Meter Services Operations & Maintenance

Sewer Flow Metering Design Specifications & Guidelines, Installation, O&M and Inspection Agreement

Date: September 2002 (Rev. 12/2015)

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Sewer Flow Metering Design Specifications & Guidelines, Installation, O&M and Inspection Agreement

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Sewer Flowmeter & Sampling System Design Guidelines

A. Scope

The purpose of this manual is to provide the JEA's customers the means of obtaining accurate sewer discharge flow data, and to provide the JEA with the means for sampling sewer discharge flows. Standardization of installations provides the JEA with accurate flow rates for billing purposes and a more efficient method of sampling industrial sewer discharges.

All items and issues discussed in the manual should be carefully reviewed, considered, and fulfilled in order to ensure a proper operating flow monitoring station.

JEA has many different types of customers that discharge into JEA's sewer system. Some of the customers are residential and some are commercial/industrial facilities. In order to cover the wide range of JEA customers, this manual has been adapted accordingly. This manual has been developed to address sites that only require a sewer flow meter installation, and for those sites that require a sewer flow meter installation along with a sampling unit.

This manual provides guidelines for different types of sewer discharge systems: Open and Closed Systems. While this manual suggests the use of magnetic flow meter for pressurized/closed system, and Parshall flume/ultrasonic level sensor installations for open channel flow applications, special cases may arise where different types of installations that are more site specific, and more suitable may be allowable. This manual addresses "standard" installations only. However, the principles and basis for design and installation of the flow monitoring stations presented in this manual shall be used as guideline for unique site installations.

B. Purpose and Principles of Operation

Open Channel (Gravity Flow) The operation of an ultrasonic level sensor is based on the Doppler principle that there is an apparent change in frequency of sound or radio waves as a function of motion. The level sensor consists of a transducer and a transmitter. The transducer sends a continuous ultrasonic pulse into the liquid stream. When the transmitted frequency is reflected back to the transducer from a suspended particle moving in the stream, the apparent frequency change will be proportional to the velocity of the moving liquid. The transmitter measures the differences between the transmitter and the reflected frequencies and transmits an output signal linearly proportional to the liquid flow.

Closed Channel (Pressurized Flows) The operating principle of a magnetic flow meter is based on the electrical law (Faraday's law of induction) that an electrical current is directly proportional to the velocity of the conductor. A magnetic flow meter uses the fluid, which passes through it as the conductor. Therefore, the electrical current produced is proportional to the fluid flow rate and can be used to indicate the flow rate.

Ultrasonic flow tube meter operates on the principle of transit time difference can also be used for pressurized/closed discharge system. An acoustic signal (ultrasonic) is transmitted from one sensor to another. The time (transit) that the signal requires to arrive at the receiver is then measured. According to the physical principles, the signal sent against the direction of flow requires longer to return than the signal in the direction of flow; therefore, the difference in the transit time is directly proportional the velocity of flow. The transmitter coverts the measured values supplied by the sensors into standardized output signals.

C. Agreements and Ownership of Flow Meter Installation for All Future Installations

Ownership of the meter and associated piping includes, but not limited to, operation and maintenance of the meter and parts replacement associated with the meter. If the flow meter is installed on the property of the customer, JEA shall have the right to access the flow meter installation and perform meter reading for billing purposes. As referred to in Attachment I, the Agreement establishes access rights and installation agreements between JEA and the proposed customer.

Surveying services will have to be performed at each of the installation locations to acquire a layout of the existing site and accurate elevations of all existing piping associated with the customer's sewer discharge system. A "sample" copy of a Surveying Scope of Services that may be used once a surveying consultant has been established has been illustrated in Attachment C.

D. Flow Meter and Sampling Unit Design and Installation

In order to minimize costs associated with rework and reengineering, JEA requires that all surveying and design work be performed and sealed by Florida registered professionals. A minimum of three (3) sets of detailed construction drawings for any proposed new or revised discharge flow measurement system shall be made for review and archiving purposes. These drawings shall indicate the relevant pipe slopes, elevations, locations, dimensions, types and locations of instrumentation, details of flow metering elements, the estimated flow range (minimum, maximum, and average), and details of upstream and downstream piping, structures and devices which could influence flow through the flow monitoring installation.

All Work shall be done in accordance with the latest edition of the JEA Water and Sewer Standards, Details, and Materials, and the attached specification sections.

Manufacturer's calculations, catalog cut sheets, and data sheets shall be included with the construction drawings for any equipment installed as part of the flow monitoring system. Complete rating data and meter sizing calculations shall be submitted for any engineered flow metering device.

New systems need to be calibrated before installation and prior to activating the flow monitoring installation. A calibration report must be prepared and submitted with a completion of construction notification. The initial calibration should be conducted in accordance with the requirements specified herein, according to the manufacturer's recommendations, and using JEA's calibration report forms (See Attachment G).

Some installation may not require an Industrial Pretreatment Sampling Unit (IPSU). The need for a sampling unit shall be established by JEA. Please refer to http://www.jea.com/business/services/industrialpre/permits.asp for details. All flow instrumentation shall be housed in the equipment storage box indicated on the figures. Space will be provided in the equipment storage box for a sampling unit, whether the unit is installed initially or in the future.

1. Gravity Flow – Parshall Flume and Ultrasonic Level Sensor

For systems that consist of gravity flow, a Parshall flume with an ultrasonic level sensor shall be installed into the system. The type of ultrasonic level sensor installed shall be as specified in the attached Specification Section 13400, Attachment F.

1.1 Sizing/Selection Guidelines for Parshall Flumes and Ultrasonic Level Sensors for Wastewater Applications

To ensure proper operation of the Parshall flume, there are a few guidelines that must be followed when selecting the size of the flume. The size of the flume will depend on the minimum and maximum flow rates that the system will encounter. The size of the flume required for the customer's specific flow rate can be determined from Table 1 indicated on Figure 1 in Attachment D. The selection of the ultrasonic level sensor shall be based primarily on the specifications detailed in the attached Specification Section 13400.

1.2 Design/Installation Guidelines for Parshall Flumes and Ultrasonic Level Sensors for Wastewater Applications

The system in which the Parshall flume is to be installed shall be evaluated before the procurement/construction process begins. Calculations and supporting data shall be designed by a Florida registered professional engineer concerning, but not limited to, the elevation of the incoming and out going lines of the flume vault, corresponding pipe slopes, flow ranges, head calculations, upstream and downstream analysis, and all other relevant calculations. Once all relevant analysis and calculations have been performed, refer to previous section (1.1) for the Parshall flume and ultrasonic level sensor selection criteria. The flume installation design shall be in accordance with the flume design illustrated by Figures 2 through 4 in Attachment E.

The flume shall be installed with the inlet approach section completely level. When the crest of the flume is greater than 6-inches above the channel bottom or invert of the incoming pipe, then a short sloping approach to the inlet of the flume with a slope no greater than 4:1 shall be provided. A long, straight run of pipe shall be provided upstream of the flume to ensure that turbulent flow is not passing through the flume. The piping downstream of the flume vault shall not have a slope greater than 2%. The flume shall be installed to allow for free flow discharge downstream of the flume throat. The installation of the flume shall also be in accordance with the manufacturer's recommendations. The position of the flow level sensor shall be per the manufacturer's recommendations.

All 4-inch and larger piping associated with the Parshall flume and flow level sensor installation shall be SDR 26 polyvinyl chloride (PVC). All other piping shall be as indicated on the attached figures. A sufficient number of guard posts, acceptable to JEA, shall be installed in order to protect the flow meter installation from any damage.

1.3 Instrumentation/Power Supply

In a typical flume system, the flow level sensing device is usually an ultrasonic level sensor; depending on the system requirements, another level sensor type may be more appropriate and will be considered. The ultrasonic level sensor shall have the capability of interfacing with a JEA required ISCO sampling unit so that flow-proportioning sampling may be performed, please refer to http://www.jea.com/business/services/industrialpre/permits.asp for details. Each installation shall be provided with a JEA standard flow read-out for the ultrasonic level sensor, as indicated in the attached Specification Section 13400, in Attachment F. The flow read-out/totalizer shall be mounted in an upright position at a location and height (five feet minimum) accessible to JEA personnel for meter reading purposes. An extra duplex outlet will be required. All other instrumentation shall be installed inside the equipment storage box. The source of the power supply for the instrumentation shall be coordinated with JEA and shall

NOT be tied into a Ground Fault Interrupter (GFI) circuit. If the plant/facility will have continuing sewer discharge, limiting or full capacity, the power wiring shall be routed in a separate conduit to a properly sized uninterruptible power supply (UPS). The UPS shall provide the necessary power directly to the meter. Using a UPS in this configuration will ensure a steady-state "pure" power supply and lightning protection. Industrial grade electric power surge suppression device should be considered regardless to better protect the system in case of lightning strike. Surge suppressors should be installed in both the electronic module (4-20 ma) and power module of the metering system.

All electrical equipment and wiring installed in a confined space or exposed to vapor space of the public sewer shall be suitable for operation in hazardous locations, as specified in the current National Electrical Code. All electrical equipment shall be of explosion proof construction, or alternately may be certified to be intrinsically safe by a nationally recognized testing laboratory, such as Underwriters Laboratories, Inc.

1.4 Meter Bypass

Meter Bypass is not allowed in any Gravity Flow (Open Channel) Discharge System.

1.5 Meter Flow Totalization

The readout from the meter shall be able to display totalized flow volume in thousands of Gallons and flow rate in Gallons per Minute (GPM)

2. Pressurized Flow – Magnetic or Ultrasonic Flow Tube Meter

For systems that consist of pressurized flow, (i.e. pump station with a force main) a magnetic or ultrasonic flow tube meter shall be installed into the system. All sizing, selection, design, and installation of the magnetic flow meters shall be in accordance with the following guidelines and the manufacturer's recommendations. The following illustrates the guidelines and installation requirements for selecting and installing the magnetic flow meters:

2.1. Sizing/Selection Guidelines for Magnetic and Ultrasonic Flow Tube Meters for Wastewater Applications

a. To ensure that the flow meter operates accurately, there are a few guidelines that must be followed when selecting the size of the flow meter. Magnetic flow meters should be selected to create a desired fluid velocity through the flow meter tube between 3 feet per second to 15 feet per second. However, the velocity shall be no less than 2 feet per second for abnormal flow conditions that are extremely below the average flow rate and no more than 20 feet per second for peak flow

conditions. The velocity through the magnetic flow meter generally should not be allowed outside of the desired velocity range for more than 5% of the total operating time of the system. The size of the magnetic flow meter required for the customer's specific flow rate can be determined from the table of velocities based on flow rates as illustrated in Table 2 on Figure 1 in Attachment D.

b. Ultrasonic Flow Tubes Meter shall not be applied where discharge flow has gaseous content.

All other items involved in the selection of the magnetic flow meter should be as indicated in the attached Specification Section 13400, Attachment F.

2.2. Design/Installation Guidelines for Magnetic and Ultrasonic Flow Tube Meters for Wastewater Applications

The system in which the flow meter is to be installed shall be evaluated before the procurement/construction process begins. Calculations and supporting data shall be designed and performed by a State Registered Professional Engineer concerning, but not limited to, the elevation of the incoming and out going lines of the flow meter vault, flow meter sizing, flow ranges, and all other relevant calculations.

Once all relevant analysis and calculations have been performed, refer to previous section (2.1) for the flow meter selection criteria. The magnetic flow meter structure design shall be in accordance with the magnetic flow meter design illustrated by Figures 5 through 7 in Attachment E.

Magnetic or Ultrasonic Flow Tube meters shall not be installed immediately downstream of any mixing points in the system (i.e. any chemical addition, etc.) Any chemicals not fully mixed with the fluid can result in inaccurate readings. Flow disturbing piping obstructions located too near the magnetic flow meter inlet and outlet may add an additional 1 to 10% of uncertainty to the measured flow. The flow meter shall be installed with upstream and downstream pipe diameters of the flow meter per manufacturer's recommendations. The meter shall be installed in a manner to provide sufficient space to facilitate calibration, in-line maintenance, or meter removal.

The meter shall also be installed to facilitate full flow within the flow meter at all times during flow recording. Meter orientation leading to non-full meter pipe, trapping gases, or resulting in material build-up on the electrodes severely degrades the meter accuracy, potentially costing the business owner extra in sewer bill.

Meter installed below ground level shall be properly insulated per NEMA 6P Standard or equivalent.

The flow meter shall be electrically grounded properly per manufacturer's requirements. Avoid locating the magnetic flow meter near heavy electrical induction equipment, as this may affect the performance of the meter. Orient the meter per manufacturer's recommendations.

The corrosive and/or abrasive characteristics of the process liquid dictate the proper selection of the lining material and electrode construction. During installation of the flow meter, liner protectors shall be used to protect the flow meter liner. This will prevent damage to the flow meter liner during installation or due to over torqueing of the flange bolts during installation. The flange connections shall be torqued per the manufacturer's installation specifications.

Flow meter installation shall be braced with proper weight and strength supporting structures strong enough to protect and hold up the meter in any field condition(s), above or below ground. All 4-inch and larger piping associated with the flow meter installation shall be restrained joint ductile iron pipe. All other piping shall be as indicated on the attached figures in Attachment E. The sump pump discharge shall be routed to the nearest JEA sewer manhole. If the nearest JEA sewer manhole is not a feasible option, the sump pump discharge line shall be routed to the upstream wetwell. A sufficient number of guard posts, acceptable to JEA, shall be installed in order to protect the flow meter installation from any damage.

2.3. Instrumentation/Power Supply

The magnetic or ultrasonic flow tube meter shall have the capability of interfacing with ISCO sampling unit so that flow-proportioning sampling may be performed, if an on-site sampling unit is required. Please refer to http://www.jea.com/business/services/industrialpre/permits.asp for details. Each installation shall be provided with a JEA standard flow read-out for the magnetic flow meter, as indicated in the attached Specification Section 13400 in Attachment F. The flow read-out shall be mounted in a location accessible to JEA personnel for meter reading purposes.

Driven-shield signal leads shall be used and routed between the transmitter and the meter through a dedicated 1-inch or 2-inch conduit, depending on wiring size. Each installation shall be provided with a flow read-out for the meter, as indicated in the attached Specification Section 13400, in Attachment F. The flow read-out/totalizer for above ground installation shall be mounted in an upright position at a location and height (three feet minimum) accessible to JEA personnel for meter reading purposes. The remote flow read-out/totalizer for underground installation shall be mounted in an upright position at a location and height (five feet minimum) accessible to JEA personnel for meter reading purposes. An extra duplex outlet will be required. The source of the power supply for the instrumentation shall be coordinated with JEA and shall NOT be tied into a

Ground Fault Interrupter (GFI) circuit. If the plant/facility will have continuing sewer discharge, limiting or full capacity, the power wiring shall be routed in a separate conduit to a properly sized uninterruptible power supply (UPS). The UPS shall provide the necessary power directly to the meter. Using a UPS in this configuration will ensure a steady-state "pure" power supply and lightning protection. Industrial grade electric power surge suppression device should be considered regardless to better protect the system in case of lightning strike. Surge suppressors should be installed in both the electronic module (4-20 ma) and power module of the metering system.

2.4. Meter Bypass

Meter Bypass is only allowed in a permanently installed Sewer Metering System with locking rings for JEA keyed Lock. When a sewer meter needs to be bypassed for any reason, JEA must be contacted and unlocked by JEA. The bypass duration will be mutually determined by JEA and the customer and will be strictly monitored and enforced. Ground Water Discharge of temporary (a project with defined end date) nature **SHALL NOT** have any bypass.

2.5. Meter Flow Totalization

The readout from the meter shall be able to display totalized flow volume in thousands of Gallons and flow rate in Gallons per Minute (GPM)

E. Flow Meter Installation Maintenance and Calibration

To make sure the sewer/groundwater will properly discharge to JEA's sewer system; all customers with sewer flow meter shall install and connect to JEA's sewer system per JEA's Water & Sewer Rules and Regulations, Chapter III, sections 3.1 - 3.09. This Rules & Regulations can be downloaded from:
http://www.jea.com/about/pub/downloads/RulesRegs-WS.pdf

In order to ensure proper operation and continued accuracy of the flow meter installation all customers with sewer flow meter shall have a program of regular maintenance and calibration checking in accordance with this manual and guidelines expressed in JEA's Water, Sewer and Reclaimed Water Design Guidelines:
(http://www.jea.com/about/pub/downloads/WSRDesignGuidelines.pdf)

Flow monitoring systems will measure flow accurately when all systems receive periodic cleaning, maintenance, and calibration. Flow charts generated and recorded by the flow meter installation shall be capable of supporting a temporary connection of a portable chart recorder.

The owner/customer, and in some instances, the JEA Regulatory Conformance (Industrial Pretreatment) department, shall be responsible for operation and maintenance of all sampling units associated with the flow monitoring station installations.

1. Maintenance Records

The system shall be cleaned and calibrated at the required frequency as recommended by the equipment manufacturer or as deemed necessary by JEA. Any maintenance or cleaning which is performed more often than once per month may simply be listed as routine in the report (refer to Attachment G for record forms.)

2. Calibration Check and Report

All flow monitoring systems used to obtain information for flow measurement and billing purposes must have the calibration of the system checked no less than the minimum manufacturer's recommendations or per schedule listed on page 10 of this section, whichever is the most stringent time frame. A detailed summary of the calibration check shall be recorded to insure proper and regular calibration checks (refer to Attachment G for record forms.)

The calibration procedure and methods shall comply with the industry standards, United States Environmental Protection Agency (USEPA), and/or Florida Department of Environment Protection (FDEP) requirements and in accordance with the manufacturer's recommendations. The approval and the results of the calibration check shall be reported and attested to by the actual Field Calibration Technician in accordance with the JEA format.

The calibration report shall include the following, minimal information each time the flow meter is calibrated:

- Flow meter Installation Description - Provide a brief description of the system and all separate components, including model numbers. If the system incorporates a sump/pump arrangement it must be so stated including the rate of discharge as gallons per minute (gpm) and the frequency and duration of the pump cycle.

- Contact Closure Frequency - State the normal setting for the number of gallons of wastewater discharged between sampling contact closures. The minimum closure frequency shall be one (1) pulse for every one hundred (100) gallons.

- Calibration Results - The flow monitoring calibration must be tested at a minimum of five (5) different flow rates, induced real flow or simulated flow. The calibration flow rates should be at 10%, 25%, 50%, 75%, and 100% of the flow range of the flow meter in use.

- The procedure for checking the totalizer must also be in accordance with the industry standards and included with the calibration results.

- A copy of all data collected, any calculations performed and any other pertinent information must be included with the report, unless this requirement is waived by JEA.

- Method of Calibration - A detailed description of the method of calibration must be provided, including a description of any special pieces of equipment used and, if necessary for clarity, a schematic of the complete calibration setup showing all significant features and equipment.

- Any proposed new method of calibration shall be extensively reviewed and evaluated, for conformity with industry standards, prior to the actual calibration check. Manufacturer's certified calibration curves or data or recent laboratory curves or data together with a laboratory calibration certificate must be submitted for any manufactured flow metering device used to check the calibration of the flow monitoring system. Comparison of the effluent flow monitoring system with incoming water meter readings is not acceptable as a valid calibration check.

  The calibrating method and instrumentation devices used to perform the calibration must be sufficiently accurate (within ± 1% of actual flow rate throughout the entire operating flow range of the company's flow meter). The cumulative errors of the calibrating instrument and the company's flow meter should not exceed a total of ± 2% throughout the entire operating flow range (10%, 50%, and 100%). Where practical, the installed flow monitoring system should be adjusted to record and totalize the correct flows as indicated by the calibrating system data.

  Where the data from a hydraulic calibration of a system (e.g. height vs. flow in gpm) manifests a flow curve that differs from the standard equation for the particular device, but is smooth and accurate, a flow performance curve for the in-place element should be developed and attached to the records for that particular flow meter installation. The unique curve should then be referred to in setting or correcting the instrumentation to indicate accurate monitoring of flow rate, daily and total discharges.

  While flow monitoring systems employing a magnetic or ultrasonic flow tube meter and ultrasonic flow meter level measurement with Parshall Flume may be calibrated based on flow rate, JEA requires all systems be tested and calibrated at least annually.

  Intervening calibration checks may be instrumentation calibrations, as described below, accompanied by verification that the system has been properly maintained.

  Due to unobservable wear corrosion, accretion or warpage, a flume may not exhibit (after a few years) the same flow curve or theoretical values that it did when new. For this reason, a periodic hydraulic calibration may be required. Please contact JEA Meter Services Operations & Maintenance for frequency and

where appropriate, exceptions. An acceptable method for the hydraulic calibration is to measure known flows through the element with an independent meter (certified to within ± 1%) while observing the heights manifested in the flume at the various flow rates. This is best accomplished when the system is not subject to the regular customer waste flows when test water is induced at controllable rates through the system upstream of the in-place meter and through a certified calibration meter. Another acceptable method is the insertion of the certified meter in a full flowing closed pipe portion of the system upstream of the flume, thereby utilizing the system's own flows. This should be done at times when both the maximum and minimum flows would be manifested. A spool piece could be installed at that point for removal and insertion of the certified meter when a known flow calibration is needed. These methods should also be employed when a new flume is installed to ascertain its adherence to the equation.

- Laboratory Certified Calibrating Meter - All calibrating meters to be used for calibration of the flow meter installations shall have an accuracy of within $\pm$1% of actual flow throughout the entire operating flow range of the customer's flow meter. In order to maintain accuracy greater than the system being calibrated, the calibrating meter is required to have been certified within the three (3) months, and must have been certified within the nine (9) months, preceding the date of flow meter calibration.

- The laboratory certificate attesting to the bench certification must reflect a date that is in accordance with the above chronological parameters together with the information that the meter was tested over its full range or at least over the range of flows generated through the flow meter of the facility in question.

- The certificate must attest to the Laboratory's traceability to the National Bureau of Standards (NBS) Industry Standards, USEPA, FDEP, or the American Water Works Association (AWWA) Standards. If the laboratory and/or its equipment have been certified by either organization, the certifying number must be indicated on the bench calibrating certificate.

- The instrumentation calibration must confirm that actual flow rates are accurately sensed by the primary measuring device and transmitted to the flow rate recorder and/or totalizer, but does not require comparison of the primary element performance with an independent flow metering method or device.

  The instrumentation should be checked at a minimum of three flow rates covering the range of normal operation. It is recommended that the entire range of the primary element covering five flow rates from zero to the upper limit of accuracy be simulated.

- JEA may require intermediate calibration and reporting where a system malfunctions and needs extensive repair and/or has been "off-line" for an extensive period; where the flows determined by the system differ widely from

values determined by JEA's monitoring procedures; or in other cases where JEA has determined the need. The date of the intermediate calibration shall, in the usual case become the due date for the periodic checks. However, JEA may choose to adhere to the original due date despite the intermediate check where ongoing anomalies in a customer's system persist.

- "Corrective Measures" - All flow meter installations must indicate, record, and totalize within ± 2% of the actual discharge flow rate through out the entire operating flow range. If the system does not perform within these limits, appropriate corrective action must be taken. Prior to any major system modifications, a description and plans of the proposed modifications shall be submitted to JEA for approval. Any minor adjustments or parts replaced should be described in the report with a sketch attached.

  The percent of error prior to any corrective measures should be noted by the certifying engineer on the check record form.

  One of the following options may be used by JEA to determine flow during periods when effluent meters are out for repairs or are not operating within the required accuracy until the meter is repaired and reported to JEA for verification: a) water meter volumes, but without allowance for losses; b) previous three (3) month average; or c) estimation.

- The "Certification of Calibration" form submitted as part of the calibration check must contain the original signatures of the actual Field Calibration Technician and JEA's Meter Specialist/Technician.

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Attachment A

Summary of

Sewer/Groundwater Meter

Installation Steps, System

Establishment Checklist,

Document Requirements, and

Process Flow Chart

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Summary of JEA Sewer/Groundwater Discharge Metering and Installation Steps

In order for the meter be proper designed and installed for JEA's acceptance, here are a few steps we (The customer, Customer's Consultant, and JEA) should adhere to:

1. Decide which system of ground water discharge would be best suitable for the process: Open System – Gravitational Open Channel Discharge or Closed System – Magnetic Flow Meter installed after generally a lift station/certain containment where discharge is generally pumped out.

2. Customer/Consultant to provide piping diagram to show and verify the sewer discharge is a “Single” discharge and no other facility other than the customer’s is discharging to the lift station.

3. Determine what type and make of meter to utilize to capture the sewer flow.

4. Size the meter accurately by determining the average discharge flow rate in GPM and show calculations that the average flow profile will be in the range of 3 feet per second - 15 feet per second in order to accurately capture all flow volume. This flow profile will yield the best accuracy on all average meters.

5. Determine the optimum location for the meter to be installed and provide sketch(es) of how the meter will be installed, including structural supports. JEA will be happy to meet with you and/or your engineer/consultant onsite to discuss the location as it is planned.

6. It would mutually beneficial for above items 1-5 be agreed to by both you and JEA prior to proceeding any further including procuring the meter. Once the above items are acceptable to both the customer and JEA, the customer shall proceed to purchase a meter that will display totalized flow in thousands of gallons.

7. Review and execute forms and agreements in the back of the design guideline manual and submit them to our PreService Office at 21 W. Church Street, Jacksonville, FL 32202.

8. Once the meter has been procured and installed per our agreement, please notify JEA and JEA will inspect the meter, and if there are no further concerns, will initialize the meter in the account for billing.

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Meter Services Operations & Maintenance
Office: (904) 665-8432 Fax: (904) 665-6803
Regulatory Conformance (Industrial Pretreatment)
Office: (904) 665-5110 Fax: (904) 665-8334

Commercial & Industrial Sewer Flow Metering System Establishment Checklist

Customer Acknowledgment	Checklist Items
	1) Customer should review and execute Sewer Flowmeter Installation /Inspection Agreement (Attachment H) and submit to JEA as soon as the project is established.
	2) The customer should communicate any design criteria issues and parameters with JEA as early and as much as possible.
_____	3) The customer must submit the Installation/Inspection Agreement along with three (3) sets of design/survey/installation packages to the JEA Meter Services Operations & Maintenance for review and approval by representatives of JEA prior to actual meter installation.
	4) JEA Meter Services Operations & Maintenance will notify the customer (in writing) of the final status of the plan review.
_____	5) The customer may not proceed with the installation of the equipment until a letter/Email of approval has been issued.
_____	6) If the customer makes any changes to the original design, such proposed changes shall be reported to JEA Meter Services Operations & Maintenance prior to making such changes.
	7) During installation/construction, if the customer requires any inspection of the installation/calibration, please contact JEA Meter Services Operations & Maintenance to schedule for the inspection.
_____	8) The customer must notify JEA Meter Services Operations & Maintenance within 48 hours of completion of the installation. Such notification shall be made during normal business hours, Monday-Friday, 8:00 AM - 4:00 PM, excluding weekends and holidays. An inspection/calibration witness date will be scheduled with the customer within 2 business days.
_____	9) Upon completion of the inspection, a final letter/Email of approval will be submitted to the customer. If the project requires an Industrial Pretreatment Permit, the customer must obtain final Permit Release before putting the sewer meter in full service. Otherwise, the flow metering equipment can be put into full service when such letter/Email is received by the customer.
_____	10) At least annually, the customer shall submit a calibration report to Industrial Pretreatment within TEN (10) calendar days of the date of initial equipment calibration.
_____	11) Routine maintenance and calibration reports should be submitted to JEA Meter Services Operations & Maintenance regularly (at least annually.)
_____	12) If any processing and/or operational requirement should change or any repair, upgrade. Or replacement of the metering system is required in the future; JEA Meter Services Operations & Maintenance shall be contacted to evaluate the adequacy of the flow metering system and any changes that may apply.

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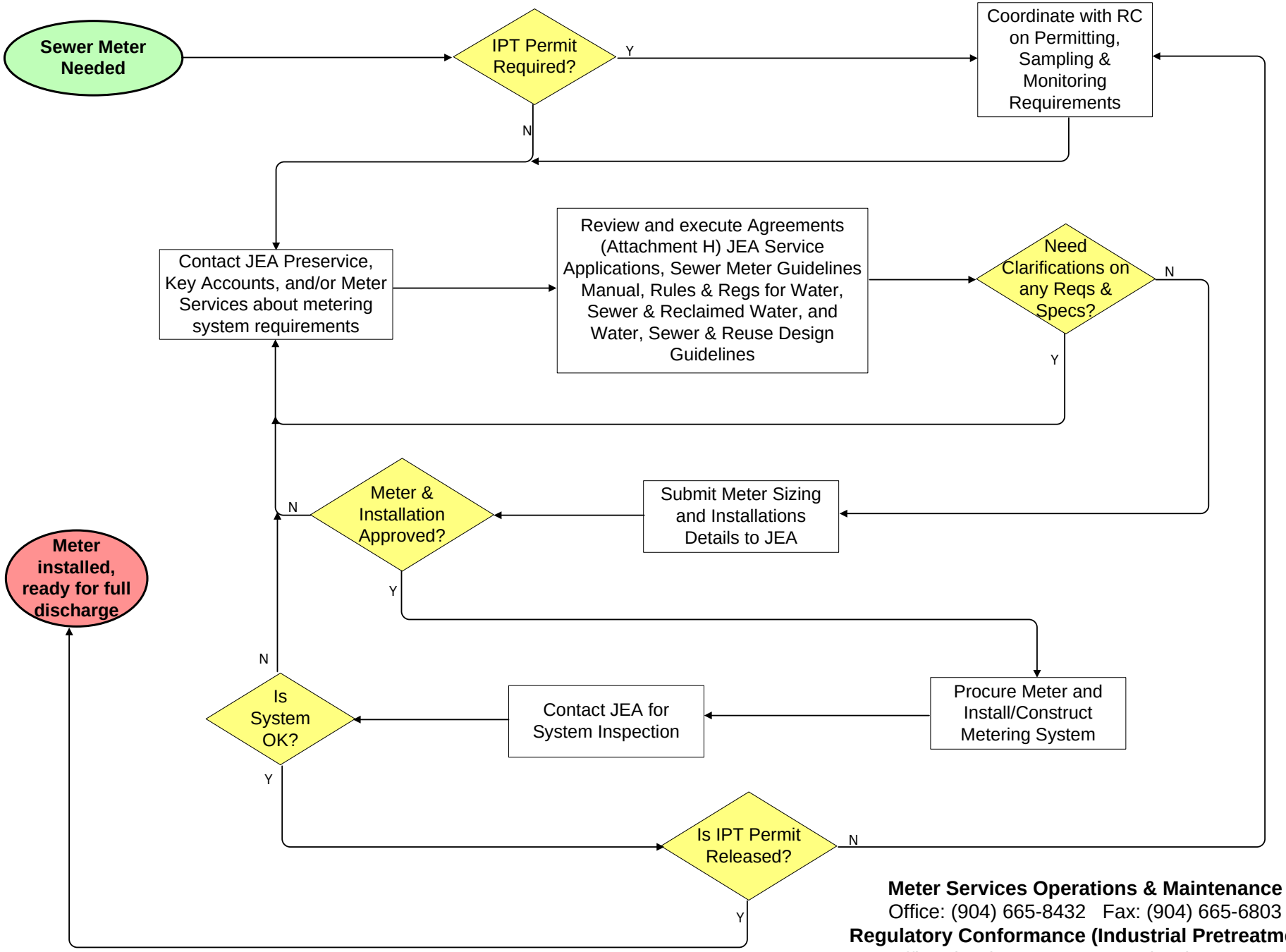
JEA Sewer Meter Request/Install Process Flow



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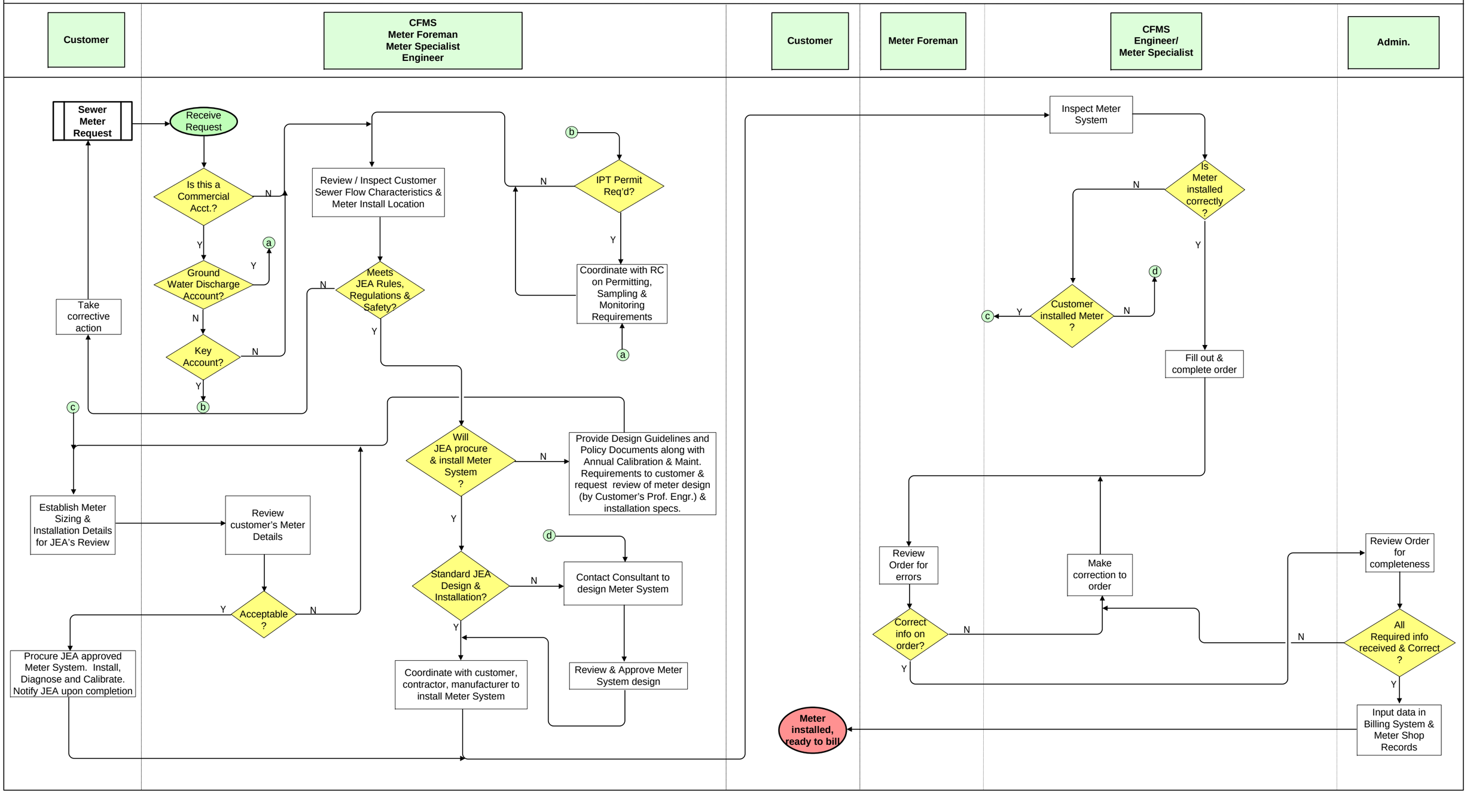
Process Development System

Process Description: **4237.1 Meter System Installation (sewer)**

Process Customer: **Commercial/Residential Water/Sewer Customer (Customer, Key Accounts, Regulatory Conformance (RC)/IPT)**

Process Flowchart



Attachment B

Typical Manufacturers for Parshall Flume, Magnetic and Ultrasonic Tube Flowmeters

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Typical Manufacturers for Parshall Flume, Magnetic and Ultrasonic Tube Flowmeters

Gravity Flow (Open Channel) Systems

Engineered Fiberglass Composites, Inc.
http://www.engineeredfiberglass.com/parshall.htm

Plasti-Fab
http://www.plasti-fab.com/wastewater-products/parshall-flumes

Tracom
http://www.tracomfrp.com/parshall.htm

Teledyne ISCO
http://www.isco.com/products/products1.asp?PL=202

Pressurized Flow (Closed Channel) Systems

Endress+Hauser
http://www.us.endress.com/

Krohne
http://www.instrumart.com/ProductList.aspx?ManufacturerID=955

Foxboro
http://iom.invensys.com/EN/Pages/Foxboro_MandI_flow.aspx

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Attachment C

Sample

Surveying Service

Scopes

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Description of Surveying Scope of Services
Flow Monitoring Station Installation

Client:
Engineering Consultant:
Surveying Consultant:

I. General

A. Surveying

1. The Surveying Consultant shall provide all surveys to establish control lines relative to existing right-of-ways, with all ground control points referenced to the Florida State Plane Coordinates, NAD83 for future use.

2. Surveys shall establish at least one temporary benchmark with an official elevation, based off an existing benchmark, in the limits of the survey area.

3. Surveys of existing conditions shall include the street address numbers and property lines of all property along the route of the attached Figures.

4. Street survey baselines shall be stationed and plotted to increase from west to east and from south to north. Baselines shall be able to be reestablished by the Contractor during construction.

5. Surveys shall include full topographical information with contour lines at one-foot intervals, spot elevations along the street centerlines, and right-of-way lines at no less than 50 feet intervals and at all street centerline intersections and right-of-way line intersections. Datum for elevations shall be NGVD29.

6. Surveys shall include plan views of utilities, underground structures, sewers lines, water lines, drains, manholes, catch basins, headwalls, landscaping, driveways, pavement, trees, fences, plus all physically visible items not specifically named. Survey shall also include drainage swales and any other drainage features.

7. Surveys shall indicate elevations for drainage manholes/inlets and sewer manholes at all inverts and at the rim of the manhole/inlet.

8. If sewer manhole inverts can not be obtained because the manhole is submerged, then the Surveying Consultant shall contact JEA, sewer dispatch at 665-4802, for the necessary information. The JEA sewer dispatch department will assist the Surveying Consultant by cleaning, pumping, or jetting the appropriate line.

Description of Surveying Scope of Services
Flow Monitoring Station Installation

B. Drawing Standards

1. Drawing Standards shall meet JEA drawing requirements as previously established. All surveys shall be drawn in JEA's current drafting standard.

II. Project Requirements

A. Schedule

1. The Surveying Consultant shall submit completed surveys to the Engineering Consultant, of all the locations indicated below, within the number of days coordinated with Engineering Consultant after receiving the Notice to Proceed and/or Purchase Order.

B. Site Requirements

1. Survey data as indicated in Section I-A shall be performed in the areas designated as "Limits of Survey", on the attached Figures.

2. For the areas indicated as "Located MH and Sewer Line Only", on the attached Figures, the Surveying Consultant shall only provide the location, inverts, and top elevations of the manholes and sewer lines.

3. Surveying Consultant shall coordinate activities on private property with the various industries.

C. Site Locations

1. The site locations shall be coordinated with JEA.

Attachment D

Design

Example

Calculations

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Building Community℠

Sewer Flowmeter & Sampling System Design Guidelines

ATTACHMENT D

EXAMPLE CALCULATIONS

Parshall Flume – The sizing and positioning of the Parshall flume is based on many factors. The average, minimum, and maximum flow rates must all be taken into account when sizing the flume. Table 1 on Figure 1, in this attachment section, presents the minimum and maximum flow rates that the varying sizes of flumes can accurately meter.

However, the positioning and elevation determination is based on several different factors. The flow rate, downstream and upstream conditions of the existing system, pipe sizes selected, pipe elevations of the existing system, and space availability all factor into the positioning of the flume. Detailed calculations shall be performed by a Florida register professional engineer for each flume installation.

All flumes shall be designed to allow for a free flow discharge downstream of the flume throat.

Magnetic Flow Meter – The sizing of the magnetic flow meter is based on the velocity of fluid flow in the pipe. As indicated in the text of the standard manual the velocities required for proper operation of the magnetic flow meter are as follows:

> "Magnetic flow meters should be selected to create a desired fluid velocity through the flow meter tube between 3 feet per second to 15 feet per second. However, the velocity shall be no less than 2 feet per second for abnormal flow conditions that are extremely below the average flow rate and no more than 20 feet per second for peak flow conditions. The velocity through the magnetic flow meter shall not be allowed outside of the desired velocity range for more than 5% of the total operating time of the system."

In order to calculate the velocity in the flow tube of the magnetic flow meter, the flow rate; minimum, maximum, and average; for the customer must be obtained. Once the flow rates have been collected, select a flow meter size and calculate the velocity, using the average flow rate, in the following manner:

Q = discharge or flow rate (ft^3/s) A = area of pipe or flow meter (ft^2)
V = velocity through the flow meter (ft/s) d = diameter of the flow meter (ft)
Formulas: $V = Q/A$ $A = d^2 * (\pi/4)$
Ex: Average flow rate = 300 gpm = 0.668 ft^3/s
Initial flow meter size selected = 4 inches = 0.33 ft
$A = 0.33^2 * (\pi/4) = 0.0873\ ft^2$
$V = 0.668/0.0873 = 7.66$ ft/s

The velocity was calculated to be 7.66 feet per second, which is within the desired range of 3 to 15 feet per second. The next step is to calculate the velocity, using the same flow meter size, for the minimum and maximum flow rates. If the velocities are within the desired range, then the flow meter size selected may be used. If the velocities for the minimum and maximum flow rates are not within the desired range then repeated the above step using a different flow meter size. Table 2 on Figure 1, in this attachment; lists the velocities for various flow rates for various flow meter sizes.

BLACK & VEATCH | CALCULATION SUMMARY

Project name	*JEA - IP Flowmeters*	**Project number**	*96918.300*		
Section of work	*Coca-Cola Bottling Company*	**Calculation number**	*FM-6*	**Rev**	-
Calculation title	*Elevation Calculations*	**Page number**	*1*	**of**	*3*

Prepared by *T.J. Whatley* **Date** *07/11/00*

Checked by **Date**
Comments

Reviewed by **Date**
Comments

Other review

Type of calculations

Preliminary
Detailed *Yes*
Costing
Other

Comments

Purpose of calculations

Determine the minimum water elevations of system based on downstream elevations.

Conclusion of calculations

Minimum flume floor elevation allowed is 12.92 ft. Therefore, the flume elevation of 14.17 ft set in the previous calculations FM-4 are O.K.
*Upstream invert el. = 13.58 ft**
*Downstream invert el = 13.17 ft**
Flume floor el. = 14.17 ft

**Elevations have been rounded to the nearest inch.*

Comments, especially regarding assumptions/preliminary data that may change outcome

A 4 to 1 slope before convergence of the flume.
A long distance of straight pipe before entry into the "normalizing" section of the flume
The system is not controlled by downstream conditions.

Source documents (codes, standards, drawings etc)

Previous calculations performed by T.J. Whatley for the Metal Container Installation (FM-3).
Previous calculations performed by T.J. Whatley for the Coca-Cola Installation (FM-4).
Isoco Open Channel Measurement Handbook, 3rd edition, by Dougla M. Grant
Plasti-Fab - Design and Cal. Of Submerged Open Channel Flow Structures/ Parshall Flumes

Use a new summary sheet for significant revisions. File new summary on top of previous summary.

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Owner JBA — Computed By TJW
Plant Casa Grande — Unit — Date 7/11 19__
Project No. 96918.300 — File No. — Verified By
Title ELEVATION CHECK — Date 19__
Page of

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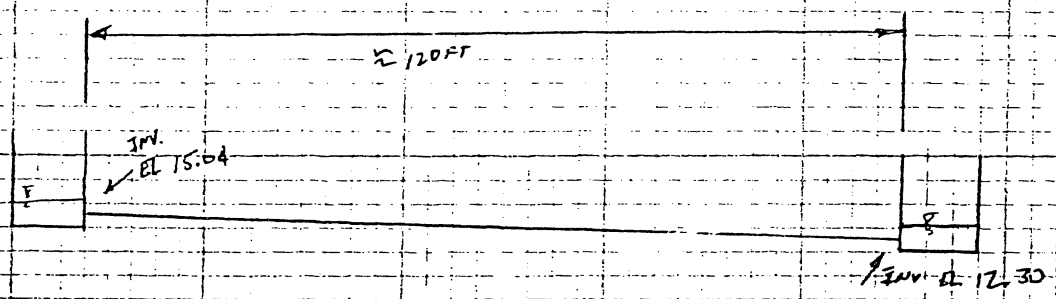


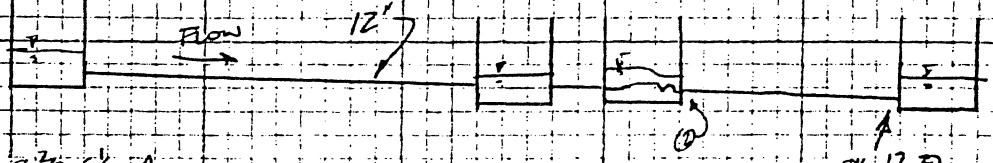
EXISTING SLOPE:

$15.04 - 12.30 = 2.74$

$\frac{2.74}{120} = \frac{x}{100}$ $\quad x = \frac{(2.74)(100)}{120} = 2.28\%$

USE MAXIMUM FLOW RATE OF ~~350 gpm~~ 0.78 cfs

SAMPLE



$Q_F = \frac{1.49}{n} R^{2/3} S^{1/2} A$

$Q_F = \frac{1.49}{0.011} \left(\frac{1}{4}\right)^{2/3} (0.0228)^{1/2} \left(1^2 \frac{\pi}{4}\right) = 6.37 \text{ cfs} \approx 2861.47 \text{ gpm}$

$\frac{Q}{Q_F} = \frac{0.78}{4.37} = 0.122$ ⇒ FROM THE ATTACHED TABLE USING $\frac{Q}{Q_F} \Rightarrow \frac{d}{D}$

$\frac{d}{D} = 0.25 \Rightarrow d = 0.25(D) = 0.25(1'1/2) = 0.25$

INV. EL @ ② = $12.30 + (0.0228)(35) = 13.10$ FT

WATER EL @ ② = $13.10 + 0.25 = 13.35$ FT

@ 350 gpm ≈ 0.78 cfs

$Q = 0.9920 H_a^{1.547}$

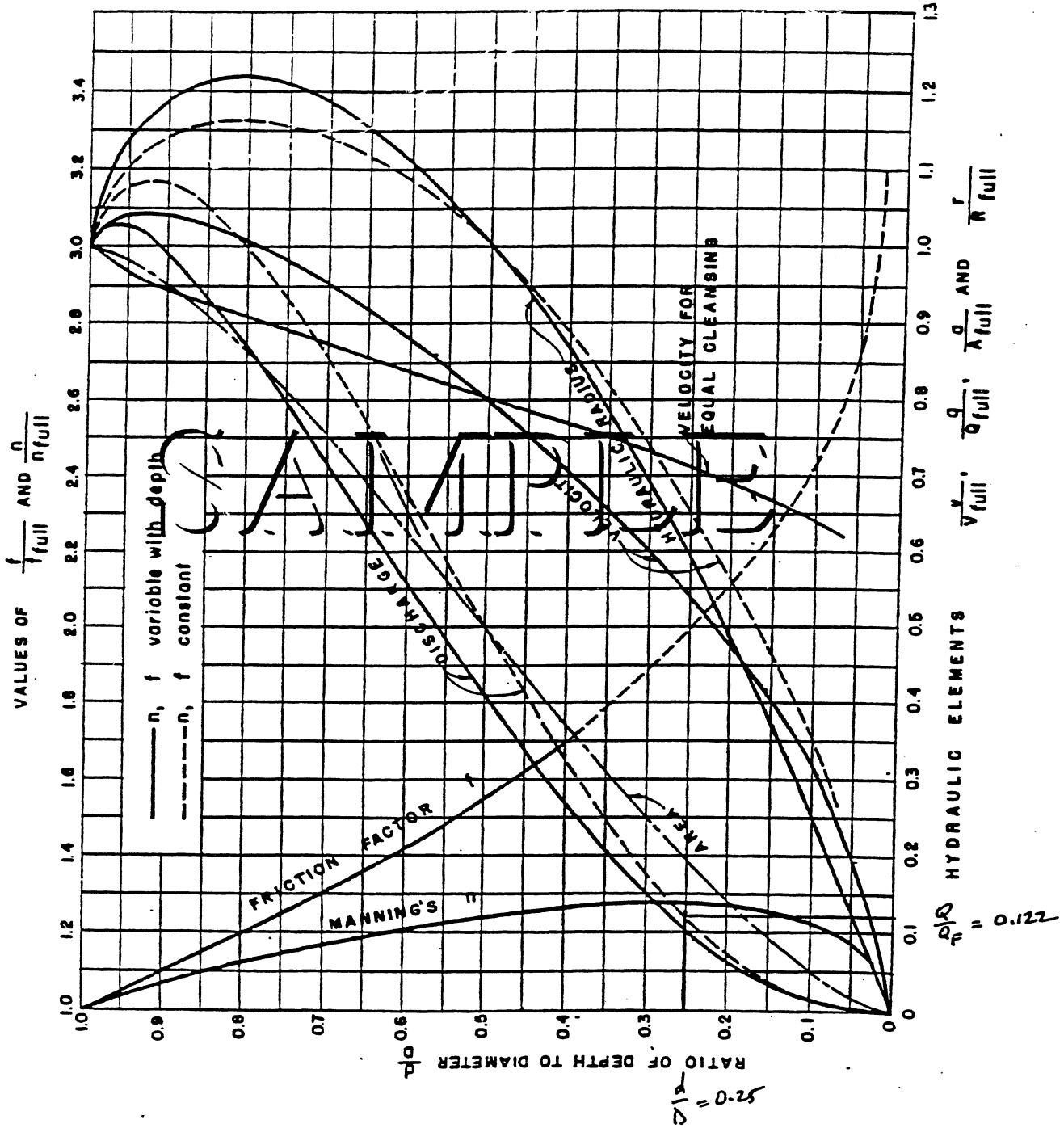
$H_a = 1.547 \sqrt{\frac{0.78}{0.9920}} = 0.85$

$\frac{H_b}{H_a} < 50\% \Rightarrow H_b = H_a(60\%) = (0.856)0.5 = 0.428$ FT

FLUME FLOOR ≤ $13.35 - 0.428 = 12.92$ FT MIN ELEVATION

THEREFORE, PREVIOUS ELEVATIONS SET ARE O.K. — REFER TO FM-4

REVISED, SUPERSEDED AND VOID CALCULATIONS MUST BE CLEARLY IDENTIFIED



HYDRAULIC PROPERTIES OF SEWERS FLOWING PARTIALLY FULL

From Design and Construction of Sanitary and Storm Sewers, ASCE Manual 37, WPCF Manual 9

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CALCULATION SUMMARY

Project name	*JEA - IP Flowmeters*	Project number	*96918.300*		
Section of work	*Coca-Cola Bottling Company*	Calculation number	*FM-4*	Rev	-
Calculation title	*Elevation Calculations*	Page number	*1*	of	*4*

Prepared by	*T.J. Whatley*	**Date**	*06/26/00*
Checked by		**Date**	
Comments			
Reviewed by		**Date**	
Comments			
Other review			

Type of calculations

Preliminary
Detailed *Yes*
Costing
Other

Comments

Purpose of calculations

Determine the water elevations through the discharge system when a 3" parshall flume has been installed. Also determine if free flow or submerged flow will occur.

Conclusion of calculations

For 70 gpm (minimum flow rate)
Water El at upstream manhole = 14.667 ft
Water El at flume manhole = 14.502 ft
Warer El at downstream manhole = 13.772 ft

For 350 gpm (maximum Flow rate)
Water El at upstream manhole = 15.241 ft
Water El at flume manhole = 15.076 ft
Warer El at downstream manhole = 14.346 ft

Conditions will allow for free flow.

Comments, especially regarding assumptions/preliminary data that may change outcome

A 4 to 1 slope before convergence of the flume.
A long distance of straight pipe before entry into the "normalizing" section of the flume.
The system is not controlled by downstream conditions.

Source documents (codes, standards, drawings etc)

Previous calculations performed by T.J. Whatley for the Metal Container Installation.
Previous calculations performed by Tim McCrary (formerly B&V) for 7th and Talleyrand installation.
Isoco Open Channel Measurement Handbook, 3rd edition, by Dougla M. Grant
Plasti-Fab - Design and Cal. Of Submerged Open Channel Flow Structures/ Parshall Flumes

Use a new summary sheet for significant revisions. File new summary on top of previous summary.

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Owner JEA — Computed By TJW
Plant Coca Cola — Unit — Date 6/16 19 —
Project No. — File No. — Verified By —
Title — Date — 19 —
Page 2 of 4

- CALCULATE PIPE ELEVATION AT INSTALLATION POINT
  - ASSUME UNIFORM SLOPE BETWEEN 2 KNOWN ELEVATION POINTS.

POINT #1 - COCA-COLA SEWER MANHOLE UPSTREAM OF INSTALLATION POINT
- INV. ELEVATION = 15.04 FT

POINT #2 - JEA SEWER MANHOLE DOWNSTREAM OF INSTALLATION POINT
- INV. ELEVATION = 12.30 FT

POINT #3 - DISCHARGE MANHOLE OF FLOWMOTOR INSTALLATION
- INV. ELEVATION = ?

CHANGE IN EL BETWEEN POINT #1 + #2 = 15.04 - 12.30 = 2.74 FT
DISTANCE BETWEEN POINT #1 + #2 = 115 FT ± (BASED ON SURVEY)

DISTANCE BETWEEN POINT #1 + #3 = 60 FT ± (" " ")

CHANGE IN ELEVATIONS AT POINT #3 => $\frac{2.74}{115} = \frac{X}{60}$ => $115X = 164.4$ => $X = 1.43$

- THEREFORE, ELEVATION AT POINT #3 = 15.04 - 1.43 = **13.61 FT**

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Owner JEA — Computed By JW
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Project No. (illegible) — File No. — Verified By
Title (illegible) — Date 19
Page 3 of 4

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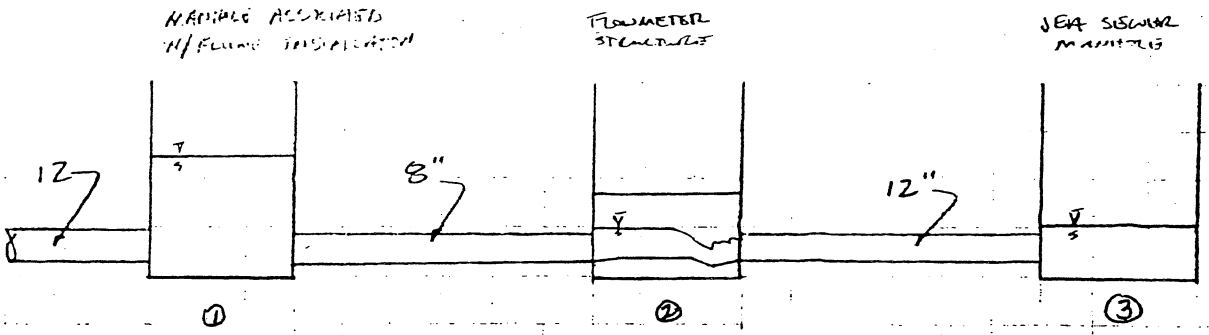
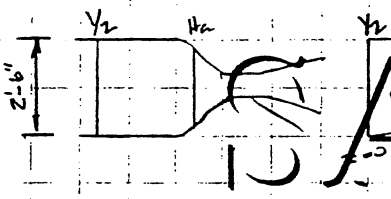
• ASSUME NO DOWNSTREAM CONTROL



3" PARSHALL FLUME



For 3" Flume $\Rightarrow Q = 0.9920\, H_a^{1.}$

USE $Q = 70$ gpm (MIN FLOW RATE

$H_a = \sqrt{\frac{0.156}{0.9920}} = 0.302$

$V_{H_a} = \frac{Q}{A_{H_a}} = \frac{0.156}{(0.651)(0.302)} = 0.$

• DEPTH AT Y_2

$$Y_2 + \frac{V_2^2}{2g} + Z_2 = Y_{H_a} + \frac{V_{H_a}^2}{2g} + Z_{H_a}$$

$$Y_2 + \frac{Q^2}{A_2^2 2g} + \cancel{Z_2}^{\,0} = 0.302 + \frac{(0.7)^2}{2(32.2)} + 0.5$$

$$Y_2 + \frac{0.156^2}{\left[(Y_2^2)2.5^2\right]\cdot 2(32.2)} = 0.892 \Rightarrow Y_2 + \frac{6.05\cdot 10^{-5}}{Y_2^2} = 0.892$$

$$Y_2^3 - 0.892 Y_2^2 + \cancel{6.05\cdot 10^{-5}}^{\text{NEGLIBLE}} = 0 \Rightarrow Y_2^2(Y_2 - 0.892) = 0 \quad \boxed{Y_2 = (}$$

① - ② $\Rightarrow$ $H_1 = H_2 + h_{LOSSES}$

$$Y_1 + \cancel{\frac{V_1^2}{2g}}^{\,0} + \cancel{Z_1}^{\,0} = Y_2 + \frac{V_2^2}{2g} + \cancel{Z_2}^{\,0} + h_{LOSSES}$$

$$Y_1 = 0.892 + \frac{(0.07)^2}{2(32.2)} + \underbrace{\left[(0.1)(0.05) + (1.5)(0.05)\right]}_{h_L \text{ IN } 8" \text{ PIPE}} \Rightarrow \boxed{Y_1 = 1.057 \text{ FT}}$$

$V_2 = \frac{Q}{A_2} = \frac{0.156}{(2.5)(0.892)} = 0.07($

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Owner JCH — Computed By TJW
Plant COCA-COLA — Unit — Date 6/26 19
Project No. 9698.300 — File No. — Verified By
Title ELEVATION DETERMINATION — Date 19
Page 4 of 4

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①-③

$$H_1 = H_2 + h_{LOSSES} \Rightarrow y_1 + \frac{V_1^2}{2g} + z_1 = y_3 + \frac{V_3^2}{2g} + z_3 + h_{LOSSES}$$

$$h_{LOSSES} = \underbrace{[(0.2)(0.5) + (1.5)(0.05)]}_{\text{HEAD LOSS IN PIPE}} + \underbrace{0.67}_{\text{HEAD LOSS ACROSS FLUME}} = 0.895^{*}$$

$$1.057 + \frac{V_1^2}{2g}^{\text{NEG}} + 13.61 = y_3 + \frac{V_3^2}{2g}^{\text{NEG}} + 10.20 + 0.895$$

$$y_3 = 1.057 + 13.61 - 10.20 - 0.895 = 3.572^{FT}$$

SAMPLE

BOTTOM EL. @ ① = 13.61 FT — WATER EL @ ① = 14.667 FT
BOTTOM EL. @ ② = 13.61 FT — WATER EL. @ ② = 14.502 FT
BOTTOM EL. @ ③ = 10.20 FT — WATER EL. @ ③ = 13.772 FT

HEIGHT OF FLUME FLOOR = 13.61 + 0.58 = 14.19 FT

TO ENSURE FREE FLOW DOWNSTREAM DEPTH MUST NOT BE GREATER THAN 50% OF H_4 OR $(0.302)(.5) = 0.151 \Rightarrow 14.19 + 0.151 = 1$

$14.34^{FT} > 13.772^{FT} \therefore$ O.K.

ACTUAL WATER EL. = 11.92 FT → BASED ON VISIONOR SURVEY

USING SAME PROCEDURE FOR MAX FLOW RATE OF 350 gpm:

$y_1 = 1.631$ — WATER EL. @ ① = 15.241 FT — 50% OF $H_4 = (0.853)($
$y_2 = 1.464$ — WATER EL. @ ② = 15.076 FT — $= 0.428$
$y_3 = 4.146$ — WATER EL. @ ③ = 14.346 FT — $14.19 + 0.428 = 14.$

$14.62^{FT} > 14.346^{FT} \therefore$ O.K.

REVISED, SUPERSEDED, AND VOID CALCULATIONS MUST BE CLEARLY IDENTIFIED

ATTACHMENT D

TABLE 1

PARSHALL FLUME SIZE DETERMINATION TABLE								
THROAT WIDTH W	MIN. HEAD FT	MINIMUM FLOW RATE			MAX. HEAD FT	MAXIMUM FLOW RATE		
		CFS	MGD	GPM		CFS	MGD	GPM
1 in.	0.07	0.005	0.003	2.24	0.60	0.153	0.099	68.7
2 in.	0.07	0.011	0.007	4.94	0.60	0.306	0.198	137
3 in.	0.10	0.028	0.018	12.6	1.5	1.86	1.20	835
6 in.	0.10	0.054	0.035	24.2	1.5	3.91	2.53	1750
9 in.	0.10	0.091	0.059	40.8	2.0	8.87	5.73	3980
1 ft.	0.10	0.120	0.078	53.9	2.5	16.1	10.4	7220
1.5 ft.	0.10	0.174	0.112	78.1	2.5	24.6	15.9	11,000
2 ft.	0.15	0.423	0.273	190	2.5	33.1	21.4	14,900
3 ft.	0.15	0.615	0.397	276	2.5	50.4	32.6	22,600
4 ft.	0.20	1.26	0.816	565	2.5	67.9	43.9	30,500
5 ft.	0.20	1.55	1.00	696	2.5	85.6	55.3	38,400
6 ft.	0.25	2.63	1.70	1180	2.5	103	66.9	46,200
8 ft.	0.25	3.45	2.23	1550	2.5	139	90.1	62,400
10 ft.	0.30	5.74	3.71	2580	3.5	292	189	131,000
12 ft.	0.30	7.93	5.13	3560	4.5	519	335	233,000

TABLE 2

MAGNETIC FLOW METER SIZE DETERMINATION TABLE								
Flow Rate			Magnetic Flowmeter Size (inches)					
gpm	mgd	cfs	3	4	6	8	10	12
50	0.07	0.11	2.27					
100	0.14	0.22	4.54	2.55				
150	0.22	0.33	6.81	3.83				
200	0.29	0.45	9.07	5.10	2.27			
250	0.36	0.56	11.34	6.38	2.84			
300	0.43	0.67	13.61	7.66	3.40			
350	0.50	0.78	15.88	8.93	3.97	2.23		
400	0.58	0.89	18.15	10.21	4.54	2.55		
450	0.65	1.00		11.48	5.10	2.87		
500	0.72	1.11		12.76	5.67	3.19	2.04	
550	0.79	1.22		14.04	6.24	3.51	2.25	
600	0.86	1.34		15.31	6.81	3.83	2.45	
650	0.94	1.45		16.59	7.37	4.15	2.65	
700	1.01	1.56		17.87	7.94	4.47	2.86	
750	1.08	1.67		19.14	8.51	4.79	3.06	2.13
800	1.15	1.78			9.07	5.10	3.27	2.27
850	1.22	1.89			9.64	5.42	3.47	2.41
900	1.30	2.00			10.21	5.74	3.68	2.55
950	1.37	2.12			10.78	6.06	3.88	2.69
1000	1.44	2.23			11.34	6.38	4.08	2.84

Minimum Velocity = 2 fps*
Desirable Velocity = 3–15 fps*
Maximum Velocity = 20 fps

* velocity allowed for abnormal flow conditions (extremely below average or peak) for short periods of time.

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FLOW METER SIZE DETERMINATION TABLES

FIGURE 1

J:\SHARED\ACAD\INDUSTRIAL PRETREATMENT\FLOW METER FIGURES 1

Attachment E

Typical Flowmeter Installation Drawings

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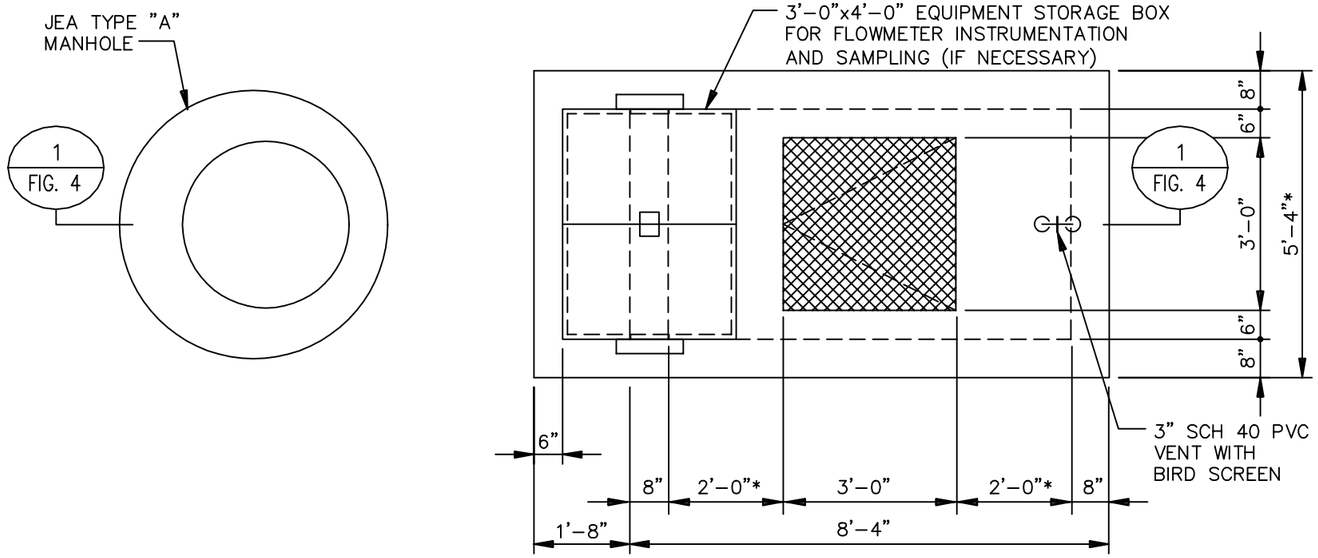

PLAN ABOVE GRADE (A)

3/8" = 1'-0"

* DIMINSIONS ARE BASED ON A 3" PARSHALL FLUME

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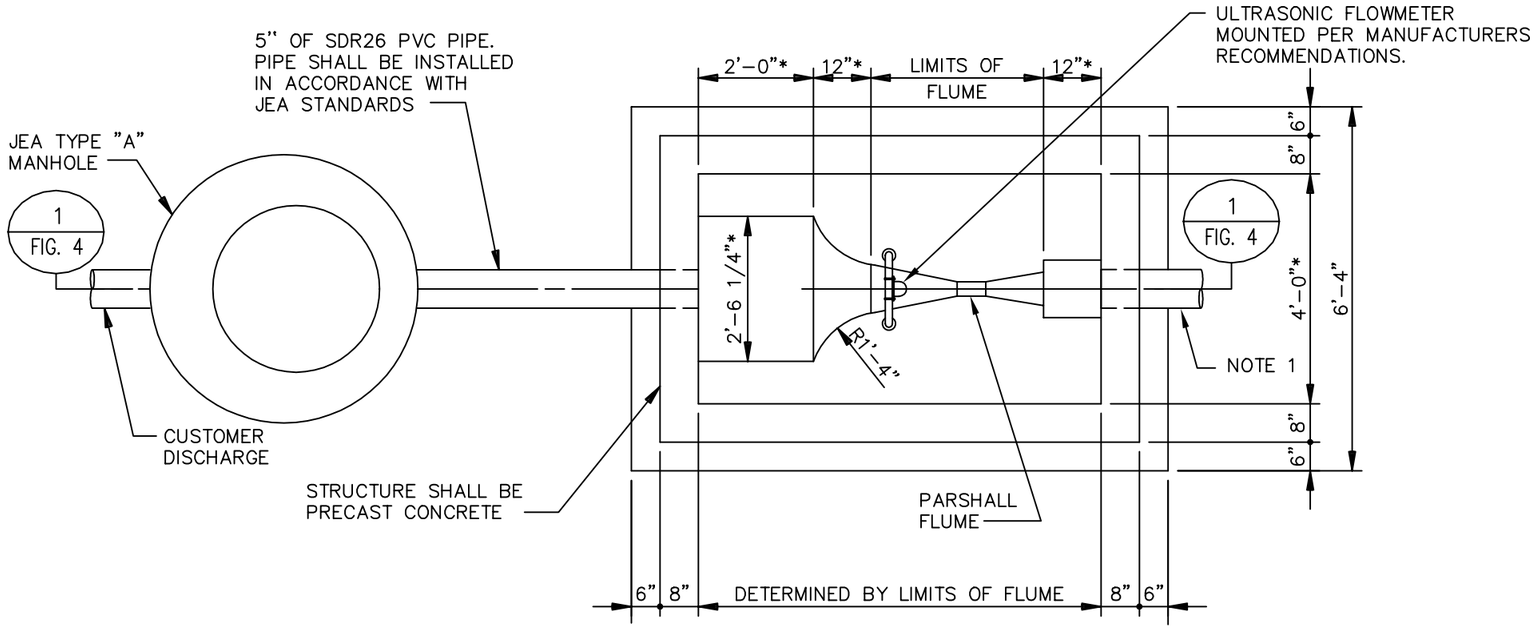
PARSHALL FLUME/ULTRASONIC
FLOW METER DESIGN GUIDELINES

FIGURE 2
ATTACHMENT E

J:\SHARED\ACAD\INDUSTRIAL PRETREATMENT\FLOW METER FIGURES 2



PLAN BELOW GRADE B

3/8" = 1'-0"

* DIMENSIONS ARE BASED ON A 3" PARSHALL FLUME

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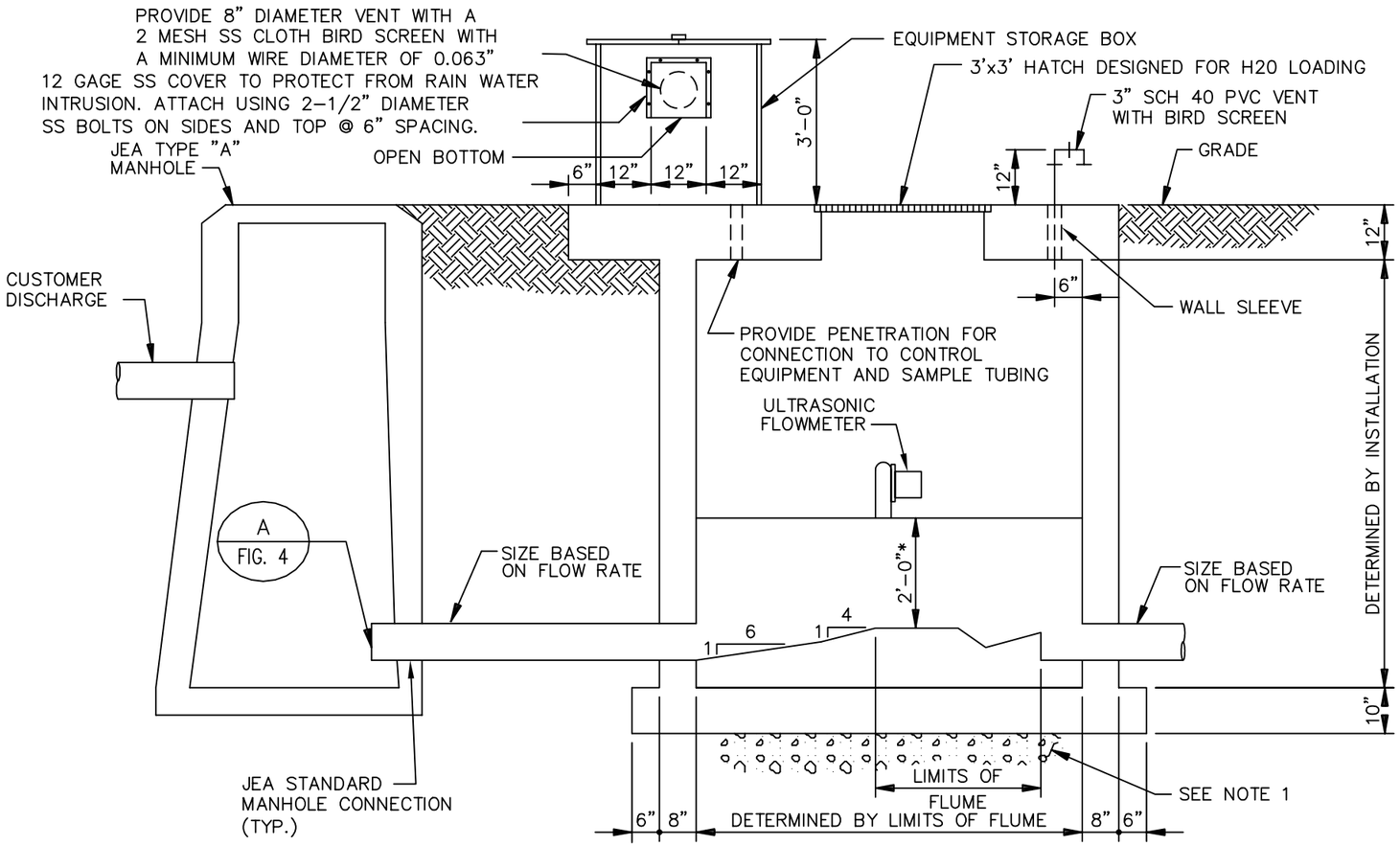
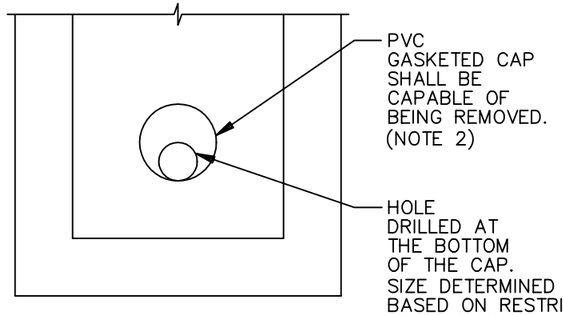
PARSHALL FLUME/ULTRASONIC
FLOW METER DESIGN GUIDELINES

FIGURE 3
ATTACHMENT E

J:\SHARED\ACAD\INDUSTRIAL PRETREATMENT\FLOW METER FIGURES 2



SECTION 1
3/8" = 1'-0"
FIG. 2 & FIG. 3



DETAIL A
3/4" = 1'-0"
FIG. 4

NOTE:
1. PROVIDE MINIMUM 12" OF COMPACTED GRANULAR FILL.
2. AS NEEDED TO RESTRICT DISCHARGE IF REQUIRED BY INDUSTRIAL USED WASTEWATER PERMIT LIMITS.

* DIMENSIONS ARE BASED ON A 3" PARSHALL FLUME

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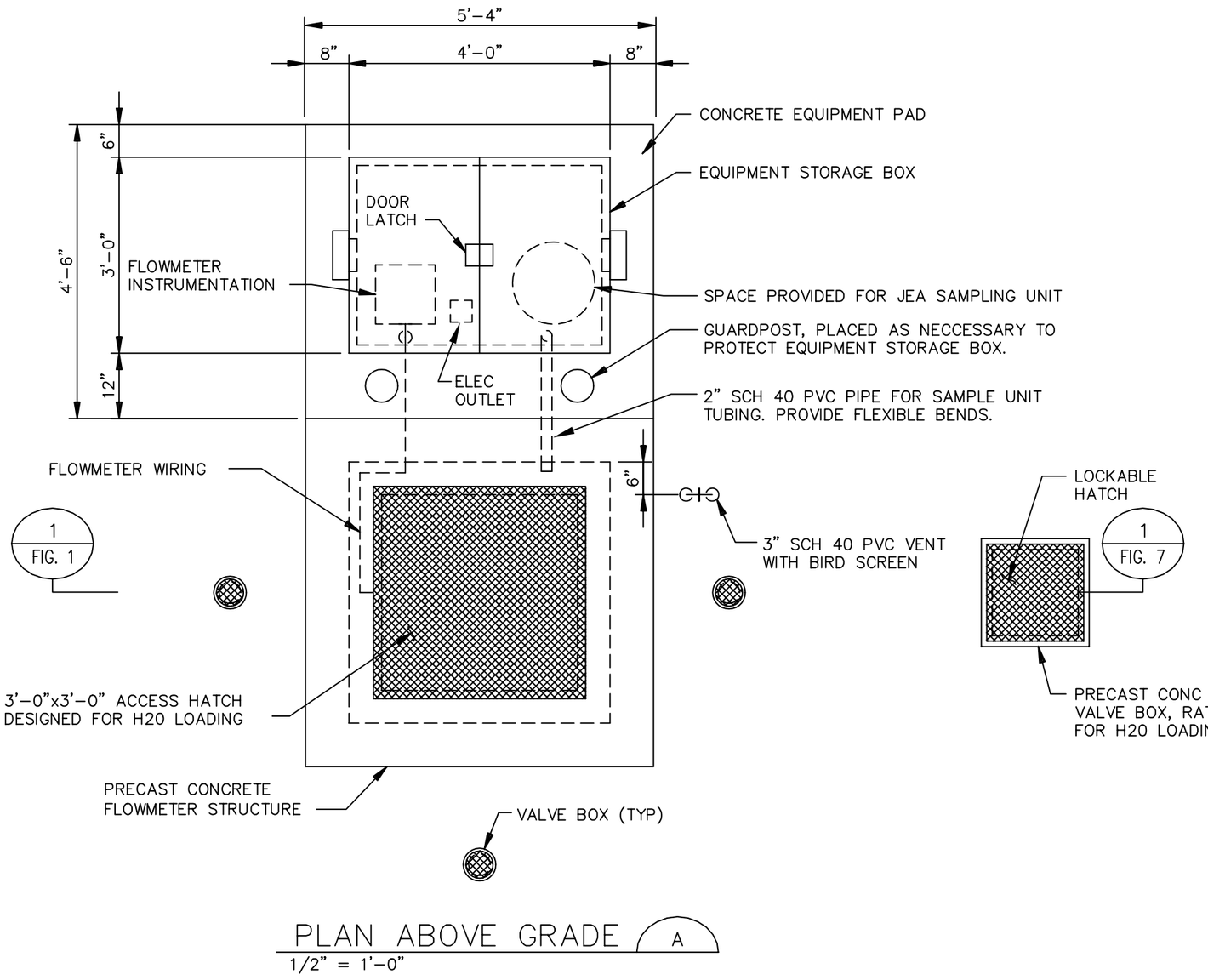
PARSHALL FLUME/ULTRASONIC FLOW METER DESIGN GUIDELINES

FIGURE 4
ATTACHMENT E

J:\SHARED\ACAD\INDUSTRIAL PRETREATMENT\FLOW METER FIGURES 2



PLAN ABOVE GRADE (A)

1/2" = 1'–0"

J:\SHARED\ACAD\INDUSTRIAL PRETREATMENT\FLOW METER FIGURES 2

DATE	REVISION OR ISSUE	NO.	BY	CK	APP	DATE	REVISION OR ISSUE	NO.	BY	CK	APP

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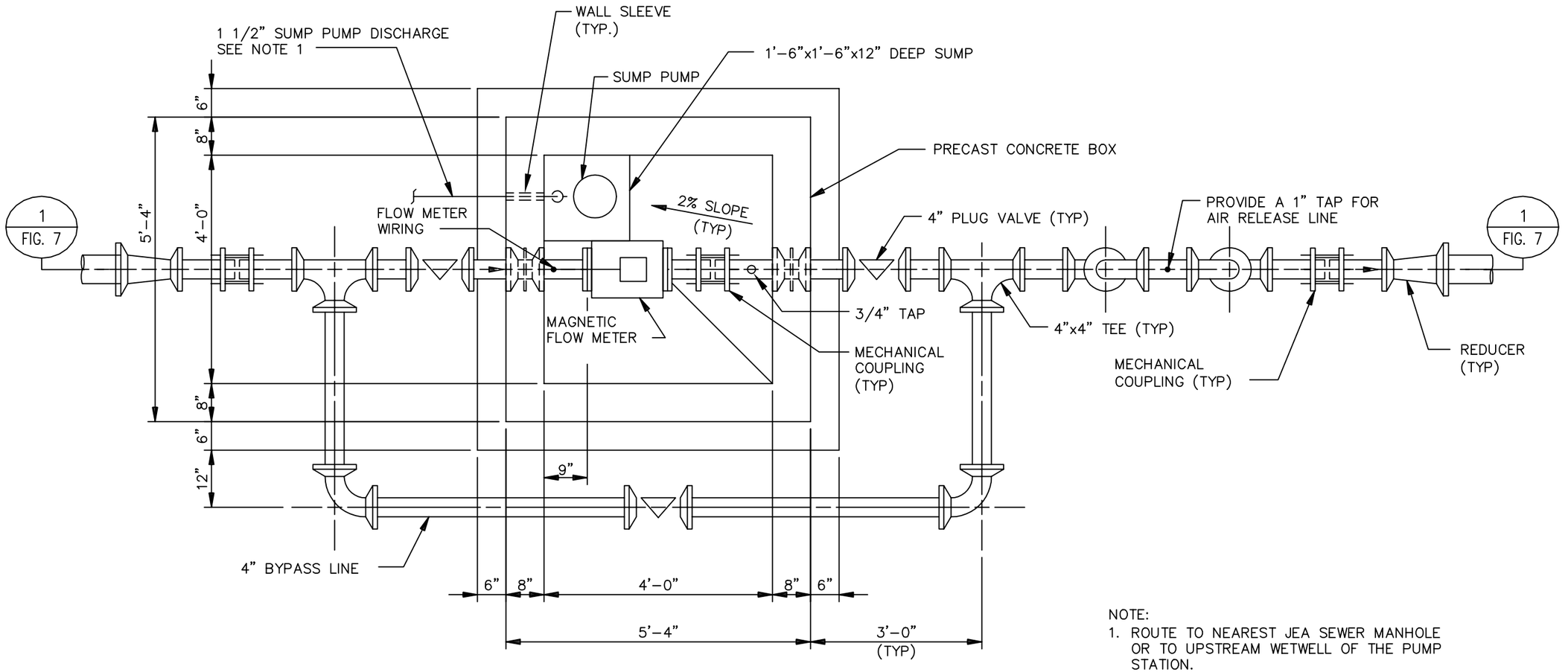
JACKSONVILLE, FLORIDA

MAGNETIC FLOWMETER DESIGN GUIDELINES
(BELOW GRADE INSTALLATION)

FIGURE 5
ATTACHMENT E



PLAN BELOW GRADE* B

1/2" = 1'-0"

NOTE:
1. ROUTE TO NEAREST JEA SEWER MANHOLE OR TO UPSTREAM WETWELL OF THE PUMP STATION.

* DIMENSIONS AND SIZES ARE BASED ON A 4" MAGNETIC FLOW METER

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JEA
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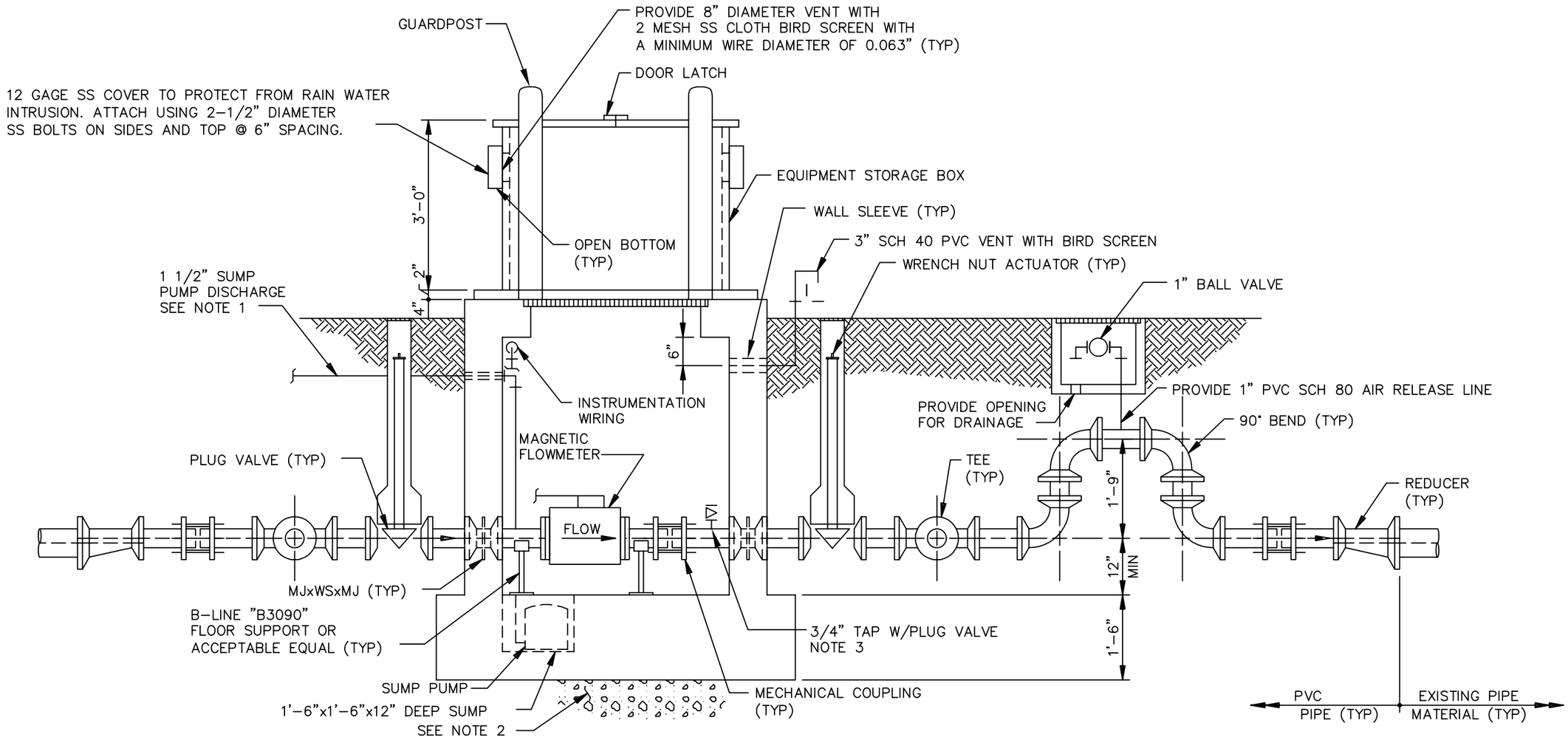
MAGNETIC FLOW METER DESIGN GUIDELINES
(BELOW GRADE INSTALLATION)

FIGURE 6
ATTACHMENT E

J:\SHARED\ACAD\INDUSTRIAL PRETREATMENT\FLOW METER FIGURES 2



SECTION* 1
1/2" = 1'-0"
FIG. 5 & FIG. 6

NOTE:
1. ROUTE TO NEAREST JEA SEWER MANHOLE OR TO UPSTREAM WETWELL OF THE PUMP STATION.
2. PROVIDE MINIMUM 12" OF COMPACTED GRANULAR FILL.
3. IF REQUIRED INSTALL AN ISCO FORCE MAIN SAMPLING SYSTEM CONSISTING OF PRESSURE REDUCING VALVE (IF NECESSARY), 3-WAY SOLENOID VALVE, SAMPLE UNIT PIPING AND TUBING, AND SAMPLE UNIT.

* DIMENSIONS AND SIZES ARE BASED ON A 4" MAGNETIC FLOW METER

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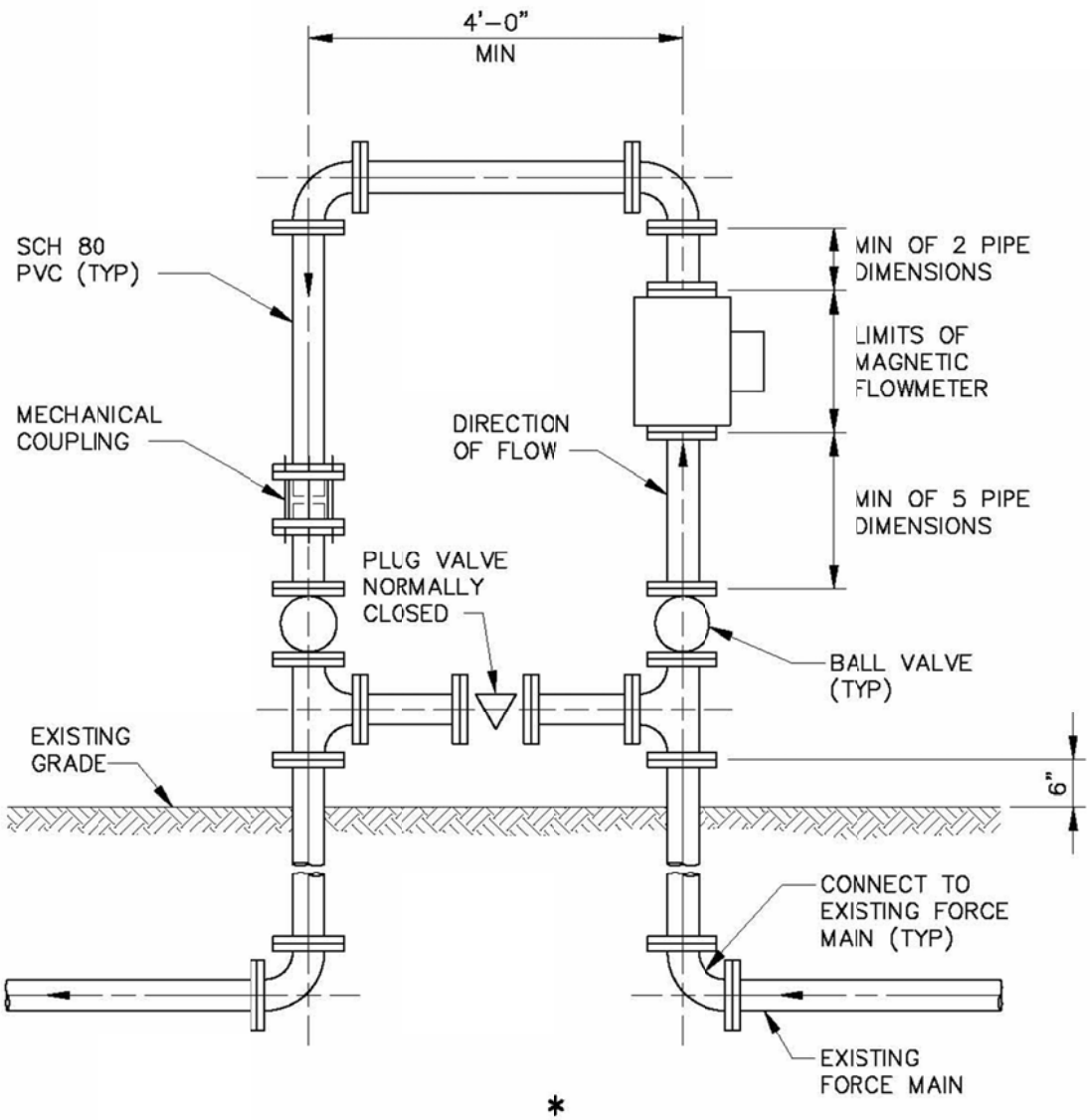
MAGNETIC FLOW METER DESIGN GUIDELINES
(BELOW GRADE INSTALLATION)

FIGURE 7
ATTACHMENT E

J:\SHARED\ACAD\INDUSTRIAL PRETREATMENT\FLOW METER FIGURES 2



*

SECTION

1/2" = 1'-0"

Bypass Loop is not permitted for Ground Water Discharge or other Non-Permanent Discharge Projects

NOTES:

THIS IS A TYPICAL ARRANGEMENT. OTHER PIPING ARRANGEMENTS AND HORIZONTAL PLACEMENT OF THE MAGNETIC FLOWMETER ARE ACCEPTABLE.

* PIPING MUST BE CONFIGURED TO ENSURE FULL FLOW IN THE CROSS-SECTIONAL AREA OF THE METER.

* DIMENSIONS AND SIZES ARE BASED ON A 4" MAGNETIC FLOWMETER.

JEA Building Community	JEA JACKSONVILLE, FLORIDA	
	MAGNETIC FLOW METER GUIDELINES (ABOVE GRADE INSTALLATION)	FIGURE 8 ATTACHMENT E

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Attachment F

Sample

Specifications for

Various Flowmeter

Systems

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APPLICATION: Below ground flume and magnetic flow meter installation.

Section 02722

PRECAST REINFORCED CONCRETE FLOWMETER VAULTS

PART 1 - GENERAL

1-1. SCOPE. This section covers the precast reinforced concrete flowmeter vaults to be furnished and installed as indicated and detailed on the figures, complete with all fittings, specials, jointing materials, and other necessary appurtenances.

Excavation and backfill are covered in the JEA earthwork section.

1-2. GENERAL.

1-2.01. Coordination. The Contractor shall coordinate connections to piping and installation of access hatches.

1-2.02. Governing Standards. Except as modified or supplemented herein, the precast reinforced concrete flowmeter vaults shall conform to all applicable provisions of ASTM C913. Design of the vaults shall be in accordance with the latest edition of AASHTO Standard Specifications for Highway Bridges and ACI 318.

1-3. DELIVERY, STORAGE, AND HANDLING.

1-3.01. Delivery. Precast concrete vault sections shall not be delivered to the site until concrete control cylinders representing these vault sections have attained a compressive strength of at least 80 percent of the specified minimum 28 day strength.

1-3.02. Handling. Precast concrete vault sections and fittings shall be handled carefully and shall not be bumped or dropped. Hooks shall not be permitted to come in contact with joint surfaces. Once the vaults have been installed the Contractor shall cut off the lifting rings flush with the vault surface.

1-4. SUBMITTALS. Submittals shall be made in accordance to JEA standards.

PART 2 – PRODUCTS

2-1. BASIS OF DESIGN. The precast reinforced concrete flowmeter vaults shall conform to the design requirements of ASTM C890, AASHTO Standard Specifications for Highway Bridges, ACI 318, and shall be provided as indicated on the drawings.

In addition, the precast reinforced concrete vaults shall be designed to resist the soil and hydrostatic uplift and lateral forces without leaking or becoming buoyant with a water elevation to the top of the vaults.

The top of the precast concrete flow meter vaults shall be able to withstand an H-20 loading. The vault manufacturer shall design the foundation to resist all applicable loads. The Contractor shall construct the foundation as required by the vault manufacturer.

Concrete cover requirements shall be the following with no minus tolerance:

Interior surfaces, min, inches	1-1/2
Exterior surfaces, min, inches	1-1/2

2-2. MATERIALS. Unless otherwise specified, all materials used in the manufacture of the precast reinforced concrete flowmeter vaults, fittings, and accessories shall conform to ASTM C913.

Cement	ASTM C150, Type I or II.
Fly Ash	ASTM C618, Class F only, except loss on ignition shall not exceed 4 percent. Fly ash content shall be 20-25 percent by weight of the total cementitious material.
Water-Cement Ratio, max	0.40.
Joints	ASTM C913.
Reinforcement	ASTM C913.
Non-shrinking Grout	Grace "Supreme", L&M "Crystex", Master Builders "Masterflow 713 Grout", Sauereisen Cements "F-100

	Level Fill Grout", or Five Star Products "Five Star Grout".
Joint Sealant	Bidco “C-56”, Press-Seal “CPS-210”

2-3. FABRICATION.

2-3.01. Manufacture. The vault sections shall be manufactured in accordance with ASTM C913 except as modified in this section. The compressive strength of all concrete shall be 4000 psi.

2-3.02. Curing. Concrete shall be water or steam cured. Membrane curing compound will not be acceptable.

2-3.03. Marking. Each section of the vaults shall be marked in accordance with ASTM C913. Identification of specials to show the location in the line shall be plainly and permanently marked thereon.

2-3.04. Coating. The vaults shall be painted or coated as specified in the JEA standard coatings section for sewer manholes.

2-3.05. Testing. All testing shall conform to ASTM C913. All testing shall be performed by an independent testing laboratory acceptable to the JEA. Copies of reports covering all tests made by the testing laboratory shall be submitted for review. All tests shall be made at the Contractor's expense. JEA reserves the right to sample and test any vault section after delivery and to reject sections represented by any sample which fails to comply with the specified requirements.

PART 3 – EXECUTION

3-1. INSPECTION. The precast concrete flowmeter vaults shall be inspected when delivered. The vaults may be rejected because of any of the following:

a. Fractures or cracks passing through the wall, except a single end crack that does not exceed the depth of a joint.

b. Honeycombed or open texture.

c. Damaged ends, where such damage could prevent making a satisfactory joint.

3-2. INSTALLATION. Vaults shall not be installed in water, nor under unsuitable weather or trench conditions.

Placement of vault sections shall begin at the lowest elevation, with female ends facing the direction of laying except when reverse laying is permitted by the Engineer.

Foreign material shall be prevented from entering the vaults during installation. No debris, tools, clothing, or other materials shall be placed in the vault section.

All openings used for handling shall be sealed with grout following installation.

3-2.01. Cleaning. The interior of the vault sections and fittings shall be thoroughly cleaned before installation and shall be kept clean until the work has been accepted. All joint contact surfaces shall be kept clean until the joint is completed.

3-2.02. Alignment. Vault sections shall be laid to the lines and grades indicated on the drawings. Batter boards, laser beam equipment, or surveying instruments shall be used to maintain alignment and grade. At least one elevation measurement shall be made on each box section.

If laser beam equipment is used, periodic elevation measurements shall be made with surveying instruments to verify accuracy of grades. If such measurements indicate thermal deflection of the laser beam due to differences between ground temperature and the air temperature within the vaults, precautions shall be taken to prevent or minimize further thermal deflections.

3-2.03. Jointing. All joint preparation and jointing operations shall comply with the instructions and recommendations of the vault manufacturer.

Joints with flexible joint sealant shall be coated with the recommended adhesive, and the joint sealant shall be positioned in accordance with the manufacturer's installation instructions. Joints shall be pulled together with sufficient force to uniformly fill and seal the annular space in the joint. Joints shall not be made when adverse weather conditions may prevent proper sealing, nor when the temperature of the pipe and sealing materials is too low to achieve proper sealing.

End of Section

Section 06600

FIBERGLASS REINFORCED PLASTIC FABRICATIONS

PART 1 - GENERAL

1-1. SCOPE. This section covers fiberglass reinforced plastic fabrications.

1-2. GENERAL. The items furnished under this section shall be the products of a manufacturer who has furnished items of the type specified which have been in successful service for a substantial period.

1-3. SUBMITTALS. Complete drawings, details, and specifications covering the fiberglass reinforced plastic fabrications shall be submitted in accordance with the submittals section.

A standard calibration curve or tabulation for the flume liner shall be prepared and certified by the manufacturer. The calibration curve or tabulation shall show the flow at various levels, shall cover the entire specified range of flow, and shall be legible to within 0.5 percent of the flow at any point.

PART 2 - PRODUCTS

2-1. BASIC MATERIALS.

Plastic Laminate	Polyester or other suitable plastic reinforced with fiberglass.
Tensile Strength at Break	11,000 psi minimum, ASTM D638.
Flexural Strength	18,000 psi minimum, ASTM D790.
Tangent Modulus of ElasticityASTM D790.	900,000 psi minimum,
Finished Thickness	Within ±10 percent of nominal.
Fasteners	AISI 18-8 stainless steel.

All surfaces of plastic laminate shall be sealed with a resin layer at least 5 mils thick. Field-cut surfaces shall be recoated with resin obtained from the fabricator.

2-2. PARSHALL FLUME LINER. The Parshall flume liner shall be as manufactured by F. B. Leopold, Plasti-Fab, Warminster, or equal, and shall conform to the parameters required to perform accurately for the specific flow rate and to the following requirements:

Height of sidewalls above floor of approach section inches	27
Minimum wall thickness inch	1/4

The liner shall be accurate in all dimensions and shall include, in one integral piece, the approach, throat, and downstream sections. Each section shall have a floor and vertical sidewalls. The inside surfaces shall be smooth and free from irregularities. Flanges and anchors shall be provided as necessary on the outside surfaces to ensure that the liner will be permanently anchored to the concrete.

The liner shall be stiffened and braced so that the deflection caused by concrete placement shall not exceed 1/16 inch at any point. Internal braces shall be readily removable after concrete is placed, without damage to the inside surfaces of the liner. All permanent reinforcing members shall be completely encased in plastic.

2-3 EQUIPMENT STORAGE BOX. The Contractor shall provide a 4'-0" wide by 3'-0" deep by 3'-0" high fiberglass equipment storage box that will contain a JEA provided sampling unit and the Contractor provided flowmeter instrumentation. The box shall have a flat roof. The roof shall be a double leaf access hatch with a locking hasp so the hatch can be locked shut. Each leaf of the access hatch shall have a plated safety stop chain and neoprene door seal gasket to prevent rain water from entering the box when the access doors are closed. The box shall have an 8 inch diameter vent with a 2 mesh stainless steel cloth bird screen with a minimum wire diameter of 0.063 inches. A 12 gage stainless steel cover shall be placed over the vent to prevent rain water intrusion, as indicated on the drawings. All hardware associated with the box shall be stainless steel.

The equipment storage box shall be anchored to a concrete equipment pad, as indicated on the drawings and per manufacturer's recommendations. All hardware associated with securing of the box to the equipment pad shall be stainless steel. The box shall be able to withstand a 125 miles per hour wind load without detaching from the equipment pad. Anchor bolts shall be provided by the Contractor.

Interior and exterior color of the box shall be white. All edges of the box shall be sealed to prevent insect and moisture penetration. The box shall be factory assembled prior to shipment.

PART 3 - EXECUTION

3-1. INSTALLATION.

3-1.01. Parshall Flume Liner. The liner shall be carefully leveled and rigidly braced and anchored in position before the adjacent concrete is placed.

3-1.02. Equipment Storage Box. The box shall be positioned as indicated on the drawings. Other positioning arrangements shall be approved by the Engineer. The box shall be installed on the concrete equipment pad as indicated on the drawings and per the manufacturer's recommendations.

End of Section

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APPLICATION: Below grade flume and magnetic flow meter installation.

Section 10990

MISCELLANEOUS SPECIALTIES

PART 1 - GENERAL

1-1. SCOPE. This section covers the miscellaneous items of work not covered in other sections.

1-2. GENERAL. Miscellaneous specialties shall be furnished and installed as specified herein and in accordance with the details, arrangements, and dimensions indicated on the figures. Where not specifically indicated or specified, fasteners, gaskets, and other accessories shall be provided as required and as recommended by the manufacturer of the specific item.

1-3. DRAWINGS AND DATA. Complete specifications, detailed drawings, and setting or erection drawings covering miscellaneous specialties shall be submitted.

PART 2 - PRODUCTS

2-1. ALUMINUM ACCESS HATCHES. Aluminum access hatches shall be furnished and installed where indicated on the drawings and as specified herein. Access hatches shall be of the size indicated on the drawings and shall be manufactured by Bilco Company, Halliday Products, or Dur-Red.

2-1.01. Access Hatch Cover. Access hatches provided for the flowmeter structures shall be Model “J H20”. The covers shall be of aluminum construction, suitable for an H20 vehicular loading. The cover shall be single leaf type, constructed of structural shapes and reinforced diamond-pattern checkered plate. Structural shapes and plates shall be at least 1/4 inch thick. The hatch shall be provided with two hinges, torsion bars or other devices to assist opening, an automatic hold-open arm, a retractable handle, and a padlock hasp. The frame shall be provided with strap anchors bolted or welded to the exterior. All aluminum surfaces to be in contact with concrete or mortar shall be given a heavy coat of coal tar paint. All hatches shall be mill finished.

All hatches shall open to 90 degrees. Devices shall be provided for easy operation, including an automatic hold open arm with release handle for each door leaf. A snap lock with removable handle shall be provided for each hatch. All hardware shall be aluminum or stainless steel. Orientation of the hatches

shall be as indicated on the drawings.

PART 3 - EXECUTION

3-1. ALUMINUM ACCESS HATCH INSTALLATION. Aluminum access hatches shall be installed where indicated on the figures and as specified herein. Installation shall be in accordance with the manufacturer's instructions.

After installation, all aluminum surfaces and mechanisms shall be cleaned to remove mortar, paint, or other contaminants.

End of Section

APPLICATION: Below and above grade flume and magnetic flow meter installation.

Section 13400

INSTRUMENTATION

PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing and installation of metering and control equipment.

1-1.01. Panels and Subassemblies.

1-1.02. Metering and Control Systems. Principal components of the metering and control systems shall be as indicated on the piping and instrument diagram drawings and as listed on the instrument device schedule drawings.

1-1.03. Miscellaneous. Furnish one lot of test equipment, spare parts, and miscellaneous devices as set forth herein.

1-2. CODES, PERMITS AND AGENCY APPROVALS. All work and materials shall comply with the National Electrical Code and applicable local regulations and ordinances. Where required by applicable codes, panel assemblies, materials and equipment shall be approved, identified, labeled, or listed by Underwriters' Laboratories or other testing organization acceptable to the governing authority. A third party shall perform all inspections or testing of panels and equipment as may be required by the governing authorities.

1-3. SUPPLIER'S QUALIFICATIONS. The entire system shall be designed, coordinated, and supplied by a qualified system supplier who is regularly engaged in the business of designing and building instrument and control systems for water and wastewater projects. The instrumentation supplier shall meet the following qualifications:

The supplier shall have and shall maintain a qualified technical staff and design office. The qualifications and experience of key project personnel shall be acceptable to JEA.

The supplier shall have the physical plant and fabricating personnel to complete the work specified. The supplier's fabrication capabilities and arrangements shall be acceptable to JEA.

The supplier shall employ competent service personnel to service the equipment furnished. The geographic location of service personnel for this project shall be acceptable to JEA.

The supplier shall have successfully provided similar work for at least 5 years.

1-4. COORDINATION. Instrument and control systems shall be designed and coordinated for proper operation with related equipment and materials furnished by other suppliers under other sections of these specifications and where applicable, with related existing equipment. All instruments and control devices shall be applied in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the instrument or device manufacturer and the related equipment manufacturer.

Related equipment and materials may include, but will not be limited to, primary flow measuring devices, valve actuators, chemical feeders, analytical measuring devices, supervisory control equipment, telemetry, conduit, cable, and piping, as described in other specifications associated with this project.

Installation drawings shall be prepared for interconnecting wiring and piping between the related equipment and the equipment furnished under this section. All interconnecting wiring shall be appropriate for the service and shall result in a properly functioning system.

1-5. SUBMITTALS. Complete fabrication, assembly, and installation drawings; wiring and schematic diagrams; and details, specifications, and data covering the materials used and the parts, devices, and accessories forming a part of the equipment furnished shall be submitted by the manufacturer. Submittal data shall be grouped and submitted in three separate stages. The submittal for each stage shall be substantially complete. Individual drawings and data sheets submitted at random intervals will not be accepted for that review. Submittal data for multifunctional instruments shall include complete descriptions of the intended functions and configurations of the instruments.

1-5.01. First Stage Submittal. The first stage submittal shall include the following items:

a. Product catalog cut sheets clearly marked to show the model number, optional features, and intended service of the device.

b. A detailed list of any exceptions, functional differences, or discrepancies between the supplier's proposed system and the contract requirements.

1-5.02. Second Stage Submittal. The second stage submittal shall include the following items:

a. Complete panel fabrication drawings and details of panel wiring, piping, and painting. Panel and subpanel drawings shall include overall dimensions, metal thickness, door swing, mounting details, and front of panel arrangement to show general appearance, with spacing and mounting height of instruments and control devices.

b. System wiring and installation drawings for all interconnecting wiring between components of the systems furnished and for all interconnecting wiring between the related equipment and the equipment furnished under this section. Wiring diagrams shall show complete circuits and indicate all connections.

   If panel terminal designations, device interconnections, device features and options, or other features are modified as a result of the fabrication process or factory testing, revised drawings shall be resubmitted.

At the supplier's option, and for projects with very few fabrication drawings, the first stage and second stage submittals may be combined.

1-5.03. Third Stage Submittal. Complete system documentation, in the form of operation and maintenance manuals, shall be provided. Manuals shall include complete product instruction books for each item of equipment furnished.

Where instruction booklets cover more than one specific model or range of instrument, product data sheets shall be included which indicate the instrument model number, calibrated range, and all other special features. A complete set of "as-built" wiring, fabrication, and interconnection drawings shall be included with the manuals. In addition, an electronic copy of all drawings shall be submitted to JEA. Electronic drawing files shall be AutoCAD Release 14 format.

PART 2 - PRODUCTS

2-1. GENERAL REQUIREMENTS. All equipment furnished under this section shall be selected by the system supplier for its superior quality and intended performance except for the sampling unit, which will be supplied by JEA. All manufacturer supplied devices which shall require interfacing with the JEA supplied samplers shall be coordinated with JEA to assure compatibility. Equipment and materials used shall be subject to review and shall comply with the following requirements.

2-1.01. Power and Instrument Signals. Unless specified otherwise, electrical power supply to the instrumentation equipment will be unregulated 120 volts ac at the locations noted on the one-line and functional diagrams. All transmitted

electronic analog instrument signals shall be isolated 4-20 mA dc, unless noted otherwise, and shall be linear with the measured variable.

For each analog signal, the system supplier shall be responsible for providing an external signal isolator which provides an isolated 4-20 mA signal to the final sensing device (PLC, panel mounted component, etc.). The signal isolator shall be powered from the instrument loop or from the same 120-volt ac power circuit, which powers the instrument. No external power sources shall be required.

2-1.02. Metering Accuracy. System metering accuracy, as compared to the actual process value, shall be determined from the value read at the principal readout device such as the recorder, totalizer. System requirements shall not preclude any requirements specified herein for individual devices.

For systems where the primary measuring device, transmitter, and receiver are furnished under this section, the accuracy's shall be within the following limits:

a. Pressure: 1.0 percent of measured span.

b. Level: 1.0 percent of measured span.

c. Temperature: 1.0 percent of measured span.

d. Position: 2.0 percent maximum travel.

e. Flow Rate:

   Magnetic metering 1.5 percent of full scale between 10 and 100 percent of scale.

   Differential producing primary element type metering 2.0 percent of full scale between 15 and 100 percent of scale.

2-1.03. Appurtenances. Signal converters, signal boosters, amplifiers, special power supplies, special cable, special grounding, and isolation requirements shall be furnished and installed as required for proper performance of the equipment.

2-1.04. Interchangeability and Appearance. Instruments used for the same types of functions and services shall be of the same brand and model line insofar as possible. Similar components of new instruments shall be from the same manufacturer to facilitate maintenance and stocking of repair parts. Whenever possible, identical units shall be furnished. Recorders, process indicators, control stations, and similar panel-mounted instruments shall be of the same style and shall be products of the same major instrument manufacturer.

2-1.05. Device Tag Numbering System. All devices shall be provided with permanent identification tags. The tag numbers shall agree with the instrument device schedules and with the supplier's equipment drawings. All field-mounted transmitters and devices shall have stamped stainless steel identification tags. Panel, subpanel, and rack-mounted devices shall have laminated phenolic identification tags securely fastened to the device. Hand-lettered labels or tape labels will not be acceptable.

2-1.06. Special Tools and Accessories. Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments, and accessories required for proper maintenance. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.

2-1.07. Field Mounted Instrument Weather Protection Enclosures. Each field-mounted transmitter shall be installed within a NEMA 12/3R aluminum or 316 stainless steel enclosure for weather protection. Enclosures shall exceed the dimensions of the enclosed transmitter by a minimum of six inches on all sides and shall permit full unobstructed access to the enclosed transmitter. Enclosures shall be equipped with a continuous hinged access door with 3-point latching handle. Enclosure shall be provided with a HASP so access door can be securely locked. Ventilation louvers shall be provided at top and bottom of both sides to promote convection cooling.

2-2. METERING AND CONTROL SYSTEMS. Principal components of the metering and control systems are indicated on the piping and instrument diagram drawings and on the instrument device schedule drawings.

2-3. MISCELLANEOUS INSTRUMENTATION. The following test equipment, spare parts, and miscellaneous devices shall be provided:

a. Pressure switches, level switches, float switches, and miscellaneous devices, unless noted otherwise.

2-4. INDIVIDUAL DEVICE SPECIFICATIONS. The following specifications shall apply to the equipment items in the instrumentation and control systems.

2-4.01. Magnetic Flowmeters, Signal Converters, and Accessories.

2-4.01.01. Magnetic Flowmeter. The magnetic flowmeter shall be a completely obstructionless, in-line flowmeter with no constrictions in the flow of fluid through the meter. The meter shall consist of a metallic tube with flanged ends and with grounding rings. Flange diameter and bolt drilling pattern shall comply with ANSI/ASME B16.5, Class 150. Flangeless wafer insert style meters may be used for pipe sizes up to 6 inches, where compatible with adjacent piping flanges. Meters shall be suitable for the maximum range of working pressures of the adjacent piping. Self-cleaning, by ultransonic, bullet-nosed electrodes shall

be provided for all meters used for sludge metering. Electrode's for the magnetic Flowmeter shall be 316 stainless steel. Magnetic Flowmeter liner materials shall be fully compatible with the process fluid and shall comply with the requirements specified in the Instrument Device Schedules. Each meter shall be factory calibrated, at a facility, which is traceable to NIST or other standard acceptable to the JEA, and a copy of the calibration report shall be submitted as part of the operation and maintenance manual submittal.

The meter shall be capable of standing empty for extended periods of time without damage to any components. The meter housing shall withstand submergence in 30 feet of water for 48 hours without damage.

Meters shall be as manufactured by Fischer Porter or Foxboro, or equal.

2-4.01.02. Magnetic Flowmeter Signal Converters. Separately mounted, microprocessor-based signal converters shall be provided for the magnetic flowmeters. The signal converters shall include output damping, self-testing, built-in calibration capability, and an "empty pipe zero" contact input. The overall accuracy of the magnetic flowmeter transmitter and signal converter shall be ? 0.5 percent of actual flow rate for full-scale settings of 3 to 30 fps . The meter manufacturer shall furnish the signal cable between the converter and the magnetic flowmeter. The signal converter shall be housed in a corrosion-resistant, weatherproof NEMA Type 4X; pipe mounted housing and shall be suitable for operation over an ambient temperature range of -30 to +140?F, and relative humidity of 10 to 100 percent. The keypad shall have a plastic cover guard to prevent the display and keypad of transmitter from accidental damage. The converter shall have an analog output of 4-20 mA dc. Transmitters tagged on the drawings or specified to be of the indicating type shall contain a local indicator with a minimum four digit LCD type display, scaled to read in engineering units of flow. In addition the enclosure shall have a dual compartment providing for a separate field termination enclosure from the transmitter housing. This will prevent the need to open the transmitter electronics housing to make field or power terminations.

Magnetic flowmeter systems shall provide zero flow stability by means of automatic zero adjustment of a dc excited metering circuit. Converters shall be capable of bi-directional flow measurement. Signal converters shall be of the same brand as the magnetic flowmeters.

The signal converter shall be of the "smart" type, which can be diagnosed and recalibrated, with the use of a hand-held communicator/calibrator device. One device shall be furnished for all converters provided by a single manufacturer.

2-4.02. Open Channel Ultrasonic Flowmeters. Each ultrasonic flowmeter shall be a microprocessor-based electronic unit consisting of a sensor assembly, a

signal converter/transmitter, and an interconnecting cable. The sensor shall be encapsulated in a chemical and corrosion-resistant material such as kynar or CPVC, and shall be suitable for operation over a temperature range of –20 to ?150?F, with a relative humidity of 10 to 100 percent. Sensors shall be compatible with the process media being measured. The sensor shall be mounted directly over the flume and shall measure the fluid level by means of reflected high frequency sound waves. Sensors mounted in areas subject to freezing condensation shall be protected against icing with special transducers or heaters. Sensors mounted in direct sunlight shall be provided with sunshades.

The supplier shall coordinate the sensor mounting requirements and shall furnish drawings, complete with dimensions and elevations, to ensure a proper and satisfactory installation.

The ultrasonic flowmeter shall have automatic compensation for changes in air temperature at the sensor location. If separate temperature sensing probes are provided, they shall be mounted with or adjacent to the ultrasonic sensor, as recommended by the manufacturer. The transmitter shall have a Four-digit LCD display scaled to read in engineering units of flow. Digit height shall be approximately 0.5 inch. The transmitter shall be designed to ignore momentary level spikes, false targets, or momentary loss-of echo. A loss-of-echo condition shall be indicated on the transmitter unit and shall be available as an alarm contact output. The transmitter output shall be an isolated 4-20 mA dc signal linearly proportional to flow. The signal converter shall use a microprocessor-based digital flow linearizer circuit that can be easily changed in the field. Accuracy of the transmitted signal shall be + 1.0 percent of flow range.

A sufficient length of sensor-to-transmitter signal cable shall be furnished with the instrument to locate the sensor 25 to 200 feet from the signal converter. The signal converter electronics shall be housed in a weatherproof, corrosion-resistant NEMA Type 4 enclosure suitable for wall or pipestand mounting and for operating temperatures of –15 to 125?F and a relative humidity of 10 to 100 percent. A thermostatically controlled strip heater shall be provided in the signal converter enclosure. The signal converter shall be of the ac power type.

The ultrasonic flow transmitter shall be manufactured by Fischer Porter “5OUS”, Milltronics “Multiranger Plus/HydroRanger I “, or ISCO 3010

PART 3 - EXECUTION

3-1. INSTALLATION REQUIREMENTS. The instrumentation equipment shall be installed in accordance with the manufacturers’ instructions. The services of the system supplier's technical representative shall be provided as necessary to calibrate, test, and advise others of procedures for adjustment and operation in accordance with the requirements of the quality control section.

3-1.01. Field Wiring. Field wiring materials and installation shall conform to the requirements of the electrical section.

3-1.02. Field Piping. Field piping materials and installation shall conform to the requirements of the applicable piping section.

3-1.03. Field-Mounted Instruments. Instruments shall be mounted so they may be easily read and serviced and all appurtenant devices easily operated. Installation details for some instruments are indicated on the drawings. Unless otherwise indicated on the drawings, instruments that include local indicators shall be mounted approximately 5 feet above the floor and shall be oriented for ease of viewing. Transmitters shall be mounted on corrosion-resistant pipe supports suitable for floor, wall, or bracket mounting.

3-1.04. Field Calibration. A technical representative of the system supplier shall calibrate each instrument and provide a written calibration report indicating the results and final tuning adjustment settings. The adjustments of each calibrated instrument shall be sealed or marked, insofar as possible, to discourage tampering. Instruments shall be calibrated before checkout of the operation of the system.

3-1.05. Systems Check. A technical representative of the system supplier shall participate in the checkout of metering and control systems. If interrelated devices furnished by other suppliers, such as valve actuators, motor controls, chemical feeders, or primary measuring devices, do not perform properly when placed in service, the technical representative shall use suitable test equipment to introduce simulated signals to the devices, and/or measure signals from such devices as required to locate the source of trouble or malfunction. A written report stating the results of such tests shall be furnished, if requested by the JEA, to assign responsibility for corrective measures.

3-1.06. Installation Test Equipment. Unless specified otherwise, all test equipment for the calibration and checking of system components shall be provided by the manufacturer for the duration of the testing work and this test equipment will remain the property of the JEA or the system supplier.

3-1.07. Salvage of Existing Equipment. Existing materials and equipment removed or replaced under this contract shall be turned over to JEA, or shall be discarded as directed by JEA.

All mounting brackets, piping, or holes, which remain after removal of equipment, shall be removed or repaired in a manner acceptable to JEA.

3-2. CUSTOMER TRAINING. The coordinating supplier shall provide a qualified representative at the jobsite to train JEA's personnel in operating and

maintenance of the equipment. The training session shall include a technical explanation of the equipment and an actual hands-on demonstration. The training session shall consist of one 8-hour JEA working day, and the schedule shall be arranged and coordinated with JEA.

End of Section

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Attachment G

Flow Metering Systems

Calibration and

Maintenance Record

Forms

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Meter Services Operations & Maintenance
Office: (904) 665-8432 Fax: (904) 665-6803
Regulatory Conformance (Industrial Pretreatment)
Office: (904) 665-5110 Fax: (904) 665-8334

Flow Metering System Maintenance Records

Company ____ IU Permit No. _________________

Discharge Address ____

Mailing Address ____

Name of Responsible Person __________________________________ Telephone No. _________________

Recorder's 100% Span: ___________GPM Totalizer: ______________ Gallons per Count
Sampling Socket's Pulse Interval: _______________Gallons/Pulse Type of Flow meter: ___________________

Recorder Chart (if applicable) Change Frequency: Daily ☐ Weekly ☐ Monthly ☐

REGULAR CLEANING, MAINTENANCE & CALIBRATION CHECKS					FLOW MONITORING DATA				
Primary Element Cleaned	Level Meas. Equipment Cleaned	Other (describe)	Date	By	Flow Velocity (gpm)	Peak Flow from Recorder (gpm)	Totalizer Reading	Date/Time	By

Meter Services Operations & Maintenance
Office: (904) 665-8432 Fax: (904) 665-6803
Regulatory Conformance (Industrial Pretreatment)
Office: (904) 665-5110 Fax: (904) 665-8334

Flow Metering System Calibration Check Record

Company _____ IU Permit No. _____

Discharge Address _____

Mailing Address _____

Flow Monitoring System Description (state type, brand & size of primary element & sensor):

Recorder's 100% Span: _____ GPM

Totalizer Units: _____ Gallons per Count

Sampling Signal Contact Closure Frequency: 1 closure per _____ Gallons discharged.

Current Discharge Rate as Determined by Calibrating Engineer: Avg. _____ GPM Peak_____ GPM

Calibration Check Results: Date:_____ Type of Calibration: Hydraulic ☐ Instrumentation ☐

Calibrating System		**Existing Meter**				**Error**	
Flow Rate GPM	Total Discharge Gallons	Primary Element's Head	Flow Rate GPM Indicator	Recorder	Total Discharge Gallons	Recorder	Totalizer

A copy of all data collected and any calculations performed must be attached to this form

Method of Calibration (attach additional sheets if necessary):

Corrective Measures (describe condition of flow meter prior to calibration and state if any adjustments were made):

Meter Services Operations & Maintenance
Office: (904) 665-8432 Fax: (904) 665-6803
Regulatory Conformance (Industrial Pretreatment)
Office: (904) 665-5110 Fax: (904) 665-8334

Flow Metering System Certification of Calibration Check

I hereby certify that I am knowledgeable in the field of wastewater flow measurement and that I have supervised the calibration of the flow monitoring system as described on the previous page, and also have reviewed and approved all details of the method of calibration. I consider the calibration method and procedures used to be technically sound, and assume professional responsibility for the validity and accuracy of the results reported. (This section to be completed by a Florida Registered Engineer or a certified representative of the equipment manufacturer).

Full Name (Please print or type) _____ Signature _____

Florida P.E. Cert. No. (if applicable) _____ or Certified Representative of Equipment Manufacturer _____ Date _____

CERTIFICATION OF TEST RESULTS BY AN ADMINISTRATIVE OFFICIAL OF THE COMPANY

I hereby certify that the flow monitoring system certified as properly calibrated above is so arranged and operated, so as to accurately measure and record the industrial wastewater flow to the sewer system. (This section to be completed by an authorized representative of the company.)

Company Name _____ IU Permit No. _____

Full Name (Please print or type) _____ Signature _____

Title _____ Date _____

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Attachment H

Flow Metering System

Installation / Inspection Agreement

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Meter Services Operations & Maintenance

Sewer Flowmeter Installation / Inspection Agreement For:

This is to request that the JEA provide Sewer meter installation inspection. The sewer flowmeter (and sampling unit) is (are) for billing purposes (and sampling of effluent sewer discharge).

We, the owner/customer, understand that we will be responsible for the installation and maintenance of the required on-site water piping system at our expense, including any future modifications required by the JEA to ensure that water discharged into the sewage system can be properly measured and the sewer service charge accurately computed.

The owner, tenant or occupant, and his successors in interest, shall likewise maintain at their expense all required on-site water piping and appurtenances.

We hereby grant the JEA and its authorized representative(s) authority to enter onto our premises to read, inspect, and test the subject meter. We understand the JEA is responsible solely for the maintenance of the meter and will not maintain or operate the required on-site water piping system. Should it become necessary to remove or replace the meter as detected by us or JEA, we will notify JEA then our maintenance personnel or plumber will remove the existing meter and install the new meter in the piping system in the presence of authorized JEA representatives.

We understand that should the meter be tampered with or should work be done on the meter installation without the express written authorization of the JEA we will be subject to charges in accordance with JEA's Water & Sewer Rules & Regulation policy at the time of discovery.

We grant the JEA and its authorized representative ingress and egress across our property in order to enter onto the premises at the address described in attached Request to perform the duties necessary to read, inspect, and test the meter. Authorized representatives of the JEA shall not be denied access to the meter, or subject to service disconnection.

The JEA shall perform or require its employees, agents, representatives, and/or contractors to perform all work required in connection with the inspection of the metering equipment and its associated parts, accessories and/or systems with reasonable care and in such a manner as not to damage the Customer's property or unreasonably interfere with the operations or activities of the Customer on the Customer premises. If the property of the customer is damaged by JEA's employees, JEA shall promptly repair such damage, at JEA's sole cost and expense to the reasonable satisfaction of Customer.

Description of sewer flowmeter (and sampling unit) installation: _____

_____

_____

_____

_____

_____

Date: _____ _____
Signature

_____ _____
Title Typed Name

Representing: _____
Company or Organization

Service Address: _____

Billing Address: _____

Water & Sewer Account No.: _____

Name of Contact Person: _____

Contact Person's Telephone No.: _____

Please return the completed agreement to:
JEA Meter Services Operations & Maintenance
6674 Commonwealth Av., Jacksonville, Florida 32254

THIS AGREEMENT MUST BE FULLY EXECUTED PRIOR TO PURCHASE OF THE METER.

Attachment I

Flow Metering System

Installation/

Inspection Request

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Sewer Flow Meter
Meter Installation/Inspection Request

Service Address: _____

Billing Address: _____

Water & Sewer Account No.: _____

Owner's Name: _____

Description of water source: _____

Water Source (Well) Permitted Capacity: _____

Average Daily Flow: _____

Person to contact for meter installation inspection:

Name: _____

Company: _____

Telephone: _____

Please note that the Sewer Flow Meter Purchase and Inspection/Installation Agreement **must be completed and signed** by the owner and returned to the JEA Meter Services Operations & Maintenance, 6674 Commonwealth Av., Jacksonville, FL 32254.

Please include three (3) sets of completed survey/design packages with Florida registered professionals' stamps of the system in which the Sewer flowmeter is to be installed. Those packages of survey/designs must be returned with this agreement.

Any questions concerning installation/inspection should be directed to JEA Meter Services Operations & Maintenance at 665-8432.

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Sewer Flow Meter Annual Calibration Requirement
Frequently Asked Questions & Answers

Q: The sewer meter was purchased by our company, why do we have to adhere to any testing/calibration requirements?

A: Normal JEA water and sewer billing is to bill sewer based on water consumption. As the customer has special need(s) to differentiate water and sewer billing, either due to the customer's special plumbing requirements or process taking in a lot of water not discharged to JEA's sewer system, by requesting JEA's approval for one or more separate sewer meter(s). A special agreement was established to allow customer to purchase and install sewer meter system per JEA's requirements and to maintain and calibrate the meter routinely at least once a year. Based on this agreement, the customer is required to adhere to annual testing/calibration requirement.

Q: Who receives the Annual Notice?

A: We usually send the notice to the premise owner or the facility's maintenance supervisor. However, if you have any preference as to where the notice should be sent to, please be sure to fill out the customer contact information sheet included in your notice package.

Q: Do we still need to test the sewer meter if we do not have it anymore?

A: We apologize for the misunderstanding! Either we have mis-recorded the system information of your facility or you may have changed out the system without contacting JEA. JEA is more than happy to investigate the actual state of your sewer discharge system and make sure our record properly reflect the actual system status. Billing adjustments will also be made to reflect the actual metering of your sewer. This could result in a higher or lower bill based on the findings.

Q: Who do we contact to get approval for the meter calibration vendor?

A: Please contact Meter Services Operation & Maintenance at (904) 665-8432.

Q: Who do we contact to get approval and/or inspection of the meter repair after the meter was found broken since the calibration?

A: Please contact Meter Services Operation & Maintenance at (904) 665-8432.

Q: Why do we need to test or calibrate the sewer meter? We were told the meter is very accurate and holds its calibration very well.

A: No matter how well is the meter system put together and no matter how reputable is the meter manufacturer, the type of discharge, the condition of discharge and the buildup in the meter system could all contribute to a less than desirable operating condition for the meter. Even the meter manufacturer has a routine calibration requirement in order for their meter to operate properly and remain accurate.

Q: Who pays for the calibration/testing?

A: The customer is responsible for all the costs and scheduling of the meter calibration/testing.

Q: What if there is something wrong with the meter after testing?

A: The sewer discharge is no longer properly recorded. The meter must be replace/repaired immediately. The customer is responsible to have the meter replace or repaired at the customer's cost and since this is unexpected a reasonable time allotment will be agreed upon between JEA and the customer. Meanwhile the sewer billing will be estimated based on past consumption history.

Q: We have financial difficulties or we did not budget for the extra expense associated with the meter calibration, will JEA be able to help pay for the test and put the charges into our monthly bill?

A: JEA is not prepared to pay for any expenses for the customer. However special arrangement may be made, although such arrangement cannot be guaranteed nor is it JEA's obligation.

Q: We do not have to test JEA's water meter(s), why do we have to calibrate the sewer meter?

A: Normal JEA water and sewer billing is to bill sewer based on water consumption. Therefore it is JEA's responsibility to test and maintain the water meter(s). As the customer has special need(s) to differentiate water and sewer billing, either due to the customer's special plumbing requirements or process taking in a lot of water not discharged to JEA's sewer system, by requesting JEA's approval for one or more separate sewer meter(s). A special agreement was established to allow customer to purchase and install sewer meter system per JEA's requirements and to maintain and calibrate the meter routinely at least once a year. Based on this agreement, the customer is required to adhere to annual testing/calibration requirement.

Q: Can we talk to someone in JEA to arrange an exception not to calibrate the meter?

A: JEA treats all its customers equally and equitably. It is not permissible by law for JEA to make any exception or any special concession.

Q: We have just installed the meter and it has not been a year yet. Do we still have to test the meter?

A: If the meter was recently calibrated, please contact Meter Services Operation & Maintenance at (904) 665-8432 to have someone to review your records to see if the timing and results of the calibration is sufficient to comply with JEA's requirements.

Q: Can you tell us what is entailed in the meter calibration?

A: Different types of meters have different ways/methods for calibration. Your vendor should be best qualified to let you know of the details. Meter manufacturer will also have the meter calibration steps detailed in the meter manual or on their website.

Q: Can we include any additional paper work or records with the meter testing/calibration?

A: It is not necessary to include any additional record as long as the records shows proper calibration and testing results.

Q: We have a routine meter calibration/maintenance schedule but it does not coincide with JEA's call for meter calibration schedule, how can we resolve this?

A: If the meter was recently calibrated, please contact Meter Services Operation & Maintenance at (904) 665-8432 to have someone to review your records to see if the timing and results of the calibration is sufficient to comply with JEA's requirements.

Q: After the meter testing, we found problems with the meter system. How soon do we have to repair the system and what will happen to the sewer billing in the meantime?

A: The sewer discharge is no longer properly recorded. The meter must be replace/repaired immediately. The customer is responsible to have the meter replace or repaired at the customer's cost and since this is unexpected a reasonable time allotment will be agreed upon between JEA and the customer. Meanwhile the sewer billing will be estimated based on past consumption history.

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