, NH 03001</small>	JOB NO 20060533	HUBBELL, ROTH & CLARK, INC. CONSULTING ENGINEERS	SHEET NO FIG. 2
	DATE AUG. 17, 06	555 HULET DRIVE BLOOMFIELD HILLS, MICH.	P.O. BOX 824 48303-0824

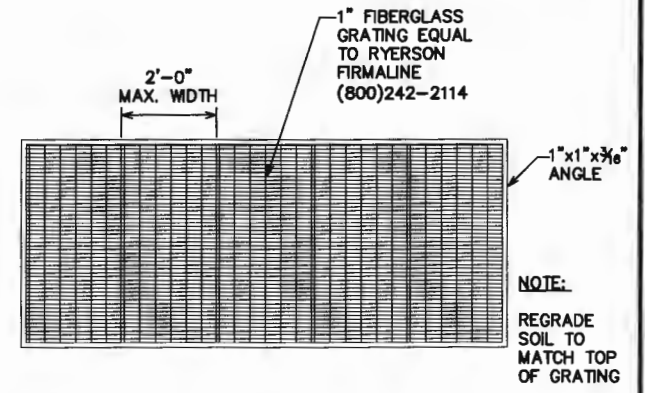
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F:\200605\20060533\C\FIG3_PLOT.dwg, 8/24/2006 12:35:05 PM, mimeredith, Adobe PDF



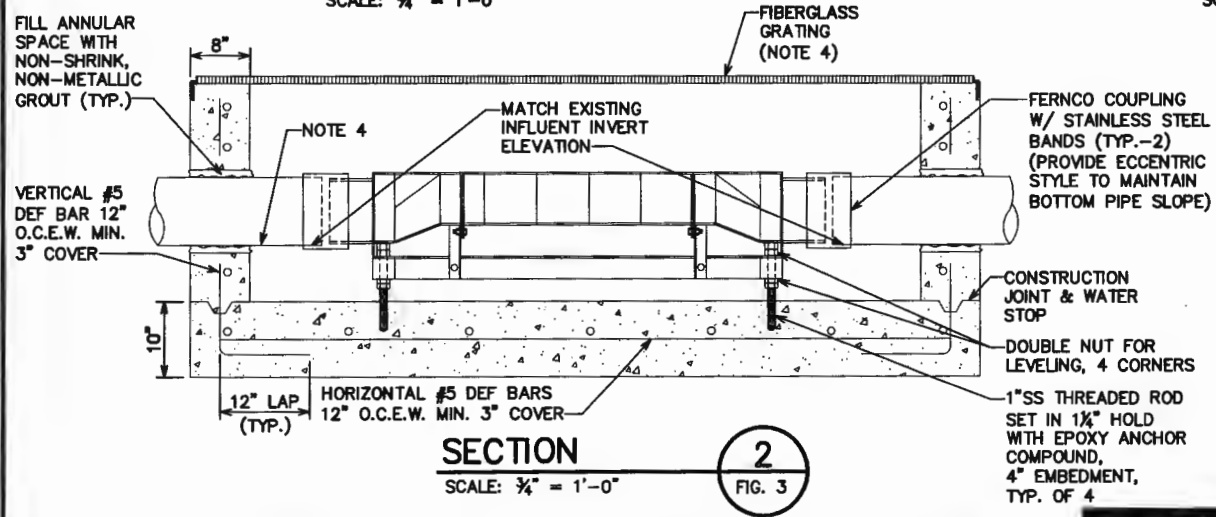
PLAN WITH GRATING REMOVED

SCALE: $\frac{3}{4}$ " = 1'-0"



PLAN WITH GRATING IN-PLACE

SCALE: $\frac{1}{2}$ " = 1'-0"



FIBERGLASS FLUME INSTALLATION

SECTION

SCALE: $\frac{3}{4}$ " = 1'-0"

NOTES:

1. ALL 304 STAINLESS STEEL FASTENERS.
2. DOUBLE NUT AND LEVEL FLUME IN ALL DIRECTIONS.
3. CONCRETE FOR STRUCTURE SHALL BE 3500 PSI @ 28 DAYS.
4. SEE PLAN SHEET FOR GRADE AND PIPE INVERT IN THE AREA WHERE STRUCTURE IS TO BE PLACED.

GIANT <small>Grand Refining Company Route 3, Box 7 Gallup, NM 87301</small>	JOB NO. 20060533	HUBBELL, ROTH & CLARK, INC.		SHEET NO.
	DATE AUG. 17, 06	CONSULTING ENGINEERS		FIG. 3
		655 HULET DRIVE BLOOMFIELD HILLS, MICH.	P.O. BOX 824 48303-0824	OF 5

FLOW METER SCHEDULE

DESIGNATION	LOCATION	ESTIMATED AVERAGE FLOW (GPM)	WATER QUALITY	FLOW METER TYPE	SIZE FLUME	INVERT ELEVATION (FEET)	PREVAILING GRADE ELEVATION (FEET)	COMMENTS
FM-1	PILOT STATION EFFLUENT TO BENZENE STRIPPER	8	DIRTY	TRAPEZOIDAL FLUME/BUBBLER	8 INCH			PROVIDE NEW 8 INCH DISCHARGE PIPE
FM-2	NEW API SEPARATOR/BENZENE	93	CLEAN	TRAPEZOIDAL FLUME/BUBBLER	8 INCH			PROVIDE NEW 8 INCH DISCHARGE PIPE
FM-3	OLD API SEPARATOR/BENZENE	9.2	DIRTY	AREA VELOCITY	24 INCH PIPE	-	-	TEMPORARY INSTALLATION - METER WILL BE MOVED TO PROPOSED STORMWATER
FM-4	BOILER PLANT TO EVAPORATION POND NO. 1	22	CLEAN	MAGNETIC	-	-	-	4 INCH METER INSTALLED ON VERTICAL RISER PIPE
FM-5	EVAPORATION POND NO. 1 TO EVAPORATION POND NO. 2	101	DIRTY	TRAPEZOIDAL FLUME/BUBBLER	8 INCH			PROVIDE NEW 8 INCH INLET PIPING AND OUTLET PIPING
FM-6	AERATION LAGOON NO. 2 TO EVAPORATION POND NO. 1	101	DIRTY	TRAPEZOIDAL FLUME/BUBBLER	8 INCH			PROVIDE NEW 8 INCH INLET PIPING AND OUTLET PIPING


NOTE:

EQUIPMENT SPECIFICATIONS

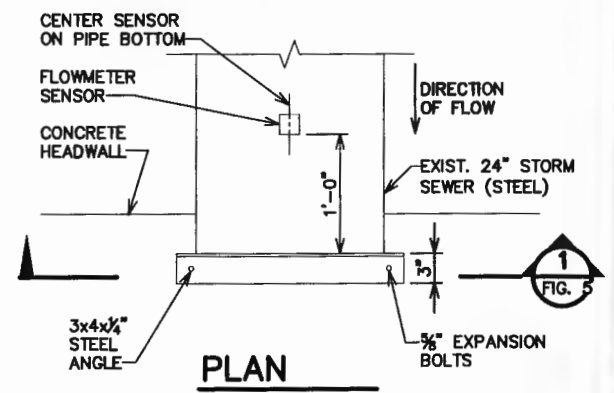
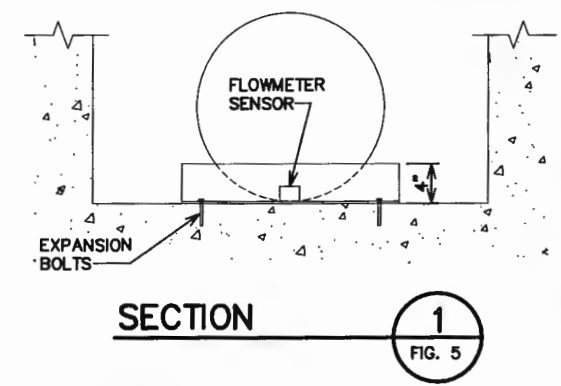
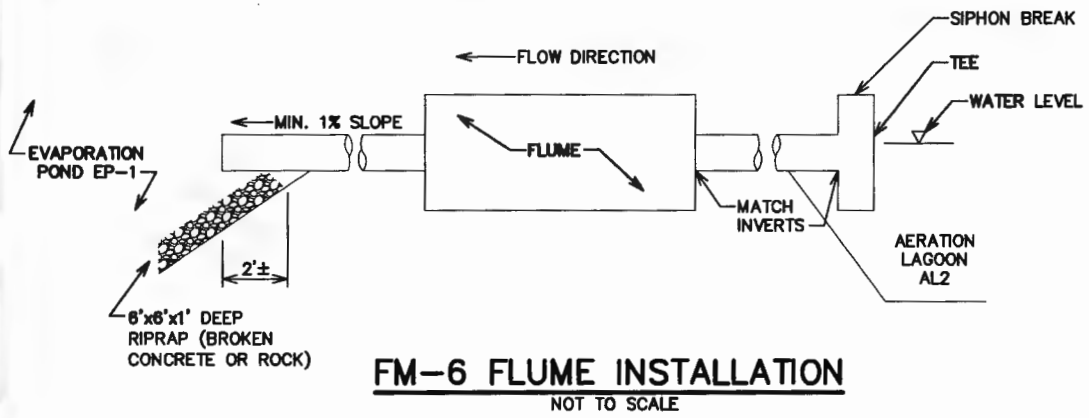
PROVIDE DUCTILE IRON OR SCHEDULE 40 CARBON STEEL PIPING, EXCEPT PM-5 WHICH MAY BE PVC PIPING.

EQUIPMENT	SUPPLIER CONTACT	SPECIFICATIONS	OWNER INPUT
TRAPEZOIDAL FLUME	TRACOM, INC. (877) 435-8637	FIBERGLASS FLUME INSERT, 60 DEGREE, LARGE V WITH INLET AND OUTLET ADAPTERS, 8" PIPE STUBS. FLUME PROVIDED WITH STAINLESS STEEL FRAME FOR LEVELING AS SHOWN ON THE DWGS.	
MAGNETIC FLOWMETER	YAMATAKE (888) 262-4639	MTG18W MagneW TWO-WIRE PLUS, WITH POLISHED PFA LINING. REMOTE READOUT WITH TOTALIZER. FOUR (4) INCH FLANGED UNIT SUITABLE FOR FLOWRATES BETWEEN 10 AND 400 GPM. BAKED EPOXY COATINGS FOR CORROSIVE ATMOSPHERES. FM CLASS 1, DIVISION 1 HAZARDOUS AREA CERTIFICATION. STAINLESS STEEL ELECTRODE AND GROUNDING RING.	OWNER TO SELECT COMMUNICATION OUTPUT, WIRING CONNECTION, CONVERTER MOUNTING, AND CABLE LENGTH. NOTE ALTERNATE MAGNETIC FLOWMETER QUOTED BY WATER TECHNOLOGY GROUP AS MANUFACTURED BY MULTIMAG.
AREA - VELOCITY METER	HACH-SIGMA - CONTACT BROOKS NEWBRY W/ WATER TECHNOLOGY GROUP (480) 415-5296	MODEL 910 AREA VELOCITY FLOWMETER WITH NON-OIL FILLED SUBMERGED SENSOR. WITH MOUNTING RING FOR 24 INCH DIAMETER PIPE AND MOUNTING CLIP.	SELECT LENGTH OF CABLE FROM SENSOR TO FLOWMETER. NOTE THAT UNIT IS BATTERY POWERED.
BUBBLER FLOWMETER PACKAGE	HACH-SIGMA - CONTACT BROOKS NEWBRY W/ WATER TECHNOLOGY GROUP (480) 415-5296	PART NUMBER 3428 950 AV FLOWMETER, 888007 BUBBLER DEPTH PROBE, 3232 CABLE TO CONNECT FLOWMETER TO PERSONAL COMPUTER.	SPECIFY LENGTH OF BUBBLER TUBING.

F:\200605\20060533\FIG4_PLOT.dwg, 8/24/2006 12:34:47 PM, mmedith, Adobe PDF

 <small>Giant Refining Company Route 3, Box 7 Collins, NJ 07901</small>	JOB NO. 20060533	HUBBELL, ROTH & CLARK, INC. CONSULTING ENGINEERS 555 HULET DRIVE BLOOMFIELD HILLS, MICH.	SHEET NO.
	DATE AUG. 17, 06		P.O. BOX 824 48303-0824

F:\200605\20060533\C\FIGS_PLOT.dwg, 8/24/2006 12:34:15 PM, mmeredith, Adobe PDF



**OLD API SEPARATOR
FLOW METER (FM-3) INSTALLATION**
SCALE: 3/4" = 1'-0"

GIANT <small>Giant Refining Company Route 1, Box 1 Collins, N.M. 87201</small>	<small>JOB NO.</small> 20060533	HUBBELL, ROTH & CLARK, INC. <small>CONSULTING ENGINEERS</small> 555 HULET DRIVE BLOOMFIELD HILLS, MICH.	<small>SHEET NO.</small> FIG. 5
	<small>DATE</small> AUG. 17, 06		<small>P.O. BOX</small> 824 48303-0824 <small>OF 5</small>

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Multi-Mag™ Magmeter

Revolutionary
Technology
Utilizes Multiple
Measuring Points
for Unsurpassed
Accuracy



**MARSH
McBIRNEY**

A Higher Level of Flow Measurement

www.mccrometer.com

"A 40 year old Venturi meter at a major station cracked. We first replaced it with a single point insertion magmeter. Accuracy over a range of flows from 4-40 MGD was required. We found the accuracy of the single point insertion meter would degrade when different combinations of pumps were used. To solve this problem we installed a Multi-Mag over four years ago. Multi-Mag has given us the accuracy and extra confidence we need in our pump station flows."

Bob Merrill
Division Foreman
United Water - NJ

Accurate Flow Measurement for:

Potable Water

Cooling Water

Raw Water

Filter Balancing

Backwash Monitoring

Water Containing Sand/Grit

Chilled Water

Well Field Monitoring



Multi-Mag™ Magmeter

With thousands of installations worldwide, our customers have consistently demonstrated their trust in Multi-Mag's accuracy, outstanding operating performance, ease of installation and significant cost savings.

Multiple Electrodes Constantly Profile the Flow to Optimize Accuracy

An array of electromagnetic sensors are strategically located on the insertable probe that spans the entire pipe diameter. This insertable probe detects and compensates for shifting profiles unlike spool-piece meters and flowmeters that provide only a single point flow measurement. Typically, accuracy is better than the $\pm 1\%$ specification.

The streamlined sensor shape minimizes flow disturbances, thus providing minimal pressure drop, unlike vortex meters, turbine meters, and orifice plates. Multi-Mag requires significantly less energy to operate than most flowmeters, including pitot tubes.

Costs for most flowmeters, including spool-piece magmeters increase substantially as pipe size increases. Not so with Multi-Mag.



A single patented probe with multiple sensors constantly measures shifting flow profiles unlike single point flowmeters.

5 Year Sensor Warranty

Compact state-of-the-art transmitter(s) available with menu-driven software for easy set-up.



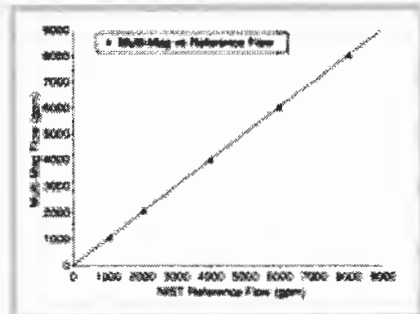
Streamlined sensor shape does not disrupt water flow and has negligible pressure loss resulting in lower energy costs.

5 year
sensor warranty

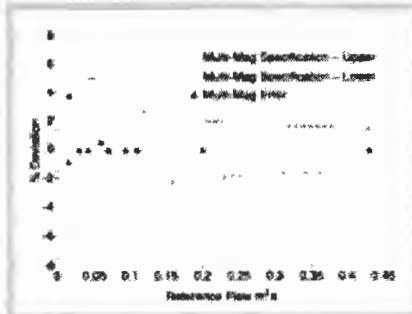
Location...Location...Location

Our Insertable Magmeter Accurately Measures Flow Where Others Can't...Close to Bends and Elbows

1% Accuracy Verified Worldwide by Independent Flow Laboratory Test Results



In February 1996, the National Institute of Standards and Technology (NIST) collected performance data on a Multi-Mag in a 9.95-inch pipe. The Multi-Mag was subjected to velocities in excess of 30 ft/s and exceeded its design goals for accuracy. $\pm 0.3\%$ of reading was achieved over the entire flow range.



In April 1995, tests were conducted on a 400 mm pipe by the Water Research Institute of Bratislava, Slovakia. A typical flow accuracy of $\pm 0.2\%$ of reading/ ± 5 mm/s was attained by the Multi-Mag.

The Water Research Center (WRC) located in England conducted Multi-Mag testing for several large water companies. The results of this evaluation solidly confirm that Multi-Mag is capable of accurately measuring flow close to bends and elbows.



"The Authority had a need to monitor the flow characteristics at an existing water booster station and then transmit the information to our filtration plant. A previous insertion meter did not provide accurate information even though it was installed at a recommended location. The Multi-Mag's adaptability to a unique piping arrangement enabled the Authority to install an accurate meter within the station at a quarter of the cost."

Bob Softcheck
General Manager
North Fayette County Municipal
Authority, Dunbar, PA

Benefits

- Installs Close to Bends/Elbows
- Electromagnetic Technology
- 5 Year Sensor Warranty
- No Ports to Clog
- For pipe sizes 4" and up
- High Temperature Sensors
- Low and/or High Flow Rates
- Quick Installation
- No System Shutdown
- Streamlined Sensor Shape
- Creates Negligible Pressure Loss
- Never Requires Calibration

Specifications — Multi-Mag™ Model 285

Measurement

Volumetric flow in filled flow conduits 4" (101.6 mm) to 120" (3 m) utilizing insertable electromagnetic averaging sensor. Flow indication in English Std. or Metric units. Contact factory for larger pipe sizes.

Flow Measurement

Method: Electromagnetic
 Zero Stability: ± 0.03 ft/s (± 0.009 m/s)
 Linearity: 0.3% of range
 Repeatability: 0.20% of range
 Accuracy: $\pm 1\%$ of reading from 0 to ± 20 ft/s + zero stability
 Has reverse flow indication.
 Range: Nominal pipe size availability
 Sensor Size-Velocity Range for Pipe Sizes

2" Sensor Velocity Range	Pipe Sizes (4" to 60")
0 to 40 ft/s	10" & under
0 to 35 ft/s	12" & under
0 to 30 ft/s	16" & under
0 to 25 ft/s	20" & under
0 to 20 ft/s	24" & under
0 to 15 ft/s	36" & under
0 to 10 ft/s	42" & under
0 to 7.5 ft/s	60" & under
3" Sensor Velocity Range	Pipe Sizes (42" to 120")
0 to 15 ft/s	60" & under
0 to 10 ft/s	100" & under
0 to 7.5 ft/s	120" & under

(Contact factory for information on models with bi-directional flow capability or velocities in excess of above specifications.)

Materials

Sensor: Fiberglass
 Cable: Polyurethane outer jacket
 Insertion Hardware: 316 Stainless Steel exposed to flow.
 Compression Seal: Silicone Rubber
 Sensor Electrodes: Carbon
 Number of electrode pairs is dependent upon sensor length.

Transmitter Enclosure:

NEMA 4X/IP65. Separate termination and electronics compartments. Glass filled polypropylene with clear polycarbonate window.

Transmitter-Dimensions

8.4"H x 6.4"W x 2.8"D
 (214mm x 163 mm x 70 mm)

Transmitter-Weight

3.2 lbs. (1.5kg)

Specifications are for products at the time the literature was printed. Due to continuous product testing and improvement, all specifications are subject to change without notice and without M/M's obligation to retrofit existing products. Marsh-McBirney, Inc., the Marsh-McBirney logo, and Multi-Mag, are trademarks of Marsh-McBirney, Inc. All other trademarks represented in this document are trademarks of their respective owners.

Potable Water Applications

Suitable for use in contact with potable water. Water Byelaws Scheme (WBS) Approved Product. Meets BS6920 - Cert. #9706516 - 2" Sensor
 3" Sensor manufactured with materials certified to NSF 61.

Configuration and Set-Up

Programming can be easily done on site using the keypad. Two levels of user defined password protection are provided.

Outputs

Analog: Galvanically isolated and fully programmable for zero and full scale. Output capability $<16V$. (800 ohm, 4-20mA) Secondary range enabled by external input or programmed alarm condition as a percent of full scale. Pulse/Frequency: One flow proportional or frequency output (transistor type) for flow rate or for external totalizer. Capable of sinking <250 mA @ $<35V$.

Dual Alarms

(2 separate outputs): Isolated protected transistor switch capable of sinking <250 mA @ $<35V$. Note: Not isolated from frequency output. Fully programmable for high/low flow rates. % of range, empty-pipe, fault conditions, forward/reverse, polarity (normally open/close), analog over-range, pulse over-range, pulse cutoff, etc.

Environmental

Minimum Conductivity: 5 umho/cm (5 uS/cm)
 Pressure/Temperature Limits:
 Sensor: Flow Temperature Range Standard: 32° to 110°F (0° to 44°C) @ 250 psi
 Optional: 32° to 140°F (0° to 60°C) @ 250 psi
 Sensor may be submersed.
 Electronics: Temperature limits
 Operating: -14° to 140°F (-25° to 60°C)
 Storage: 5° to 167°F (-15°C to +75°C)

Electrical Connections

0.5 inch NPT with gasket seal

Keypad and Display

Can be used to access and change all set-up parameters using four membrane keys and 3-line display.
 3-Line, 16 character, backlit LCD display with large 1/2" numerals for flow rate and two lines for engineering units, totalizers, alarm status, velocity and percent of range.

Isolation

Galvanic separation to 50VDC between analog, pulse/alarm, and earth/ground.

Electrical Safety

Meets ANSI/ISA-S82.10-1988 and S82.03-1988

Power Supply

Universal switch mode.
 AC: 85 to 265V 45 to 400 Hz at 20VA max.
 or DC: 11 to 40V at 20VA max. AC or DC must be specified at time of ordering.

Vibration Specification

Meets BS2011: Part 2.1Fc: 1983

Internal Totalizer

9-digit totalizer. Can be programmed to reset via external input or the keypad. Reset from keypad can be password protected.

Test Mode and Output Circuit Loop Verification

After transmitter has been programmed, operation of the test mode will drive all outputs to a programmed value which provides a total system test.

Ordering Information

Multi-Mag flowmeter includes modified NEMA 4X/IP65 (separate termination and electronics compartment) glass filled polypropylene electronics enclosure with polycarbonate window, electromagnetic velocity sensor with 20' cable, 4-membrane keys for configuring the transmitter, 3-line LCD backlit display with one line of five 1/2" numerals for flow rate indication and 2 lines containing 16 characters for viewing engineering units, velocity, totalizer, alarm status and flow rate expressed as a percent of full scale, one flow proportional or frequency output (transistor type) for flow rate or for external totalizer, a 4-20 mA output for flow and one instruction manual.

Options include high temperature sensor, extended sensor cable, (Maximum length 1000' (304m)), pole mounting kit, insertion tool, sun shield, and additional instruction manuals.

Contact factory for Sensor Mounting Hardware Ordering Information

Note: Periodic cleaning may be required depending on the concentration of substances such as manganese or iron. The sensor is relatively easy to remove and clean. Multi-Mag™ may not be suitable where stringy material such as grasses or sea weed, rags, bio-film or leaves are likely to collect on the sensor.



McCrometer, Inc.
 3255 W. Stetson Ave. • Hemet, CA 92545 USA
 Tel: (951) 652-6611 • Toll Free: (800) 220-2279 • Fax: (951) 652-3078
 www.mccrometer.com



Made in U.S.A. under one or more of the following patent numbers:
 4,015,471, 4,982,246, 4,458,948,
 4,049,434, 4,982,432, 4,458,970,
 4,669,008, 4,821,580, 5,313,042,
 5,395,006 and 5,511,688.

P/N 103004501 2.5M 5/04