ADDENDUM NO. 5

CITICO PUMP RELIABILITY IMPROVEMENTS
City of Chattanooga Project W-16-013-201
Burns & McDonnell Project 95307

CITY OF CHATTANOOGA, TENNESSEE

The following modifications are hereby introduced as part of the Contract Documents:

1) Specification Section 00 11 16 – Advertisement for Bids

   a. Delete "The allotted time for construction is 365 calendar days" on page 2 and replace with "The allotted time for construction is 425 calendar days."

2) Specification Section 00 41 00 – Bid Form

   a. Delete Section 00 41 00 and replace the attached Section 00 41 00.

   b. Refer to details regarding Allowance Item 2.D. per attached sketch SK-ADD5-001.

3) Specification Section 00 52 00 – Agreement

   a. Delete Paragraph 4.02 and replace with the following:

      "The Work will be substantially completed within 390 days after the date when the Contract Times commence to run as provided in Paragraph 2.03 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 14.07 of the General Conditions within 425 days after the date when the Contract Times commence to run.

4) Specification Section 01 11 00 – Summary of Work

   a. Immediately after Paragraph 1.01.A.5, add the following:

      "6. Installation of new flow meters and ball valves, to be supplied by Owner, in the existing Citico Pump Station."

5) Specification Section 01 22 00 – Measurement and Payment

   a. Delete Paragraph 1.02.D and replace with the following:

      "D. Schedule of Cash Allowances

         1. Soils and Concrete Testing:

            a. Allow the amount provided in the Bid for the services of a geotechnical engineering firm and testing laboratory to verify soils conditions including trench excavation and backfill and similar issues and for the testing of concrete cylinders for poured

in place concrete.

2. Utility Conflict Resolution:

   a. Allow the amount provided in the Bid for unforeseen utility conflict arising from facilities not shown on the Drawings.

3. Construction Verification Surveying:

   a. Allow the amount provided in the Bid for construction surveying by an independent surveying firm, selected by the Owner, to perform horizontal and vertical alignment checks at the discretion of the Engineer.

   b. This allowance is solely for the use of the Engineer for verification of the Contractor's reference points, centerlines and work performed. The presence of this cash allowance in no way relieves the Contractor of the responsibility of installing reference points, centerlines, temporary bench marks or verifying that the work has been performed accurately.

4. Flow Meter and Ball Valve Installation

   a. Allow the amount provided in the Bid for installation of flow meters and ball valves to replace existing flow meters and ball valves on the pump discharge piping of four pumps in the existing Citico Pump Station. Installation of flow meters includes remote transmitters and associated accessories. Installation of ball valves includes control panels and associated hydraulic actuator equipment.

5. Condition Assessment of Two Force Mains

   a. Allow the amount provided in the Bid for condition assessment of two wastewater force mains."

6) Specification Section 01 35 00 – Unique Requirements

   a. Immediately after Paragraph 1.05.A.5, add the following:

      "6. Coordinate with Owner to sequence installation Owner-supplied flow meters and ball valves within the existing Citico Pump Station such that no more than one pump is out of service at a given time."

   b. Delete "Pre-screen and" from the beginning of Paragraph 1.05.A.9.

7) Add the attached Section 01 61 17 – Owner-Supplied Materials to the project specifications.

8) Specification Section 01 51 43 – Temporary Bypass Pumping

   a. Delete Section 01 51 43 and replace with the attached Section 01 51 43.

9) Specification Section 03 30 00 – Concrete

   a. Immediately after Paragraph 2.01.C.1.b, add the following:

"c. Minimum 28-day compressive strength = 2,000 psi (13,789 kPa) for fill concrete.

10) Specification Section 09 90 00 – Protective Coatings

a. Delete Paragraph 2.04.B.2.

11) Delete Specification Section 33 01 30.17 – Sonar Sewer Inspection

12) Specification Section 33 12 16 – Utility Valves and Accessories

a. Immediately before Paragraph 1.01.B.2, add the following:

"1. Section 01 61 17 – Owner-Supplied Materials"

b. Immediately after Paragraph 2.02, add the following:

"2.03 Ball Valves

"1. Ball Valves shall be provided to replace the existing valves for four pump discharge pipes within the Citico Pump Station.

2. Owner-Supplied Materials

a. Owner shall furnish to the contractor four 30-inch Pratt flanged double-rubber-seated ball valves with cast iron body and ends and hydraulic actuator, and four Pratt "Check Mate" control systems with a stainless steel enclosure on legs, subject to the requirements of Section 01 61 17."

c. Immediately after Paragraph 3.03.A.3, add "4. Ball Valves."

13) Specification Section 33 32 23 – Grinders

a. To the end of Paragraph 2.02.C. add the following:

"with overflow bar screens of height sufficient to capture flow between between the top of the grinder frame and the inside top of the channel between the diversion chamber and the grinder. Overflow bar screen bar spacing shall not allow the passing of solids in excess 2 inches."

14) Specification Section 40 70 00 – Instrumentation for Process Systems

a. Immediately before Paragraph 1.03.B, add the following:

"A. Section 01 61 17 – Owner-Supplied Materials"

b. Immediately after Paragraph 2.01.E, add the following:

"F. Magnetic Flow Meters

1. Owner-Supplied"

c. Immediately after Paragraph 2.08, add the following:

"2.09 Magnetic Flow Meters

"A. Flow meter system shall consist of a flow element and an indicating transmitters remotely mounted to the meter tube assembly.

B. Owner-Supplied Materials

1. Owner shall furnish four 30-inch WaterMaster Magmeters with carbon steel Class 150 flanges and housing, hard rubber liner, standard stainless steel electrodes, remote transmitters, 4-20 mA output, and 60-feet of submersible cable subject to the requirements of Section 01 61 17."

d. Delete the Instrument List immediately following Section 40 70 00 and replace with the attached Instrument List

e. Refer to the attached reference drawings for Pratt Ball Valve and Control Panels.

15) Drawing Sheet S001 – Structural Legend

a. Delete legend item "GROUT" in Drawing reference grid A4 and replace with "GROUT OR FILL CONCRETE."

16) Drawing Sheet S101 – Base Plan

a. Delete note "SLOPED GROUT" in Drawing reference grid C5 and replace with "SLOPED FILL CONCRETE."

b. Delete note "NON-SHRINK GROUT NOT SHOWN FOR CLARITY" in Drawing reference grid E8 and replace with "FILL CONCRETE NOT SHOWN FOR CLARITY."

17) Drawing Sheet S301 – Structural Sections 1

a. Delete note "NON-SHRINK GROUT" in Drawing reference grid A3 and replace with "FILL CONCRETE WITH #5@12" T&B."

b. Delete note "NON-SHRINK GROUT" in Drawing reference grid A5 and replace with "FILL CONCRETE WITH #5@12" T&B."

c. Delete note "NON-SHRINK GROUT" in Drawing reference grid C8 and replace with "FILL CONCRETE WITH #5@12" T&B."

d. Add typical roughened joint to fill concrete placements per attached sketch SK-ADD5-003.

18) Drawing Sheet S303 – Structural Sections and Details 1

a. Delete note "NON-SHRINK GROUT" in Drawing reference grid F2 and replace with "FILL CONCRETE WITH #5@12" T&B."

19) Drawing Sheet S305 – Structural Sections and Details 3

    a. Revise Detail 3 per the attached sketch SK-ADD5-002.

20) Drawing Sheet C105 – Paving and Grading Plan

    a. To the end of Keyed Notes 8 and 9 add “RIPRAP PIPE END SLOPE (REF DETAIL C502)”.

21) Drawing Sheet C502 – Site Details 2

    a. Add “Riprap End Slope for Plastic Pipe” detail per attached sketch SK-ADD5-004.

The following documents are enclosed herein for reference:

1) Section 00 41 00 – Bid Form
2) Section 01 61 17 – Owner-Supplied Materials
3) Section 01 51 43 – Temporary Bypass Pumping
4) Section 40 70 00 Attachment - Instrument List
5) Sketch SK-ADD5-001
6) Sketch SK-ADD5-002
7) Sketch SK-ADD5-003
8) Sketch SK-ADD5-004
9) Reference Drawings - Pratt Ball Valve and Control Panels
10) Reference Drawings – Flow Meters
11) Question and Response No. 3

END OF ADDENDUM NO. 5

June 22, 2017

/s/ Justin C. Holland, Administrator
City of Chattanooga
Department of Public Works

Please acknowledge receipt of all addenda in your submitted Bid Form.

Only questions answered in writing by Addenda will be binding.

Addendum Prepared By
BURNS & MCDONNELL
June 22, 2017

CITICO PUMP RELIABILITY IMPROVEMENTS
CONTRACT NUMBER W-16-013-201

ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to:

City of Chattanooga, Tennessee
Purchasing Department
101 E. 11th Street, Suite G13
Chattanooga, Tennessee 37402

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 – BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for period of time after the Bid opening as stated in the Advertisement for Bids, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 – BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged.

Addendum No.	Addendum Date

B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress and performance of the Work.

D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) that have been identified in SC-4.02 as containing reliable "technical data," and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in SC-4.06 as containing reliable "technical data."

E. Bidder has considered the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder's safety precautions and programs.

F. Based on the information and observations referred to in Paragraph 3.01.E above, Bidder does not consider that further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.

G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.

I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

J. Where this Bid Form contains the provision for a bid based on a lump sum price, the Bidder shall be responsible for having prepared its own estimate of the quantities necessary for the satisfactory completion of the Work specified in these Contract Documents and for having based the lump sum price bid on its estimate of quantities.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 Bidder certifies that:

A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:

1. “corrupt practice” means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process;

2. “fraudulent practice” means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. “collusive practice” means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and

4. “coercive practice” means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

ARTICLE 5 – BASIS OF BID

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

Item No.	Description	Estimated Qty.	Unit	Unit Price	Total Price
1.	Furnishing all products, materials and equipment and performing all labor necessary to complete and put into operation the Citico Pump Reliability Improvements Project, including all work shown on the Drawings and/or specified and not included in Items 2 through 4 below, the total amount of:	Lump Sum			$
2.	Cash Allowances				
a.	Soils and Concrete Testing	ALLOWANCE			$ 15,000.00
b.	Utility Conflict Resolution	ALLOWANCE			$ 10,000.00
c.	Construction Verification Surveying	ALLOWANCE			$ 5,000.00
d.	Flow Meter and Ball Valve Installation	ALLOWANCE			$ 350,000.00
e.	Condition Assessment of Two Force Mains	ALLOWANCE			$ 100,000.00
*** * * Additional Work If Ordered By The Engineer * * ***					
3.	Removal of Unsuitable Material and Replacement with				
a.	Crushed Stone	500	CY	$	$
b.	Suitable Earth Material	500	CY	$	$

BID TOTAL, ITEMS 1 THROUGH 3, INCLUSIVE, THE AMOUNT OF _____

_____

_____ DOLLARS ($_____).

A. SUPPLIERS/MANUFACTURERS: This bid is based upon furnishing and installing major items of Equipment by the following Suppliers/manufacturers:

No.	Item	Supplier/Manufacturer
1	Submersible Pumps	_____
2	Grinders	_____
3	Sump Pump	_____
4	Variable Frequency Drives	_____
5	PLCs, Instrumentation, Controls	_____
6	Electrical Equipment and Components	_____
7	Level Transmitters	_____
8	Combination Air Valves	_____
9	Plug and Check Valves	_____
10	Slide Gates	_____
11	Motor Actuator	_____
12	Louvers, Fans, and HVAC Equipment	_____
13	Hatches	_____

B. SUBCONTRACTORS: This Bid is based upon use of the following Subcontractors (please indicate if work is to be self-performed):

No.	Trade	Subcontractor
1	Pump Installations	_____
2	Instrumentation and Controls	_____
3	Electrical Improvements	_____
4	Concrete Work	_____
5	Site Work and Grading	_____
6	Dewatering	_____
7	Temporary Bypass Pumping	_____
8	Force Main Condition Assessment	_____

ARTICLE 6 – TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 14.07 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7 – ATTACHMENTS TO THIS BID

7.01 The following documents are submitted with and made a condition of this Bid:

A. Statement of Bidders Qualifications

B. Bid Bond

C. Affidavit of No Collusion by Prime Bidder

D. Drug-Free Workplace Affidavit

E. Iran Divestment Act Compliance Certification

F. Attestation Regarding Personnel Used in Contract Performance

G. Certification By Proposed Prime or Subcontractor Regarding Equal Employment Opportunity

H. Certification Regarding Debarment, Suspension and Other Responsibility Matters

ARTICLE 8 – DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 – BID SUBMITTAL

9.01 This Bid submitted by:

An Individual

Name (typed or printed): _____

By: _____ (SEAL)
(Individual's signature)

Doing business as: _____

Attest: _____
(Notary)

Name (typed or printed): _____

A Partnership

Partnership Name: _____ (SEAL)

By: _____
(Signature of general partner – attach evidence of authority to sign)

Name (typed or printed): _____

Attest: _____
(Signature of another Partner)

Name (typed or printed): _____

A Corporation

Corporation Name: _____ (SEAL)

State of Incorporation: _____

Type (General Business, Professional, Service, Limited Liability): _____

By: _____
(Signature)

Name (typed or printed): _____

Title: _____
(CORPORATE SEAL)

Attest: _____
(Signature of Corporate Secretary)

Name (typed or printed): _____

Date of Qualification to do business in Tennessee is _____

A Joint Venture

Name of Joint Venturer: _____

First Joint Venturer Name: _____ (SEAL)

By: _____
(Signature of first joint venture partner)

Name (typed or printed): _____

Title: _____

Second Joint Venturer Name: _____ (SEAL)

By: _____
(Signature of second joint venture partner)

Name (typed or printed): _____

Title: _____

(Each joint venturer must sign. The manner of signing for each individual, partnership, and corporation that is a party to the joint venture should be in the manner indicated above.)

All Bidders shall complete the following:

Bidder's Business address: _____

_____

Phone: _____ Facsimile: _____

Primary Contact: _____

E-mail: _____

Submitted on _____, 201___.

State Contractor License No. _____.

This document was prepared in part from material (EJCDC C-410 Suggested Bid Form for Construction Contracts) which is copyrighted as indicated below:

Part 1 General

1.01 Scope

A. This Section covers furnishing, maintaining, and operating a temporary bypass pumping system during construction. The Contractor shall furnish all materials, labor, equipment, power, maintenance, etc., to implement a temporary pumping and control system for the purpose of diverting the existing flow around the work area.

B. Design and installation of these systems shall be the Contractor's responsibility subject to Engineer's approval as specified.

1.02 General

The design, installation and operation of the temporary pumping system shall be the Contractor's responsibility. The Contractor shall employ the services of a Specialty Contractor (Firm) who can demonstrate to the Engineer that it specializes in the design and operation of temporary bypass pumping systems. The Firm shall provide at least five references of projects of a similar size and complexity as this Project performed by his company within the past three years. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction.

1.03 Submittals

A. The Contractor shall prepare with the Firm a specific, detailed description of the proposed pumping system(s) required for each location and submit it along with the Firm's references within one month following Notice to Proceed.

B. The Contractor shall submit detailed plans and descriptions outlining all provisions and precautions to be taken by the Contractor regarding the handling of existing wastewater flows in accordance with the submittal section. This plan must be specific and complete, including such items as schedules, locations, elevations, capacities of equipment, pump and drive control selection and design, materials and all other incidental items necessary and/or required to insure proper protection of the facilities. The plan shall include but not be limited to details of the following:

1. Staging areas for pumps.

2. Sewer or structure plugging method, type and number of plugs, and plug support or bracing.

3. Number, size, material, location and method of installation of suction piping.

4. Number, size, material, method of installation and location of installation of discharge piping.

5. Description of bypass design as related to the options presented in Paragraph 2.01.A of this Section.

6. Bypass pump sizes, capacity, and number of each size to be on site and power requirements.

7. Motor control package design, including wiring diagrams, voltage and amperage requirements, control logic description.

8. Method of noise control for each pump and/or generator

9. Calculations of static lift, friction losses, and flow velocity (pump curves showing pump operating range shall be submitted).

10. Standby power provisions.

11. Thrust and restraint block sizes and locations if applicable.

12. Sections showing suction and discharge pipe depth, embedment, select fill and special backfill.

13. Any temporary pipe supports and anchoring required.

14. Design plans and access provisions to bypass pumping and generator fueling locations indicated on the Drawings.

15. Calculations for selection of bypass pumping pipe size.

16. Schedule for installation and maintenance of bypass pumping lines.

17. Continuous monitoring, operating and emergency response plan.

18. Contingency plan for wet weather event.

Part 2 Products

2.01 Design and Performance Requirements

A. Pumps shall have sufficient capacity to pump from negligible flows to the flows indicated below. The Contractor shall provide duty and standby pumps of adequate size to handle the flow events and temporary piping to ensure that the total flow can be safely diverted around the work area. Bypass pumping shall be provided to satisfy one of two maximum flows as indicated below. Design of bypass pumping system shall be at the option of the Contractor subject to the provisions of this Section.

   a. Dry weather maximum pumping capacity Option 1:
      i. 45 MGD at or downstream of Junction Box S136P806

   b. Dry weather maximum pumping capacity Option 2:

i. 45 MGD at or upstream of Junction Box S136P807, and,
ii. 2.5 MGD at or upstream of Junction Box S136P902

B. Bypass pump solids-passing diameter shall not exceed 3 inches.

C. Contractor shall include one standby pump of each size of pump used to be maintained on site. Standby pumps shall be on-line, ready for immediate operation, and isolated from the primary system by a valve.

D. Continuously-operating bypass pumping equipment shall be sound attenuated with a maximum sound level of 70 dBA at 30 feet when operating at full load.

E. Discharge of temporary pumping shall bypass the existing Citico Pump Station and connect directly to the existing 48-inch river crossing force main or a combination of the existing 30- and 48-inch river crossing force mains. Discharge locations shall be indicated in the bypass pumping submittals.

F. The design, installation and operation of the temporary pumping system shall be the Contractor's responsibility. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction.

G. The Contractor shall provide all necessary means to safely convey the sewage past the work area. The Contractor will not be permitted to stop or impede the main flows under any circumstances.

H. The Contractor shall maintain sewer flow around the work area in a manner that will not cause surcharging of sewers, damage to sewers and that will protect public and private property from damage and flooding.

I. The Contractor shall protect water resources wetlands and other natural resources.

J. The Contractor shall provide standby power to all electric pumping units in the event of power loss.

K. Pump Watch Services: At all times while bypass pumping is in operation, the Contractor shall provide for a trained representative of the bypass pumping manufacturer/supplier to be present at the Site to monitor and maintain the bypass pumping equipment.

2.02 Equipment

A. All pumps used shall be fully automatic self-priming units that do not require the use of foot-valves or vacuum pumps in the priming system. The pumps may be electric or diesel powered. All pumps used must be constructed to handle low flow events for long periods of time to accommodate the cyclical nature of the sewage flows.

B. The Contractor shall provide the necessary stop/start and variable speed controls for each pump. The motor controls shall use a PLC based level control system with a submersible level transducer to initiate start and stop signals to the motor controls.

C. Discharge piping systems shall be constructed of restrained joint type piping. Joints shall allow no leakage. Standard aluminum irrigation piping is not acceptable.

D. Bypass pumping may, if necessary, cross the Riverwalk, a concrete multi-use path adjacent to and parallel with the bank of the Tennessee River. The Contractor shall utilize road ramp pipeline crossings to facilitate pumped sewage crossing the Riverwalk. Road ramps shall have a minimum passable width of 10 feet and be traversable by both cyclist and pedestrian traffic. Contractor shall provide standard signage a minimum of 100 feet in either direction on the Riverwalk indicating the presence of a bump in the Riverwalk.

E. Contractor shall provide fencing adjacent to the Riverwalk to prevent access by pedestrian, cyclist, or other Riverwalk users to bypass pumping equipment. Provide a minimum 10-foot passable width between fencing where fence abuts both sides of Riverwalk pavement.

Part 3 Execution

3.01 Field Quality Control and Maintenance

A. The Contractor shall perform leakage and pressure tests of the bypass pumping discharge piping prior to actual operation.

B. The Contractor shall inspect the bypass pumping system every two hours to ensure that the system is working correctly.

C. The Contractor shall ensure that the temporary pumping system is properly maintained and that a responsible operator shall be on hand at all times when pumps are operating.

D. The Contractor shall submit a plan for the replacement of malfunctioning equipment.

E. Spare parts for pumps and piping shall be kept on site as required.

F. Adequate hoisting equipment for each pump and accessories shall be maintained on the site.

3.02 Installation and Operation

A. The Contractor shall install the bypass pipelines to minimize any disturbance to existing utilities and shall obtain approval of the pipeline locations from the Owner and the Engineer.

B. The Contractor shall notify the Owner and Tennessee American Water Company a minimum of 5 working days prior to installation of bypass pumping equipment if equipment will be placed on or near the boat ramp at the Riverwalk. Tennessee American Water, 1500 Riverside Drive, Chattanooga, TN 37406, (423) 771-4713

C. The Contractor shall protect the temporary pumping station and piping from damage during construction.

D. Contractor shall provide all fuel and power for the temporary pumping facilities. Contractor shall make arrangements for a power meter and pay all associated fees, if necessary.

E. Contractor shall re-sod any areas outside the limits of construction indicated in the Drawings which are disturbed by bypass pumping mobilization, operation, or maintenance activity.

END OF SECTION

PART 1 - General

1.01 Summary

A. This Section includes delivery, storage and handling of all Owner-Supplied Materials, including:

1. Flow meters.

2. Ball valves.

1.02 Related Documents

A. Section 01 11 00 – Summary of Work

B. Section 01 25 00 – Substitutions and Options

C. Section 01 35 00 – Unique Requirements

D. Section 01 61 16 – General Equipment Stipulations

E. Section 33 12 16 – Utility Valves and Accessories

F. Section 40 70 00 – Instrumentation for Process Systems

1.03 Transportation, Handling, Storage and Protection

A. Deliver manufactured materials and products to the project site as needed for installation, undamaged, in original packages, containers, or bundles, as packaged by the manufacturer, or as re-packaged by the Owner, with all names, brands, seals and labels intact. All materials supplied by the Owner shall be delivered to the project site at the expense of the Contractor.

B. Contractor shall retrieve Owner-supplied materials at the specified location and deliver to the project Site at no additional cost to the Owner. Owner-supplied materials shall be stored at the Sewer Maintenance Building, Moccasin Bend Wastewater Treatment Plant, Moccasin Bend Road, Chattanooga, Tennessee.

C. Store Owner-supplied electrical equipment in a weathertight shed on an elevated floor away from damp surfaces.

D. Store and protect all material and equipment in accordance with manufacturer's recommendations.

E. Protect factory finish from damage during construction operations and until acceptance of the project. Satisfactorily restore any finishes that become stained or damaged.

1.04 Equipment Selection and Serviceability

A. Locate and install all equipment as indicated in the Drawings and so that it may be serviced. Demonstrate that there is room to remove any removable and serviceable parts.

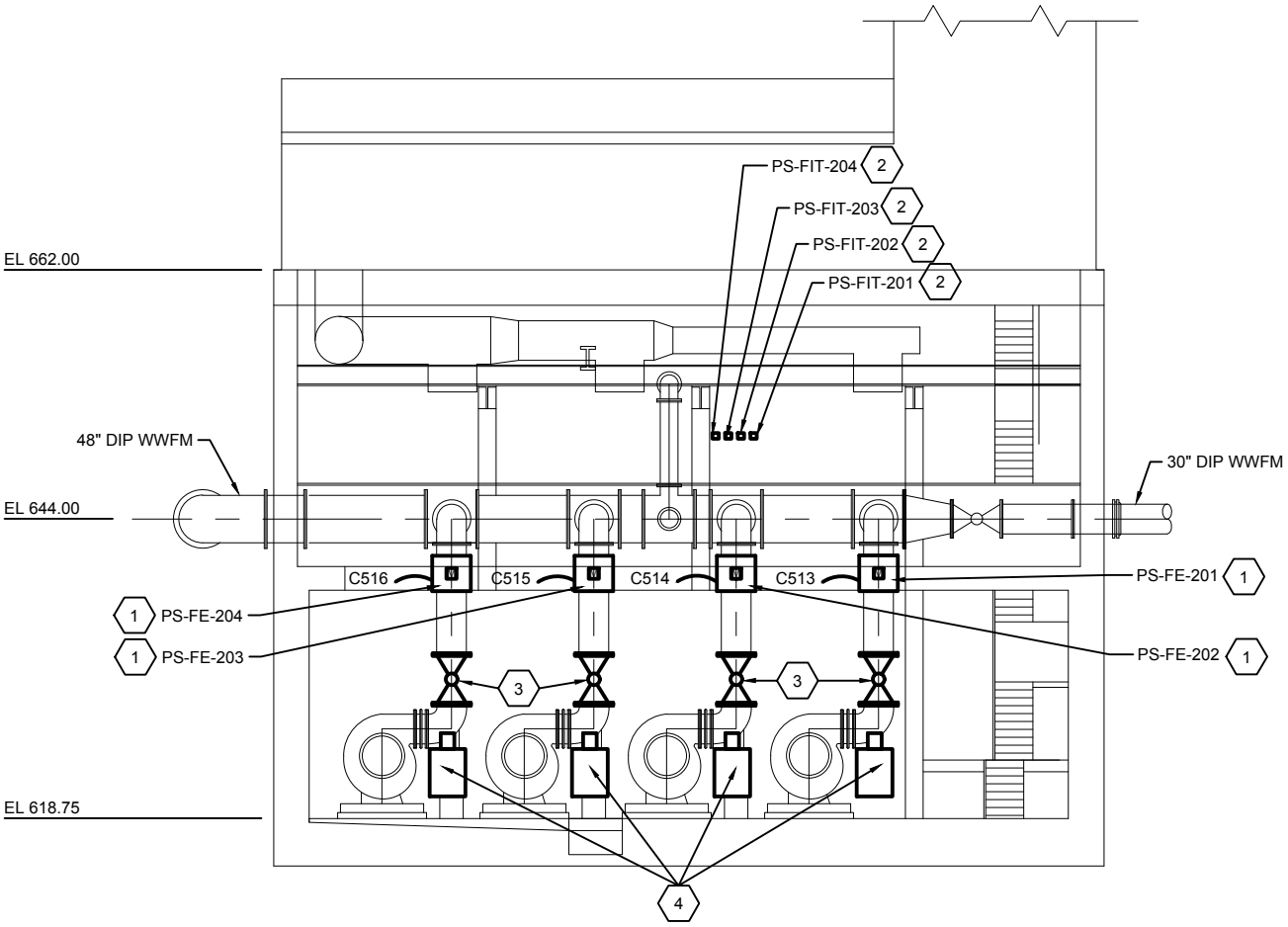
B. Where piping, control diagrams or sequencing differ from the recommended piping arrangements of the equipment manufacturer, and will directly affect the equipment performance, the manufacturer's recommendations shall be submitted in writing to the Engineer for review prior to further action.

END OF SECTION

CITY OF CHATTANOOGA, TN
CITICO EMERGENCY PUMP STATION
INSTRUMENT LIST

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	INSTRUMENT TAG NUMBER		TYPE	DESCRIPTION	FUNCTION	PROCESS CONNECTION(S)	MOUNTING		OUTPUT	RANGE/ SET POINT	ENGINEERING UNIT	XMTR TYPE	POWER	SPECIAL NOTES
2	TRANSMITTER OR CONTROLLER	ELEMENT					TRANSMITTER	ELEMENT						
3														
4	PS-FIT-201	PS-FE-201	30" MAGNETIC FLOW METER W/ REMOTE TRANSMITTER	PUMP STATION PUMP 1 DISCHARGE	FLOW	FLANGE	REMOTE	PROCESS PIPE	4-20mA	0 - 20000	GPM	4-WIRE	120VAC	1
5	PS-FIT-202	PS-FE-202	30" MAGNETIC FLOW METER W/ REMOTE TRANSMITTER	PUMP STATION PUMP 2 DISCHARGE	FLOW	FLANGE	REMOTE	PROCESS PIPE	4-20mA	0 - 20000	GPM	4-WIRE	120VAC	1
6	PS-FIT-203	PS-FE-203	30" MAGNETIC FLOW METER W/ REMOTE TRANSMITTER	PUMP STATION PUMP 3 DISCHARGE	FLOW	FLANGE	REMOTE	PROCESS PIPE	4-20mA	0 - 20000	GPM	4-WIRE	120VAC	1
7	PS-FIT-204	PS-FE-204	30" MAGNETIC FLOW METER W/ REMOTE TRANSMITTER	PUMP STATION PUMP 4 DISCHARGE	FLOW	FLANGE	REMOTE	PROCESS PIPE	4-20mA	0 - 20000	GPM	4-WIRE	120VAC	1
8														
9	EBPS-LSH-101	N/A	FLOAT SWITCH	EBPS WIER DOWNSTREAM HIGH LEVEL BACKUP	LEVEL	IMMERSION	SUSPENDED	N/A	N.O. CONTACT	N/A	N/A	2-WIRE	LOOP	
10	EBPS-LSH-111	N/A	FLOAT SWITCH	EBPS WET WELL HIGH LEVEL ALARM	LEVEL	IMMERSION	SUSPENDED	N/A	N.O. CONTACT	N/A	N/A	2-WIRE	LOOP	
11	EBPS-LSL-112	N/A	FLOAT SWITCH	EBPS WET WELL LOW LEVEL ALARM	LEVEL	IMMERSION	SUSPENDED	N/A	N.O. CONTACT	N/A	N/A	2-WIRE	LOOP	
12														
13	EBPS-LIT-101	N/A	FLEXIBLE LEAD GUIDED WAVE RADAR LEVEL TRANSMITTER	EBPS DIVERSION CHAMBER LEVEL	LEVEL	PROBE	FLANGE	FLEXIBLE LEAD	4-20mA	0 - 40	FEET	2-WIRE	LOOP	2
14	EBPS-LIT-102	N/A	RIGID LEAD GUIDED WAVE RADAR LEVEL TRANSMITTER	EBPS WIER DOWNSTREAM LEVEL	LEVEL	PROBE	FLANGE	RIGID LEAD	4-20mA	0 - 30	FEET	2-WIRE	LOOP	2
15	EBPS-LIT-111	N/A	FLEXIBLE LEAD GUIDED WAVE RADAR LEVEL TRANSMITTER	EBPS WET WELL LEVEL	LEVEL	PROBE	FLANGE	FLEXIBLE LEAD	4-20mA	0 - 40	FEET	2-WIRE	LOOP	2
16														
17	PS-AIC-001	PS-AE-1	GAS DETECTION TRANSMITTER	PUMP STATION UPPER LEVEL SCREEN ROOM H2S	GAS DETECTION	N/A	WALL	REMOTE	AS INDICATED	10	PPM	5-WIRE	120 VAC	3,4
18		PS-AE-2		PUMP STATION LOWER LEVEL SCREEN ROOM H2S	GAS DETECTION	N/A		REMOTE	AS INDICATED	10	PPM	5-WIRE		3,4
19	PS-AIC-002	PS-AE-3	GAS DETECTION TRANSMITTER	PUMP STATION DRYWELL H2S	GAS DETECTION	N/A	WALL	REMOTE	AS INDICATED	10	PPM	5-WIRE	120VAC	4
20		PS-AE-4		PUMP STATION ELECTRICAL ROOM H2S	GAS DETECTION	N/A		REMOTE	AS INDICATED	10	PPM	5-WIRE		4
21		PS-AE-5		PUMP STATION EQUIPMENT ROOM H2S	GAS DETECTION	N/A		REMOTE	AS INDICATED	10	PPM	5-WIRE		4
22	PS-AIC-003	PS-AE-6	GAS DETECTION TRANSMITTER	PUMP STATION LOWER LEVEL SCREEN ROOM COMBUSTIBLE GAS	GAS DETECTION	N/A	WALL	REMOTE	AS INDICATED	TBD	LEL	5-WIRE	120 VAC	3,4
23		EBPS-AE-1		EBPS WETWELL COMBUSTIBLE GAS	GAS DETECTION	N/A		REMOTE	AS INDICATED	TBD	LEL	5-WIRE		3,4
24														
25														

26 NOTES:
27 1. 120VAC POWER SOURCE FOR INSTRUMENT TRANSMITTER SHALL BE SUPPLIED FROM WITHIN THE ASSOCIATED RTU CABINET.
28
29 2. PROVIDE TRANSIENT VOLTAGE SURGE SUPPRESSION (TVSS) FOR INSTRUMENT.
30
31 3. SHALL BE SUITABLE FOR INSTALLATION IN A CLASS I , DIVISION 2 LOCATION
32
33 4. SENSOR CONNECTION VIA MANUFACTURER'S CABLE



EXISTING CITICO PUMP STATION SECTION

KEYED NOTES:

1. REPLACE (4) EXISTING FLOW METERS WITH OWNER-SUPPLIED 30" WATERMASTER MAGMETER. MANUFACTURER-SUPPLIED CABLE TO BE INSTALLED IN EXISTING RACEWAY.
2. REPLACE (4) EXISTING FLOW TRANSMITTERS. REUSE EXISTING CONDUIT AND CABLING TO EXISTING EQUIPMENT WHERE APPLICABLE.
3. REPLACE (4) EX CONTROL VALVES WITH OWNER-SUPPLIED 30" PRATT BALL VALVES.
4. REPLACE (4) EX CONTROL PANELS WITH OWNER-SUPPLIED PRATT "CHECK MATE" CONTROL SYSTEM PANELS WITH STAINLESS STEEL ENCLOSURE ON LEGS.

NOTES:

1. CONTRACTOR SHALL INSTALL FLOW METERS AND TRANSMITTERS, AND BALL VALVES AND CONTROL PANELS TO BE SUPPLIED BY OWNER. REFER TO SECTIONS 01 61 17, 33 12 16, AND 40 70 00.

0 8' 16' 32'
SCALE IN FEET

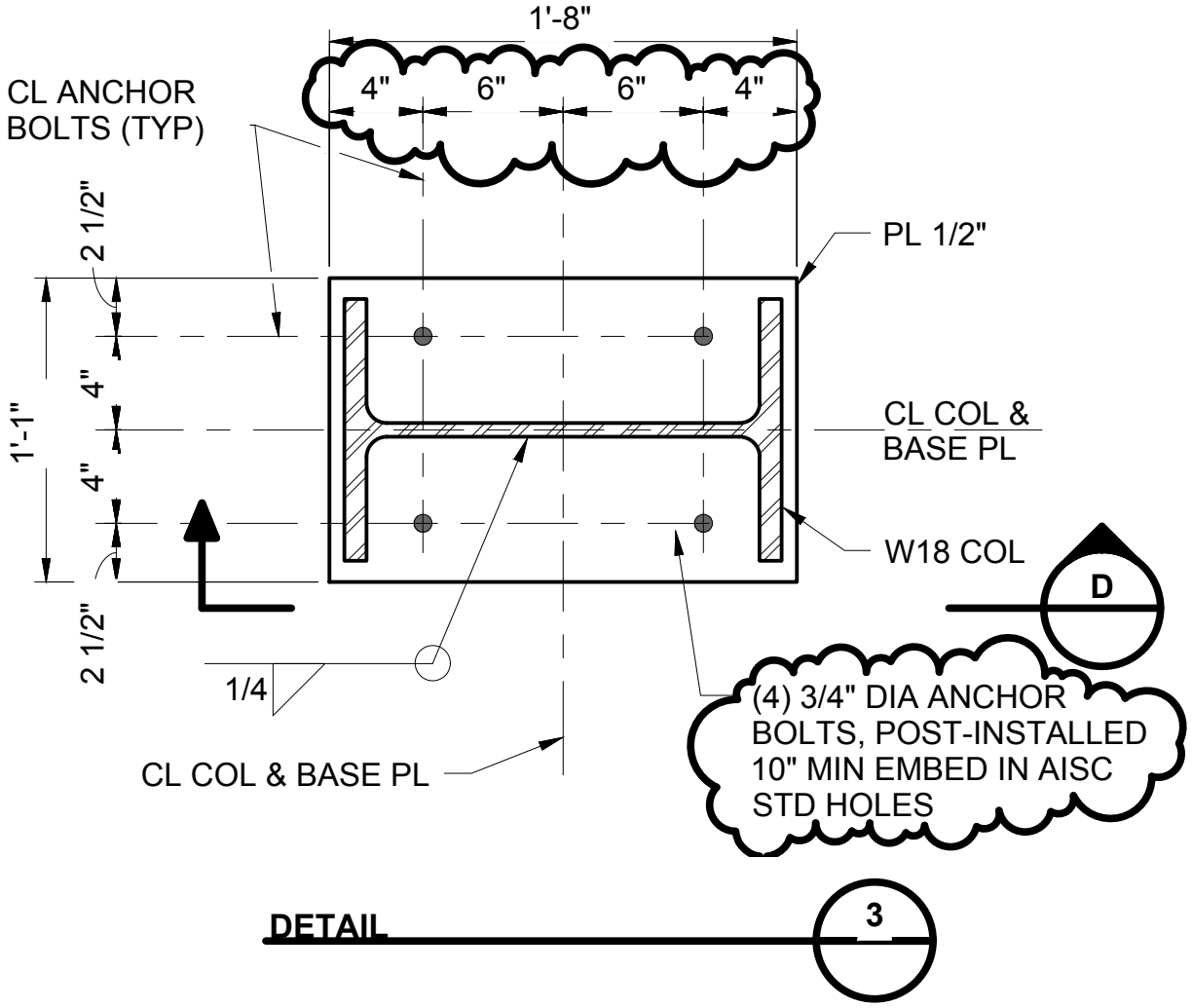
NORTH

BURNS McDONNELL

date 06/22/2017
designed SDA

CITICO RELIABILITY IMPROVEMENTS
ALLOWANCE NO. 2.D.
FLOW METER AND
BALL VALVE INSTALLATION

project 95307
contract W-16-013-201
SK - ADD5-001



TYPICAL COLUMN BASE PLATE DETAIL

0 1/2' 1' 1 1/2'

SCALE IN FEET

BURNS McDONNELL

date 06/22/2017

designed AKF

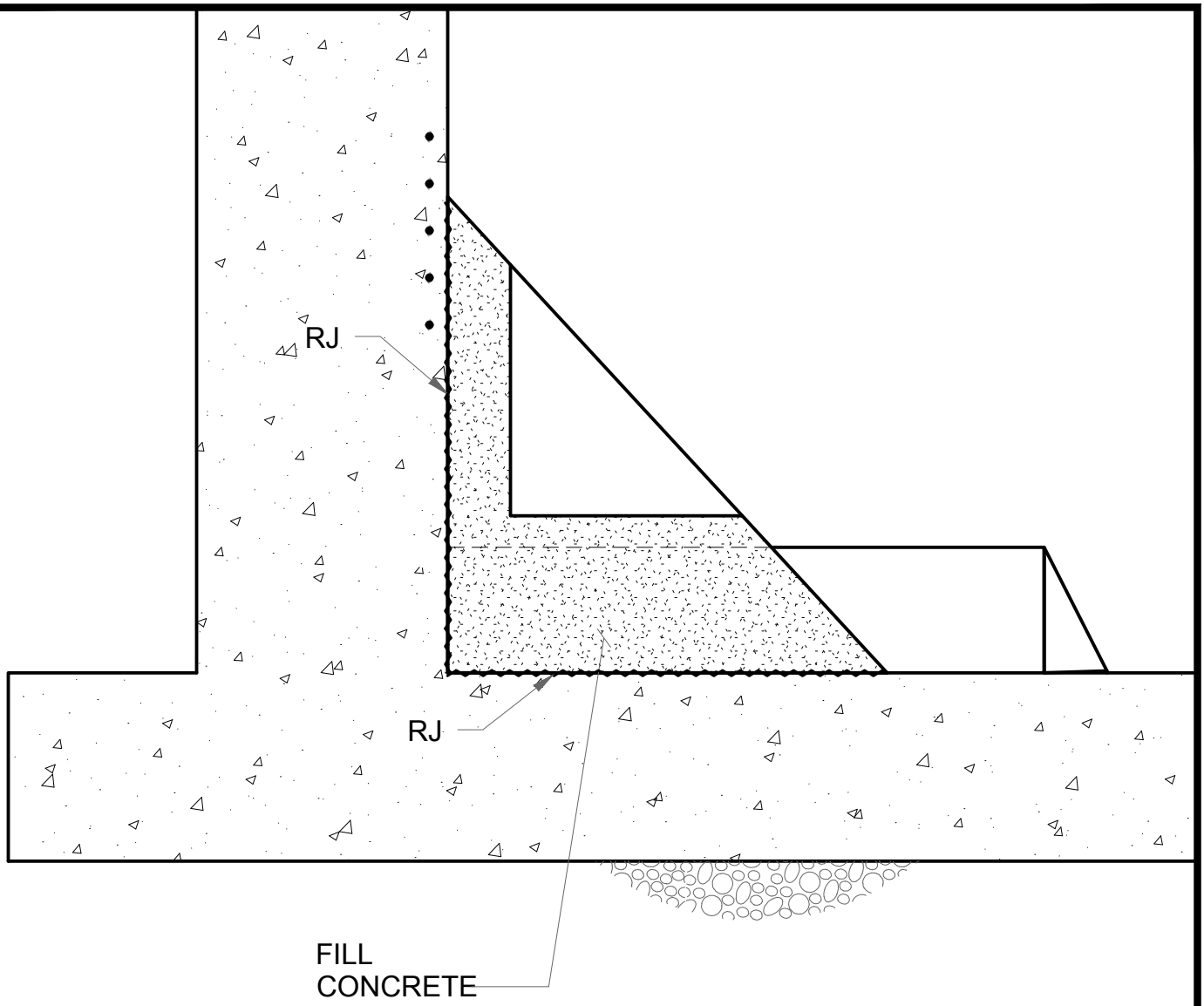
CITICO RELIABILITY IMPROVEMENTS

TYPICAL COLUMN
BASE PLATE DETAIL
DETAIL 3, SHEET S305

project 95307

contract W-16-013-201

SK - ADD5-002



NOTES:

1. PROVIDE ROUGHENED JOINTS AS SHOWN TYPICAL FOR ALL PLACEMENTS OF FILL CONCRETE WITHIN PUMP STATION.

BURNS McDONNELL

date 06/22/2017

designed AKF

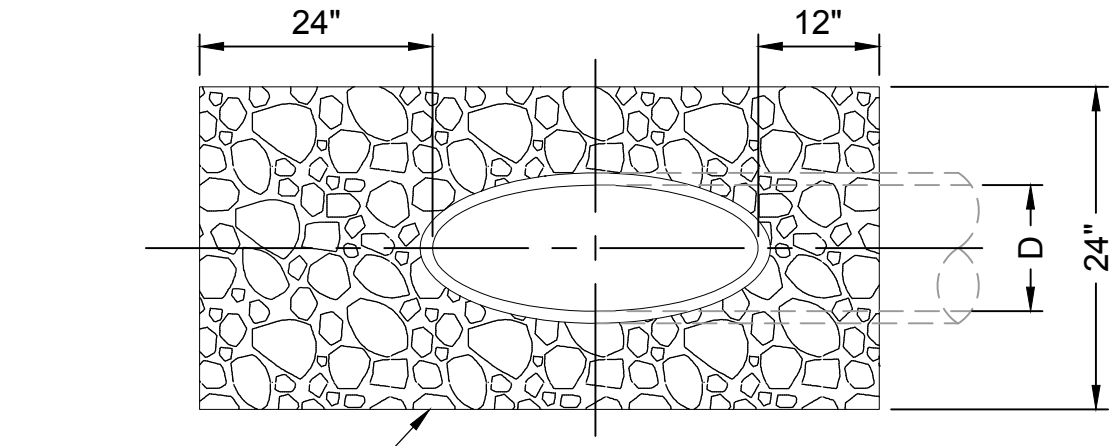
CITICO RELIABILITY IMPROVEMENTS

TYPICAL ROUGHENED JOINT
FOR FILL CONCRETE PLACEMENT
SHEET S301

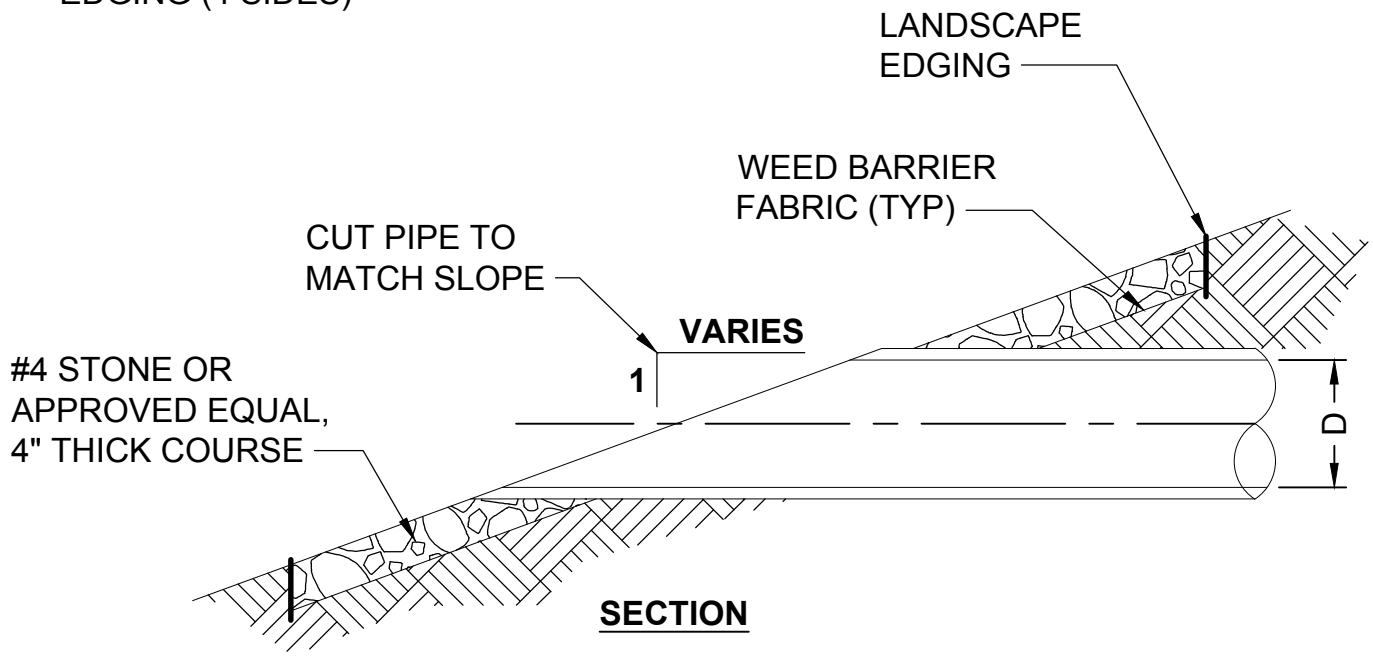
project 95307

contract W-16-013-201

SK - ADD5-003



PLAN



SECTION

NOTES:

1. PROVIDE STAKED, BED EDGING MATERIAL TO RETAIN STONE UPHILL OF EDGE OF BED.
2. SUBMIT STONE GRADATION, WEED BARRIER FABRIC, AND EDGING MATERIAL TO ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION.

RIPRAP END SLOPE FOR PLASTIC PIPE

NOT TO SCALE

BURNS McDONNELL

date 06/22/2017

designed SDA

CITICO RELIABILITY IMPROVEMENTS

RIPRAP END SLOPE
FOR PLASTIC PIPE
DETAIL, SHEET C502

project 95307

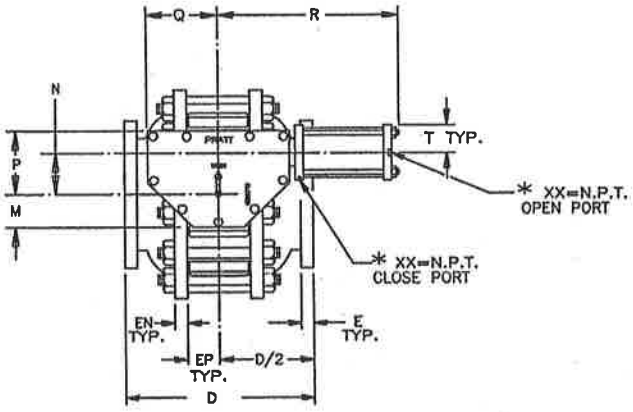
contract W-16-013-201

SK - ADD5-004

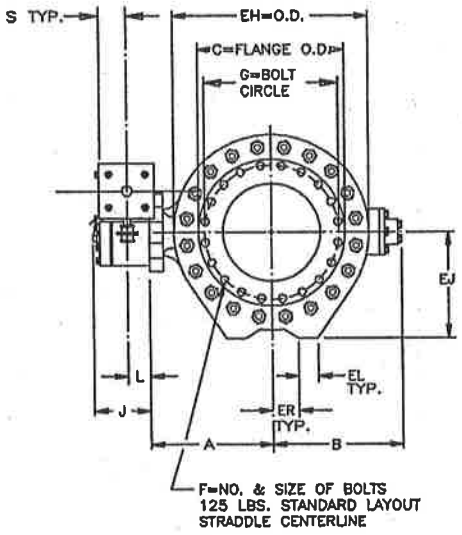
VALVE SIZE	A	B	C	D	E	F	G	EH	EJ	EL	EN	EP	ER
4	9-7/8	12-7/16	9	12-3/8	15/16	8-5/8	7-1/2	14-1/4	8-1/8	1-7/8	1-3/4	1-3/8	3-3/8
6	10-1/2	13-3/16	11	16	1	8-3/4	9-1/2	16-1/2	9	2-5/16	1-15/16	1-5/16	2-15/16
8	11-1/8	13-15/16	13-1/2	18	1-1/8	8-3/4	11-3/4	19	10-1/8	2-1/4	1-3/8	2-1/8	4-1/4
10	12-7/8	16-1/8	16	18-1/8	1-3/16	12-7/8	14-1/4	22	11-7/8	2-7/8	1	2-1/2	4-9/16
12	15	18-1/2	19	21	1-1/4	12-7/8	17	25-3/4	13-1/2	3-1/2	1-1/8	2-1/2	4-5/16
14	17-3/8	20-5/8	21	26-1/4	1-3/8	12-1	18-3/4	29-3/4	15-1/2	3-15/16	1-5/16	2-1/2	4-15/16
16	20-1/16	23-1/4	23-1/2	27	1-7/16	16-1	21-1/4	32-7/8	17-1/8	4-3/16	1-7/16	2-9/16	5-7/16
18	21-9/16	24-7/8	25	29	1-9/16	16-1-1/8	22-3/4	36-5/8	19	4-5/16	1-9/16	3-3/16	6
20	23-5/8	27-3/4	27-1/2	32	1-11/16	20-1-1/8	25	39-7/8	20-3/4	4	1-5/8	4-7/16	6-11/16
24	26-1/2	29-3/4	32	37	1-7/8	20-1-1/4	29-1/2	44-3/4	24-1/8	4-3/8	1-15/16	5-3/16	8-3/16
30	32-1/2	35-7/16	38-3/4	46	2-1/8	28-1-1/4	36	55-5/8	29-3/4	5-3/8	2-3/8	6	10-7/8
36	36-7/8	41-1/16	46	54	2-3/8	32-1-1/2	42-3/4	65-3/8	34-1/4	5-13/16	2-7/8	7	9-3/16
42	42-1/2	47-1/4	53	59-1/2	2-5/8	36-1-1/2	49-1/2	75-1/2	39-3/4	7-1/2	2-7/16	8	13-1/2
48	50-3/8	58-1/16	59-1/2	72	2-3/4	44-1-1/2	56	86-3/4	44-5/8	7	3-5/8	9-1/4	13-1/4

ACTUATOR SIZE	CYLINDER BORE	SIZE STROKE	J	L	M	N	P	Q	R	S	T	XX
MDT-3S	5	5-5/8	7-1/4	4-1/8	3-1/4	3-3/8	5-5/8	5-3/8	18-3/8	2-7/8	2-7/8	1/2
MDT-3S	8	5-5/8	7-1/4	4-1/8	3-1/4	3-3/8	5-5/8	5-3/8	20-3/4	4-3/8	4-3/8	3/4
MDT-3S	10	5-5/8	7-1/4	4-1/8	3-1/4	3-3/8	5-5/8	5-3/8	22-3/8	5-3/8	5-3/8	3/4
MDT-4S	5	8	8	4-1/2	3-3/8	4	7-5/16	6-3/4	20-5/8	2-7/8	2-7/8	1/2
MDT-4S	8	8	8	4-1/2	3-3/8	4	7-5/16	6-3/4	23	4-3/8	4-3/8	3/4
* MDT-4S	10	8	8	4-1/2	3-3/8	4	7-5/16	6-3/4	24-5/8	5-3/8	5-3/8	3/4
* MDT-4S	12	8	8	4-1/2	3-3/8	4	7-5/16	6-3/4	27-3/8	6-3/8	6-3/8	1
MDT-5	6	11	9-1/8	5-1/8	4-1/2	5-1/2	8-3/4	10	27-5/8	3-5/16	3-5/16	3/4
MDT-5	8	11	9-1/8	5-1/8	4-1/2	5-1/2	8-3/4	10	29-1/8	4-3/8	4-3/8	3/4
MDT-5	10	11	9-1/8	5-1/8	4-1/2	5-1/2	8-3/4	10	30-7/8	5-3/8	5-3/8	3/4
MDT-5	12	11	9-1/8	5-1/8	4-1/2	5-1/2	8-3/4	10	33-1/2	6-3/8	6-3/8	1
MDT-5	14	11	9-1/8	5-1/8	4-1/2	5-1/2	8-3/4	10	33-1/2	7-3/8	7-3/8	1

* OPEN AND CLOSE PORTS ARE REVERSED FOR THESE SIZES.



ACTUATOR POSITION 2



RECOMMENDED FILTRATION FOR CYLINDER SUPPLY MEDIA

AIR _____ 50 MICRONS (DRY)

OIL _____ 150 MICRONS

WATER _____ 100 MICRONS

CYLINDER PRESSURE – P.S.I.: MIN._____ MAX._____

CYLINDER MEDIA : AIR ____ OIL ____ WATER _____

NOTES:

*1. ALL DIMENSIONS SHOWN IN INCHES. "D" DIMENSION ± 1/8".

2. DIMENSIONS AND DRILLING OF END FLANGES CONFORM TO THE AMERICAN CAST IRON FLANGE STANDARDS, CLASS 125 (B16.1).

3. (RECOMMENDATIONS FOR MATING FLANGES) WHERE INSULATING BUSHINGS ARE USED, IT IS NECESSARY THAT BOLT HOLES BE DRILLED OVERSIZE BY AN AMOUNT EQUAL TO TWO TIMES THE INSULATING SLEEVE THICKNESS TO MAINTAIN THE SAME MINIMUM CLEARANCE FOR BOLTS.

4. VALVES MANUFACTURED AND TESTED IN ACCORDANCE WITH AWWA SPECIFICATIONS C-507-(LATEST REV.

5. VALVE ROTOR SHOWN IN OPEN POSITION.

REV	DATE	BY	DESCRIPTION	APP.
1	4/9/14	AMJ	REMOVE HW	SS

PRATT® HENRY PRATT COMPANY AURORA, ILL.

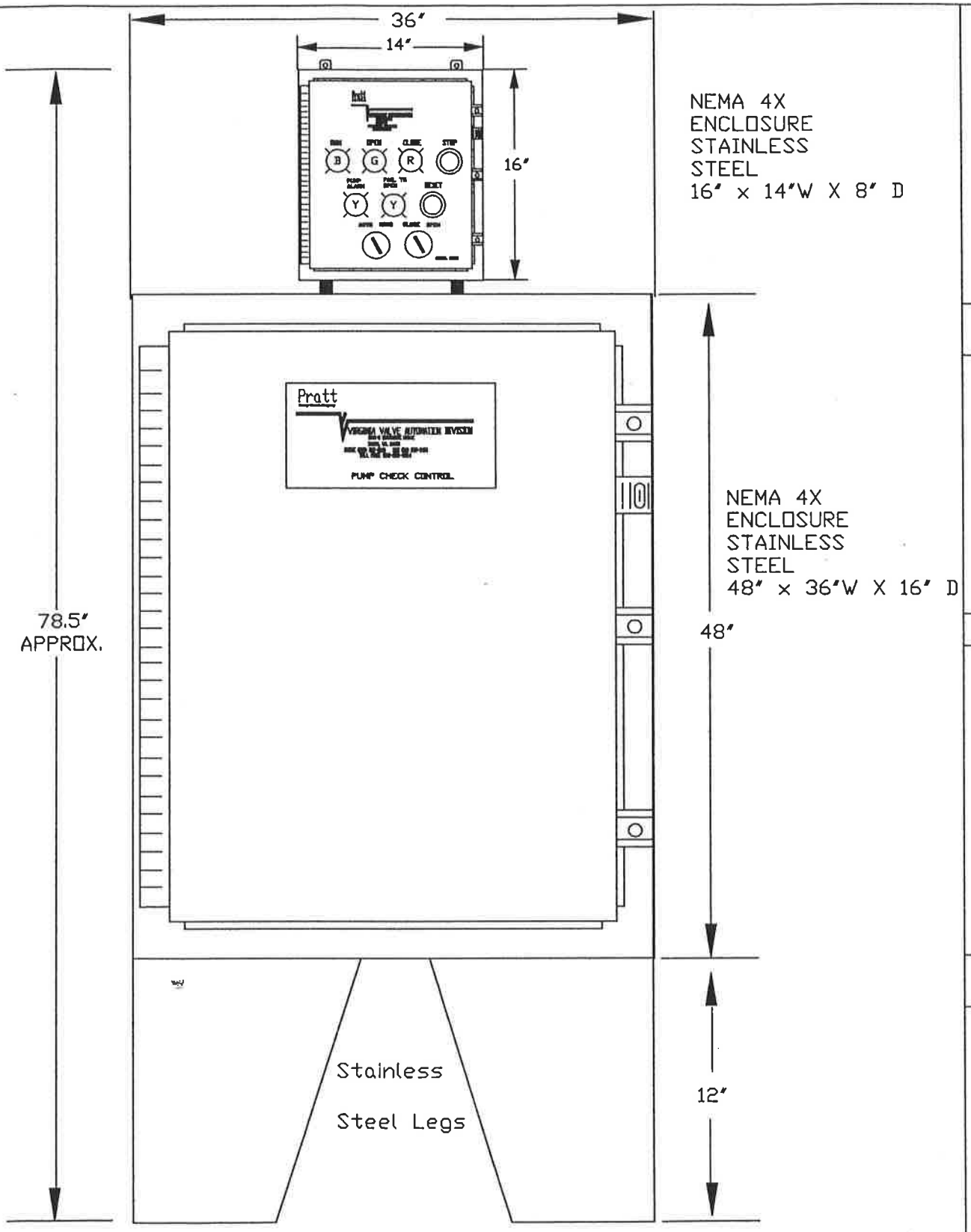
GENERAL ARRANGEMENT DRAWING
4-48 INCH 150# E-LOK BALL VALVE
DOUBLE SEAT
MDT DURACYL

SCALE NONE DATE 7-28-04

DRAWN BY ARR CHECKED BY ARR

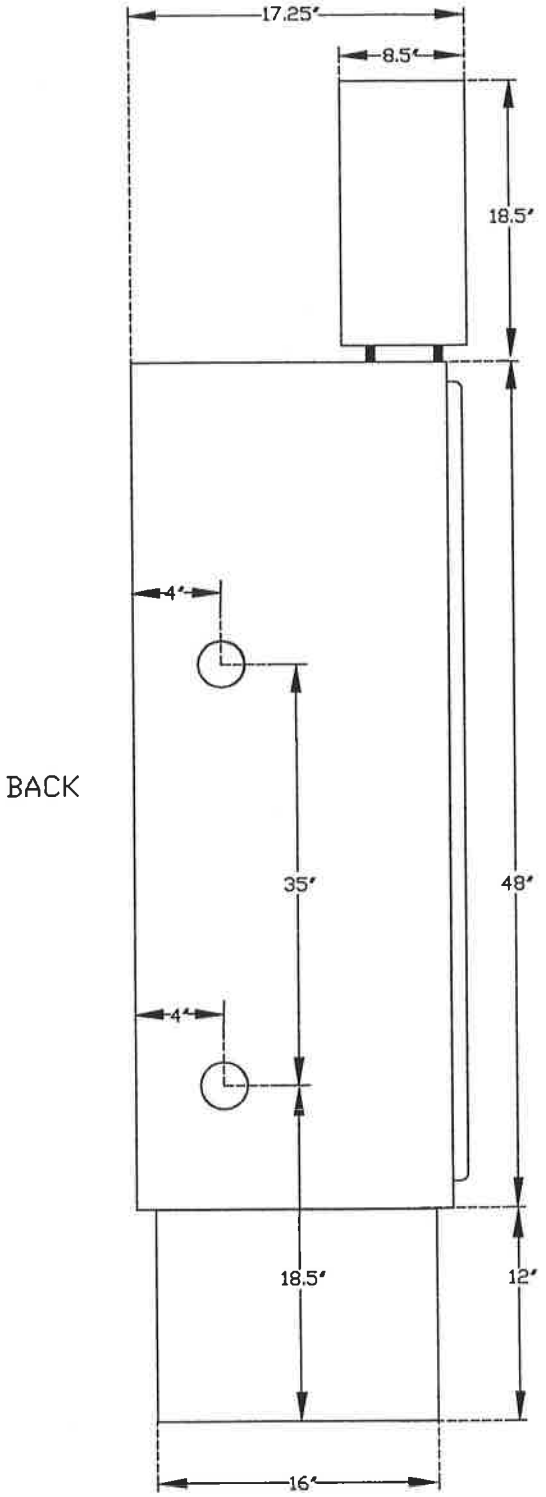
APPROVED _____ GA=BORDER

DRWG. NO. GA-11217 REV 1 A/C



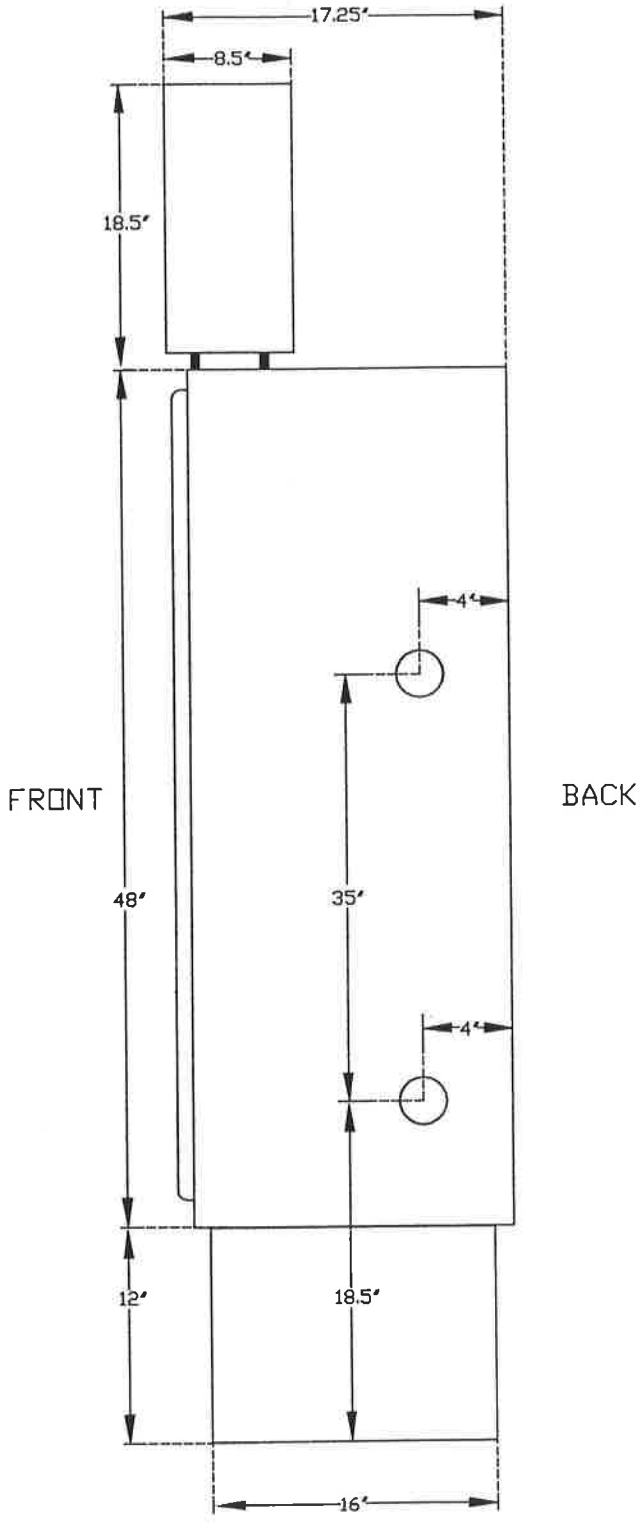
PRATT
Henry Pratt Company

TITLE: PUMP CHECK CONTROL FRONT VIEW			
PROJECT: W.C. TEAS COMPANY S.O.# 48247			
DATE: 08/25/01	SCALE: None	DWG. NO.: 010111,112,113,114 -FV	
DRAWN BY: MEL	APPROVED	SHEET NO.: 1 of 1	



PRATT
Henry Pratt Company

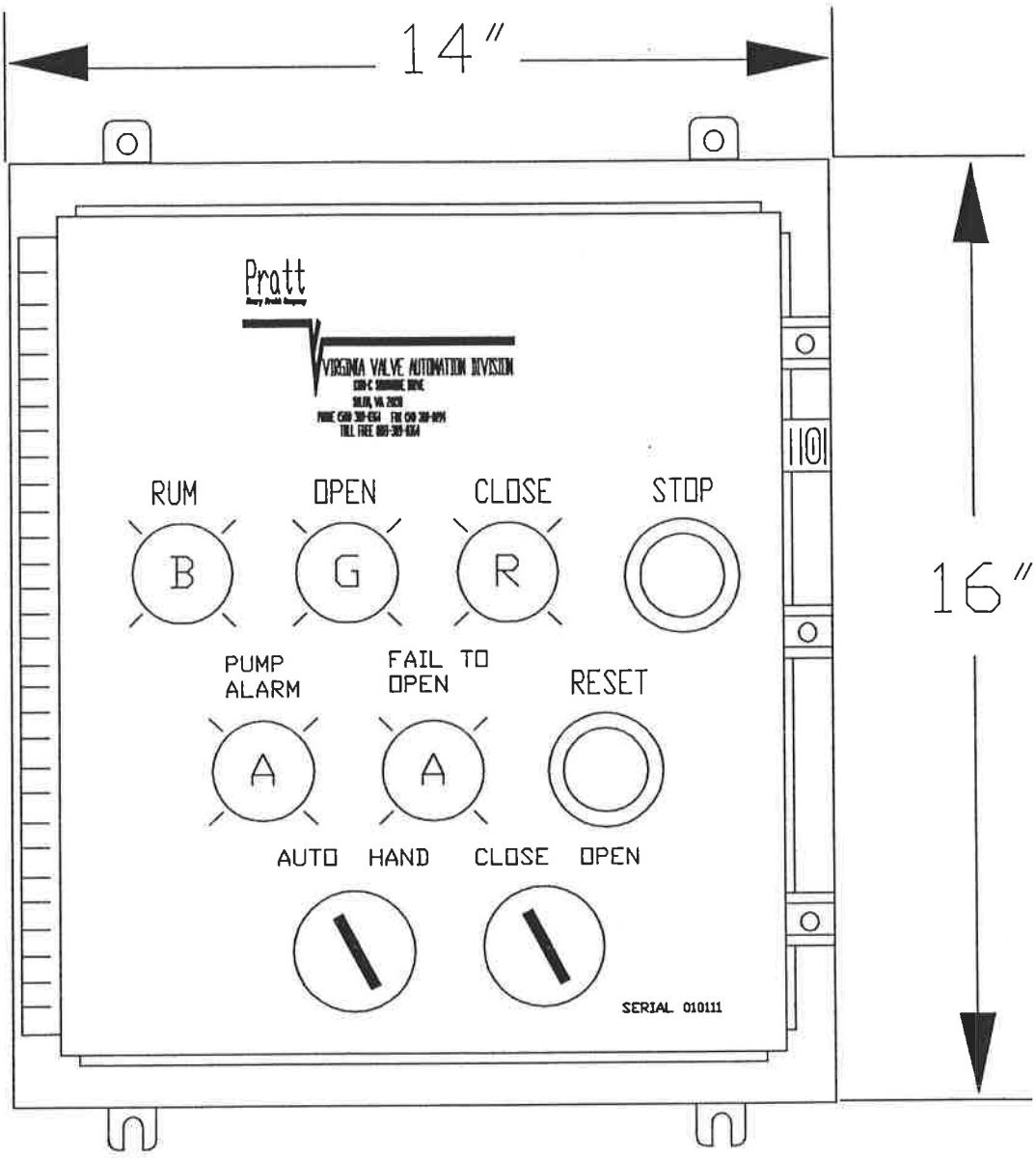
TITLE: PUMP CHECK CONTROL LEFT SIDE VIEW		
PROJECT: W.C. TEAS COMPANY S.O.# 48247		
DATE: 08/27/01	SCALE: None	DWG. NO.: 010111,112,113,114 -LS
DRAWN BY: RCB	APPROVED	SHEET NO.: 1 of 1



PRATT

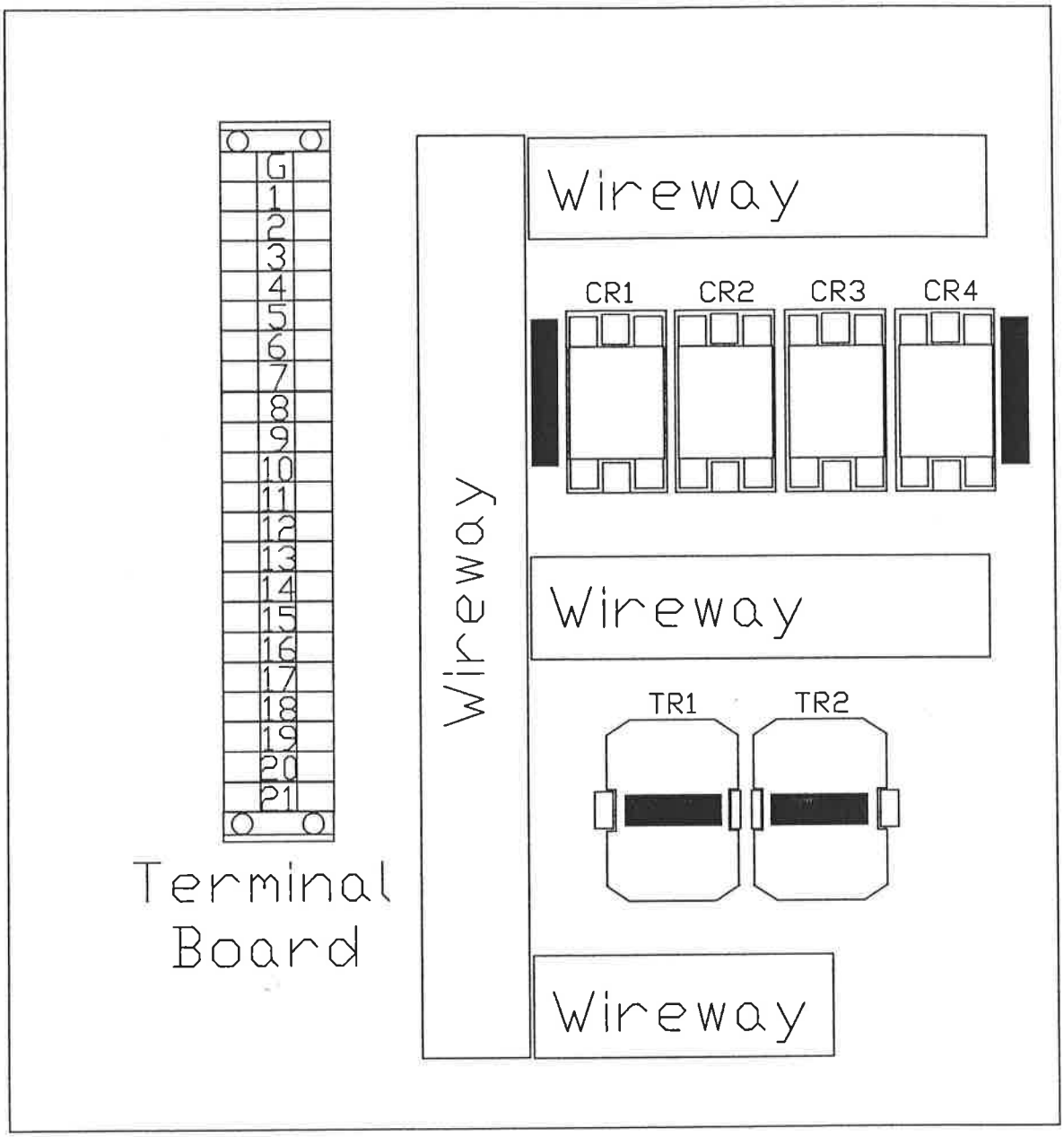
Henry Pratt Company

TITLE: PUMP CHECK CONTROL RIGHT SIDE VIEW		
PROJECT: W.C. TEAS COMPANY S.O.# 48247		
DATE: 08/27/01	SCALE: None	DWG. NO.: 010111,112,113,114 -RS
DRAWN BY: RCB	APPROVED:	SHEET NO.: 1 of 1



PRATT
Henry Pratt Company

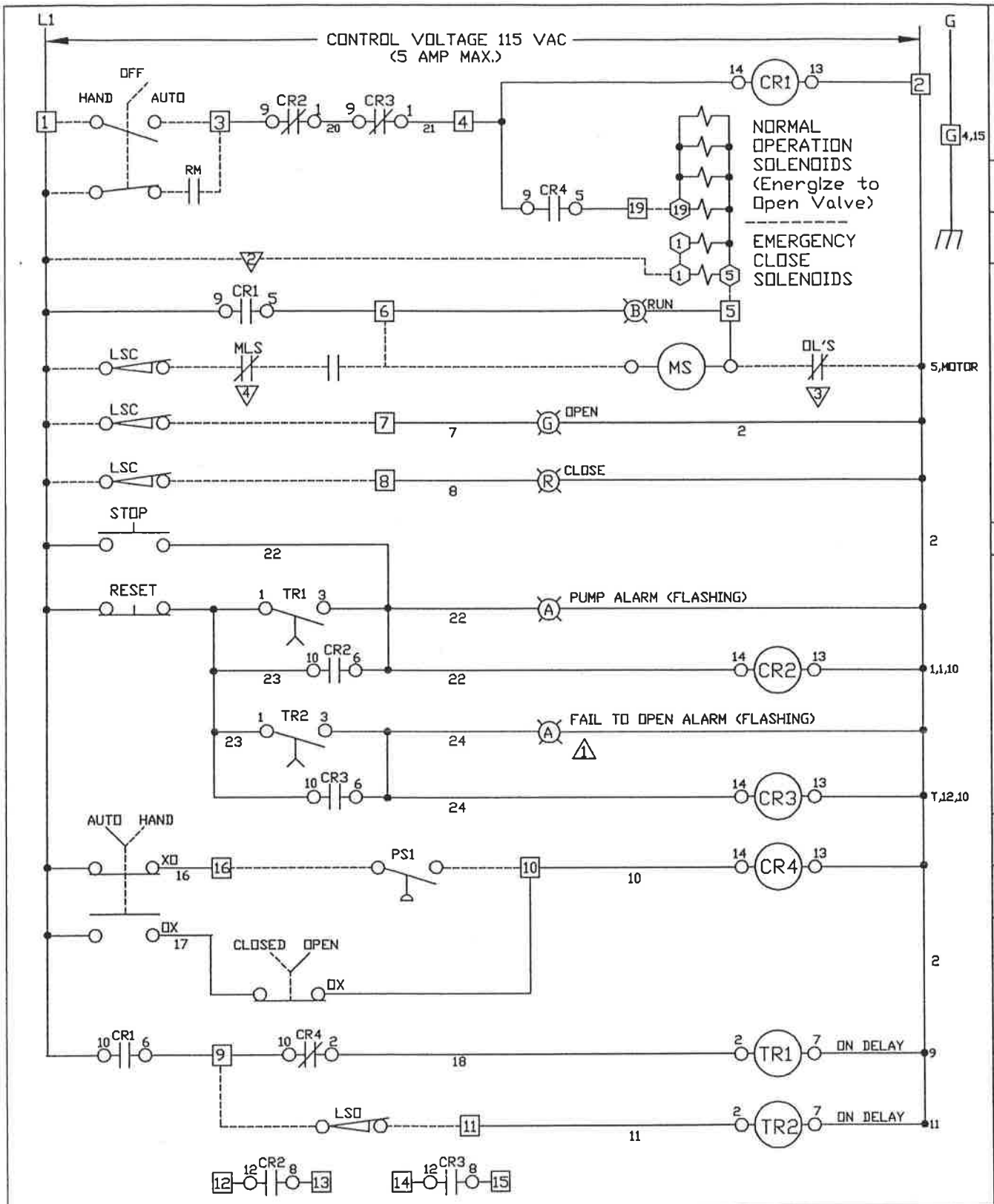
TITLE ELECTRICAL CONTROL BOX FRONT VIEW			
PROJECT W.C. TEAS COMPANY S.O.# 48247			
DATE 08/25/01	SCALE None	DWG. NO. 010111,112,113,114 -ECB	
DRAWN BY MEL	APPROVED	SHEET NO. 1 of 1	



Back Panel Layout - Control Box

PRATT
Henry Pratt Company

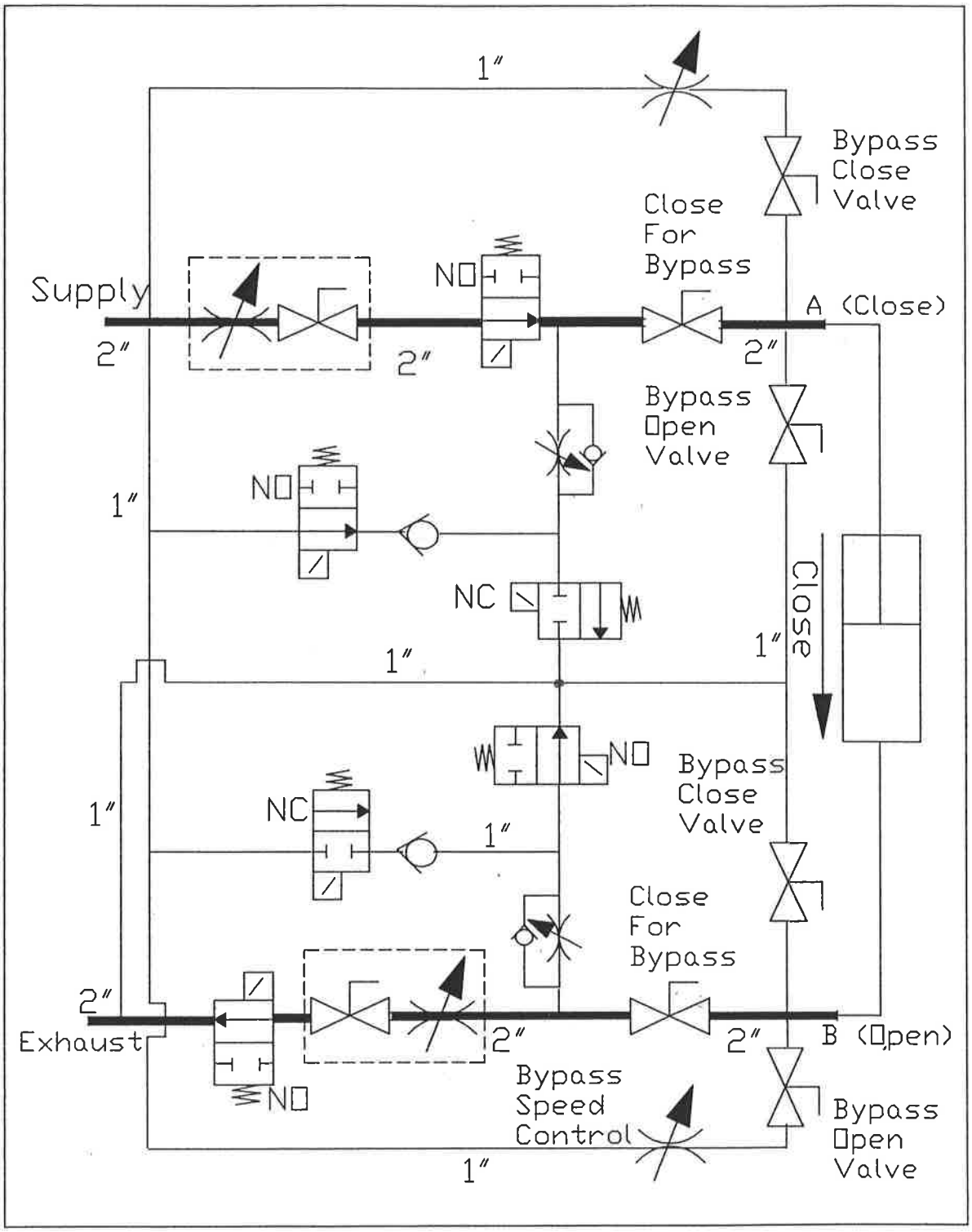
TITLE PUMP CHECK CONTROL BACK PANEL LAYOUT		
PROJECT W.C. TEAS COMPANY S.O.#48247		
DATE 08/29/01	SCALE None	DWG. NO. 010111,112,113,114 -BP
DRAWN BY RCB	APPROVED	SHEET NO. 1 of 1



PRATT Henry Pratt Company	TITLE PUMP CHECK CONTROL ELECTRICAL		
	PROJECT W.C. TEAS COMPANY S.O.# 48247		
	DATE 08/27/01	SCALE None	DWG. NO. 010111,112,113,114 -E
	DRAWN BY RCB	APPROVED	SHEET NO. 1 of 1

Field Wiring

Description	*Terminal Point*
Hydraulic Enclosure	
Ground	G
120VAC for Emergency Solenoids	1
Neutral for All Solenoids	5
120VAC for Normal Operation Solenoids	19
Electrical Enclosure	
Ground	G
120 VAC LINE, Hand-Off-Auto Selector Switch, Emergency Close Solenoids, LSC Limit Switches (Qty 3)	1
120VAC Neutral, Motor OL's NC Contact	2
RM Contact, Hand-Off-Auto Selector Switch	3
---	4
Neutral for All Solenoids, MS Coil, Motor OL's NC Contact	5
MLS NC Contact, MS Coil	6
LSC Limit Switch	7
LSC Limit Switch	8
LSO Limit Switch	9
PS1 Contact	10
LSO Limit Switch	11
CR2 No Contact	12
CR2 No Contact	13
CR3 No Contact	14
CR3 No Contact	15
PS1 Contact	16
Spare	17
Spare	18
Normal Operation Solenoids (Qty 4)	19
Spare	20
Spare	21



PRATT

Henry Pratt Company

TITLE PUMP CHECK CONTROL HYDRAULIC		
PROJECT W.C. TEAS COMPANY S.O. #48247		
DATE 08/27/01	SCALE None	DWG. NO. 010111,112,113,114 -HY
DRAWN BY MEL	APPROVED	SHEET NO. 1 of 1

SPECIFICATION FORMS FOR PROCESS MEASUREMENT AND CONTROL INSTRUMENTS

MR SYSTEMS
Advanced Systems. Proven Solutions.

1185 Beaver Ruin Rd, Suite A
Norcross, Georgia 30093

Office: (678) 325-2800
www.MRSystems.com

MR Project No. **216540**

30" WaterMaster Magmeter, Hard Rubber Liner, ANSI Class 150 Flanges, SS electrode, Remote Transmitter, 4-20 mA output, 60 Ft. of Submersible Cable

No.	By	Date	Revision
0	JTS	4/19/2017	For Approval

Reference Information
409100 2.06

Contract: **Citico CSOTF & PS Imp.**
Location: **Chattanooga, TN**

Owner: **City of Chattanooga**
Engineer: **Burns and McDonnell Engineering Company, Inc**

Manufacturer: **ABB**

Model: **FEW325.750.H.1.S.4.C2.B.1.A.1.A.3.P.3.B.3.A.1..JK.M5**

Linear Material: Hard rubber
Flange: 150 Lb
Signal cable length: 60 ft.
Conduit Connection: 1/2" NPT
Size: 30"
Rating: IP67 (NEMA 4X), IP68 (NEMA 6P)

Electrode material: SS
Proces connection material: Carbon Steel
Transmitter Output: 4-20mA, HART
Grouding Rings: SS
Power: 120Vac, 60Hz

Tag	Loop	Service	Location	Range	Scale	Comment
PS-FE/FIT	201	Existing PumpPump Station Flow No.1	Existing Pump Station	0 - 88,057 GPM	0 - 50 MGD	Provided with Phoenix Contact BOXTRAB Surge Protector
PS-FE/FIT	202	Existing PumpPump Station Flow No.2	Existing Pump Station	0 - 88,057 GPM	0 - 50 MGD	Provided with Phoenix Contact BOXTRAB Surge Protector
PS-FE/FIT	203	Existing PumpPump Station Flow No.3	Existing Pump Station	0 - 88,057 GPM	0 - 50 MGD	Provided with Phoenix Contact BOXTRAB Surge Protector
PS-FE/FIT	204	Existing PumpPump Station Flow No.4	Existing Pump Station	0 - 88,057 GPM	0 - 50 MGD	Provided with Phoenix Contact BOXTRAB Surge Protector

Application Comment:

Contractor to verify that 60 feet of cable is sufficient

Data sheet DS/WM–EN Rev. U

WaterMaster
Electromagnetic flowmeter

Measurement made easy

The perfect fit for all water industry applications

One solution for all your needs
— designed for use in all water and waste water applications, from sewage plants to distribution networks

State-of-the-art technology
— revolutionary data storage enables transmitter interchange and commissioning without the need for re-configuration
— self-calibrating transmitter with ultra-low temperature coefficient for highest accuracy

Versatile and simple configuration
— 'Through-the-Glass' (TTG) configuration eliminating the need to remove the cover
— smart key based functionality
— 'Easy Setup' function

VeriMaster in situ verification software option
— enables the customer to perform in situ verification of the flowmeter system

Unparalleled service ability
— fault-finding Help texts on the display
— minimized downtime with replaceable electronics cartridges

MID and OIML R49 approved with R49 self-checking
— Type-approved to accuracy Class 1 and Class 2 for any pipe orientation and bidirectional flows
— Type P-approved continuous self-checking of the sensor and transmitter to ensure the highest accuracy and long term performance

Innovative sensors for all applications
— optimized full-bore series for optimum turndown / low pressure drop, irrigation applications
— full-bore series for general-purpose water metering applications
— reduced-bore series for high turn down applications, for example, leakage
— buriable sensors eliminating the need for costly chamber construction

HART, PROFIBUS DP and MODBUS
— Full system and PLC integration

The Company

ABB is an established world force in the design and manufacture of instrumentation for industrial process control, flow measurement, gas and liquid analysis and environmental applications.

As a world leader in process automation technology our worldwide presence, comprehensive service and application-oriented know-how make ABB a leading supplier of flow measurement products.

Introduction

Setting the standard for the Water Industry

The WaterMaster range, available in sizes 10 to 2400 mm ($^3/_8$ to 96 in.), is designed specifically for use on the many diverse applications encountered in the Water and Waste-water industry. The modular design concept offers flexibility, cost-saving operation and reliability while providing a long service life and exceptionally low maintenance.

Integration into ABB asset management systems and use of the self-monitoring and diagnostic functions increase the plant availability and reduce downtimes.

VeriMaster – the verification tool

An easy-to-use utility, available through the infra red service port, it uses the advanced self-calibration and diagnostic capability of WaterMaster, coupled with fingerprinting technology, to determine the accuracy status of the WaterMaster flowmeter to within ±1 % of its original factory calibration. VeriMaster also supports printing of calibration verification records for regulatory compliance.

Diagnostic functions

Using its diagnostic functions, the flowmeter monitors both its own operability and the process. Limit values for the diagnostic parameters can be set locally. When these limits are exceeded, an alarm is tripped. In the event of an error, diagnostic-dependent help text appears on the display and this considerably simplifies and accelerates the troubleshooting procedure.

In accordance with NAMUR NE107, alarms and warnings are classified with the status of 'Maintenance Required', 'Check Function', 'Failure' and 'Out of Specification'.

Flow performance

Utilizing its advanced filtering methods, the WaterMaster improves accuracy even under difficult conditions. WaterMaster has an operating flow range with ±0.4 % accuracy as standard (±0.2 % optional) in both forward and reverse flow directions.

Easy and quick commissioning

'Fit-and-Flow' data storage inside WaterMaster eliminates the need to match sensor and transmitter in the field. On initial installation, the self-configuration sequence automatically replicates into the transmitter all calibration factors, meter size and serial numbers, as well as customer site-specific settings, eliminating the potential for error.

Intuitive, convenient navigation

The 'Easy Setup' function reliably guides unpracticed users through the menu step by step. The smart key based functionality makes handling a breeze – it's just like using a cell phone. During configuration, the permissible range of each parameter is indicated on the display and invalid entries are rejected.

Universal transmitter – powerful and flexible

The backlit display can be rotated easily without the need for tools. The contrast is adjustable and the display fully-configurable. The character size, number of lines and display resolution (number of decimal points) can be set as required. In multiplex mode, several different display options can be pre-configured and invoked one after the other.

The smart modular design of the transmitter unit enables easy disassembly without the need to unscrew cables or unplug connectors. HART is used as the standard communications protocol. Optionally, the transmitter is available with PROFIBUS DP or MODBUS communication.

Assured quality

WaterMaster is designed and manufactured in accordance with international quality procedures (ISO 9001) and all flowmeters are calibrated on nationally-traceable calibration rigs to provide the end-user with complete assurance of both quality and performance of the flowmeter.

WaterMaster – always the first choice

WaterMaster sets the standard for the water industry. The specification, features and user benefits offered by this range are based on ABB's worldwide experience in this industry and they are all targeted specifically to the industry's requirements.

Submersible and buriable

WaterMaster sensors have a rugged, robust construction to ensure a long, maintenance-free life under the arduous conditions experienced in the Water and Waste Industry. The sensors are, as standard, inherently submersible (IP68, NEMA 6P), thus ensuring suitability for installation in chambers and metering pits that are susceptible to flooding.

A unique feature of the WaterMaster sensors is that sizes DN40 to DN2400 ($1^1/_2$ to 96 in. NB) are buriable; installation simply involves excavating to the underground pipe, fitting the sensor, cabling back to the transmitter and then backfilling the hole.

The WaterMaster family

Overview of the WaterMaster

A wide range of features and user benefits are built into WaterMaster as standard:

- bi-directional flow
- unique self-calibrating transmitter (patented) for the ultimate in stability and repeatability
- OIML-type continuous self-checking, with alarms, ensures both sensor and transmitter accuracy
- true electrode and coil impedance measurement
- comprehensive simulation mode
- universal switch-mode power supply (options are available for AC and DC supplies)
- comprehensive self-diagnostics compliant with NAMUR NE107
- programmable multiple-alarm capability
- bus options: HART (4 to 20 mA), PROFIBUS DP (RS485), MODBUS (RS485)
- 3 configurable pulse / frequency and alarm outputs
- advanced infrared service port supports remote HMI, HART, cyclic data out and parameter download
- VeriMaster in situ verification software available as option
- read-only switch and ultra-secure service password for total security

OIML / MID approved

WaterMaster has been type tested and Internationally approved to the highest accuracy class 1 and 2 for cold and hot potable water meters – OIML R49-1 (Organisation Internationale de Métrologie Légale). For full details, OIML R49 is available to download from www.oiml.org. Its requirements are very similar to other International standards, such as EN14154 and ISO4064.

WaterMaster has been assessed by type approval at the National Measurement Office (NMO) to OIML R49 and passed to the very highest accuracy designations for sizes DN40 to DN200 (1½ to 8 in. NB).

The approval is for:

- Class 1 and Class 2 accuracy (calibration option)
- Environmental class T50 for water temperatures of 0.1 to 50 °C (32.18 to 122 °F)
- Electromagnetic Environment E2 (10 V/m)
- Any pipe orientation
- 5 Diameters upstream pipe
- 0 Diameters downstream pipe
- Pressure Loss Class <0.25 bar (3.62 psi)
- Integral or remote transmitter (<200 m [<656 ft.] cable)
- DN40 to DN200 (1½ to 8 in. NB), bi-directional flow

A major advance in WaterMaster is the self-checking capabilities that meet and exceed the R49 requirements and is the first electromagnetic flowmeter to be approved to OIML Type P permanent self checking during normal operation (not just at startup) and alarm indication for:

- transmitter and sensor status, with an accuracy alarm
- program ROM and RAM status
- double, independent storage of totalizer values, in both the sensor and transmitter non-volatile memories
- display test

The OIML R49-1 certificate of conformity is available from:

http://www.abb.com/product/seitp330/b42ec2377d3293cdc12573de003db93b.aspx

WaterMaster is also approved under the EU Measuring Instruments Directive (MID) 2004/22/EC, that covers putting into use water flowmeters for certain applications. MID WaterMaster is secured against tamping and is available as an option, along with fingerprinting for ABB VeriMaster in situ verification product, with certificate printout to ±1 % accuracy.

WaterMaster certificates of EC type-examination of a measuring instrument are available from:

http://www.abb.com/product/seitp330/b42ec2377d3293cdc12573de003db93b.aspx

Superior control through advanced sensor design

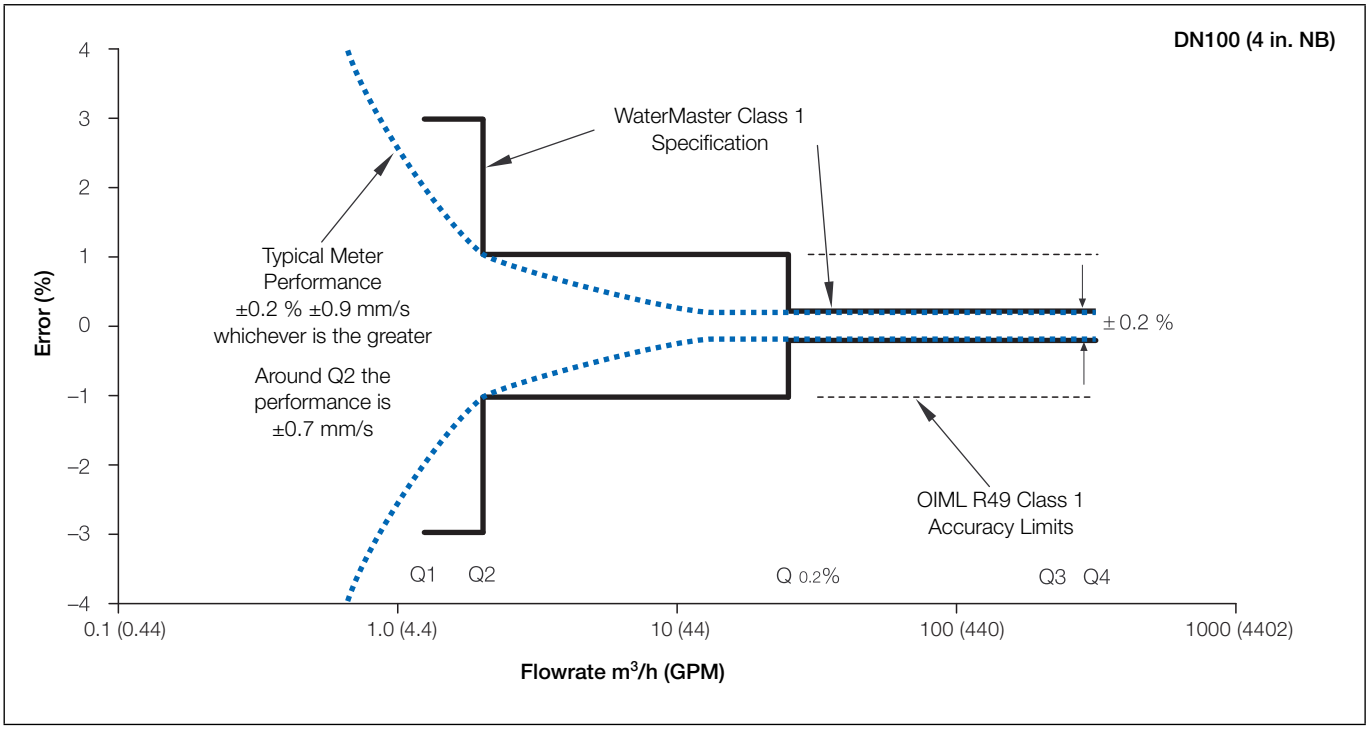
The innovative, patented octagonal sensor design improves flow profile and reduces up- and down-stream piping requirements for the most commonly used sizes of 40 to 200 mm (1½ to 8 in.). This optimized full bore meter provides impressive results in the most difficult of installation requirements.

WaterMaster sensors are also available in reduced-bore geometries giving the ultimate in low-flow performance with a very high turn-down range.

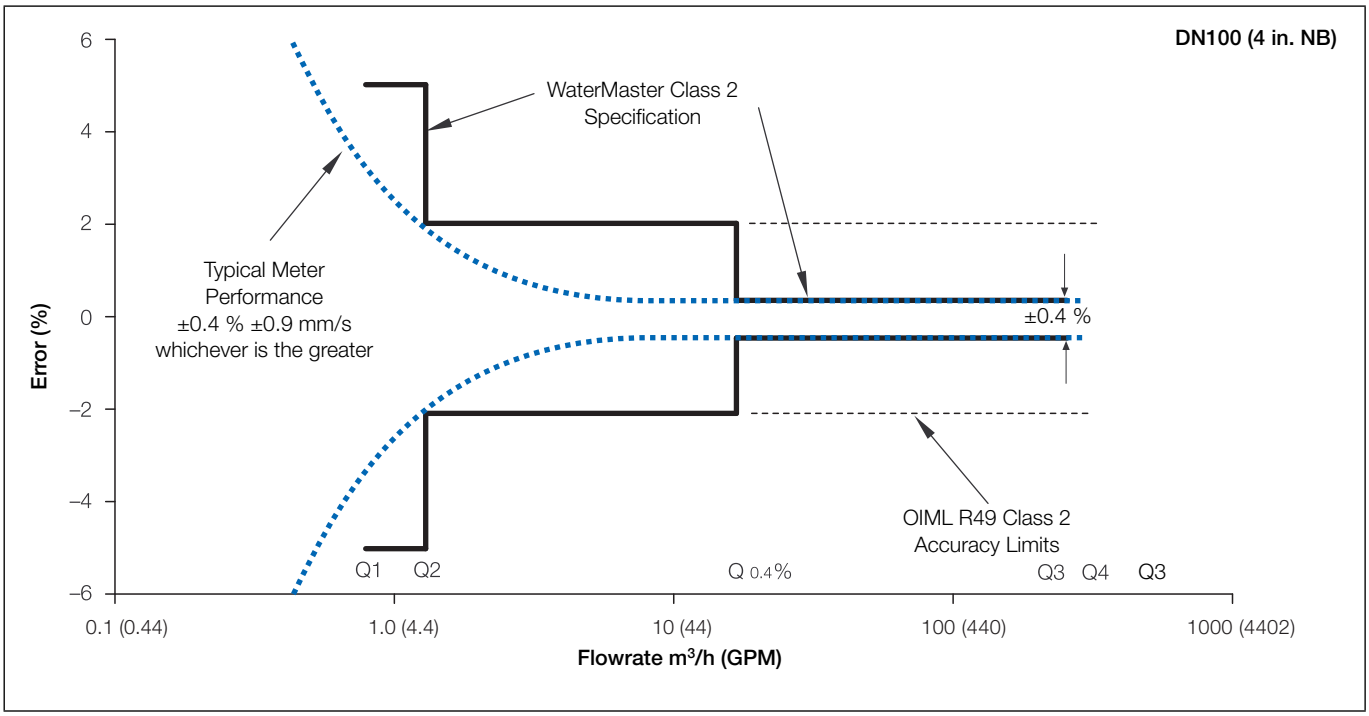
The unique design of the reduced-bore sensor conditions the flow profile in the measuring section so that distortions in the flow profile, either upstream or downstream, are flattened. The result is excellent in situ flowmeter performance, even with very bad hydraulic installation conditions.

Specification

WaterMaster specification to OIML R49 Class 1



WaterMaster specification to OIML R49 Class 2



Although OIML R49 does not define the flow accuracy below Q1, WaterMaster continues to measure flow at lower flow rates down to a cutoff velocity of ±5 mm/s (±0.2 in./s). The accuracy between cutoff and Q1 is typically ±0.9 mm/s (±0.04. in./s).

WaterMaster optimized full-bore meter (FEV) / full-bore meters (FEF, FEW) flow performance – m^3/h

			Standard Calibration – 0.4 % Class 2			High Accuracy Calibration – 0.2 % Class 1		
DN	Q4	Q3	$Q_{0.4\%}$	Q2	Q1	$Q_{0.2\%}$	Q2	Q1
10	3.1	2.5	0.167	0.013	0.008	0.31	0.02	0.012
15	7.88	6.3	0.42	0.032	0.02	0.79	0.05	0.03
20	12.5	10	0.67	0.05	0.032	1.25	0.08	0.05
25	20	16	1.1	0.08	0.05	2	0.13	0.08
32	31.25	25	1.67	0.13	0.08	3	0.20	0.13
40*	50	40	4.2	0.2	0.13	6	0.32	0.2
50*	79	63	4.2	0.32	0.20	7.9	0.5	0.32
65*	125	100	6.7	0.5	0.32	12.5	0.8	0.5
80*	200	160	10.7	0.81	0.51	16	1.3	0.8
100*	313	250	16.7	1.3	0.79	25	2	1.25
125*	313	250	16.7	1.3	0.79	25	2	1.25
150*	788	630	42	3.2	2.0	63	5	3.2
200*	1,250	1,000	67	5.1	3.2	100	8	5
250	2,000	1,600	107	8.1	5.1	160	13	8
300	3,125	2,500	167	12.7	7.9	250	20	12.5
350	5,000	4,000	267	20.3	12.7	400	32	20
400	5,000	4,000	267	20.3	12.7	400	32	20
450	7,875	6,300	420	32	20	630	50	32
500	7,875	6,300	420	32	20	630	50	32
600	12,500	10,000	667	51	32	1000	80	50
700	20,000	16,000	1600	102	64	1600	160	100
750	20,000	16,000	1600	102	64	1600	160	100
30 in (760)	20,000	16,000	1600	102	64	1600	160	100
800	20,000	16,000	1600	102	64	1600	160	100
900	31,250	25,000	2500	160	100	2500	250	156
1000	31,250	25,000	2500	160	100	2500	250	156
42 in	31,250	25,000	2500	160	100	2500	250	156
1100	31,250	25,000	2500	160	100	2500	250	156
1200	50,000	40,000	4000	256	160	4000	400	250
1350	78,750	63,000	6300	403	252	6300	630	394
1400	78,750	63,000	6300	403	252	6300	630	394
1500	78,750	63,000	6300	403	252	6300	630	394
60 in (1500)	78,750	63,000	6300	403	252	6300	630	394
1600	78,750	63,000	6300	403	252	6300	630	394
1650	78,750	63,000	6300	403	252	6300	630	394
1800	125,000	100,000	10000	640	400	10000	1000	625
1950	125,000	100,000	10000	640	400	10000	1000	625
2000	125,000	100,000	10000	640	400	10000	1000	625
2200	200,000	160,000	16000	1024	640	16000	1600	1000
2400	200,000	160,000	16000	1024	640	16000	1600	1000

* OIML R49 Certificate of Conformance to Class 1 and Class 2, with OIML R49 and MID versions available.

Note. OIML R49–1 allow Class 1 only for meters with $Q_3 \geq 100$ m^3/h. Meters outside this range have been tested and conform to Class 1.

WaterMaster optimized full-bore meter (FEV) / full-bore meters (FEF, FEW) flow performance – gal/min

			Standard Calibration 0.4 % Class 2			High Accuracy Calibration 0.2 % Class 1		
NPS/NB (DN)	Q4	Q3	$Q_{0.4\%}$	Q2	Q1	$Q_{0.2\%}$	Q2	Q1
3/8 (10)	13.8	11	0.73	0.06	0.035	1.38	0.09	0.053
1/2 (15)	34.7	27.7	1.85	0.14	0.09	3.48	0.22	0.14
3/4 (20)	55	44	2.94	0.22	0.14	5.5	0.35	0.22
1 (25)	88	70.4	4.7	0.35	0.22	8.8	0.57	0.35
1 1/4 (32)	137.6	110	7.3	0.57	0.35	13.2	0.88	0.57
1 1/2 (40)	220	176	18.5	0.89	0.56	26.4	1.41	0.88
2 (50)	347	277	18.5	1.41	0.88	34.7	2.22	1.39
2 1/2 (65)	550	440	29.4	2.24	1.40	55.0	3.52	2.20
3 (80)	881	704	47.0	3.58	2.24	70.4	5.64	3.52
4 (100)	1,376	1,101	73.4	5.59	3.49	110	8.81	5.50
5 (125)	1,376	1,101	73.4	5.59	3.49	110	8.81	5.50
6 (150)	3,467	2,774	185	14.1	8.81	277	22.2	13.9
8 (200)	5,504	4,403	294	22.4	14.0	440	35.2	22.0
10 (250)	8,806	7,045	470	35.8	22.4	704	56.4	35.2
12 (300)	13,759	11,007	734	55.9	34.9	1,101	88.1	55.0
14 (350)	22,014	17,611	1,174	89.5	55.9	1,761	141	88.1
16 (400)	22,014	17,611	1,174	89.5	55.9	1,761	141	88.1
18 (450)	34,673	27,738	1,849	141	88.1	2,774	222	139
20 (500)	34,673	27,738	1,849	141	88.1	2,774	222	139
24 (600)	55,036	44,029	2,935	224	140	4,403	352	220
27/28* (700)	88,057	70,446	7,045	451	282	7,045	704	440
29 (750)	88,057	70,446	7,045	451	282	7,045	704	440
30 (760)	88,057	70,446	7,045	451	282	7,045	704	440
32 (800)	88,057	70,446	7,045	451	282	7,045	704	440
36 (900)	137,590	110,072	11,007	704	440	11,007	1,100	688
39/40* (1000)	137,590	110,072	11,007	704	440	11,007	1,100	688
42 (1050)	137,590	110,072	11,007	704	440	11,007	1,100	688
44 (1100)	137,590	110,072	11,007	704	440	11,007	1,100	688
48 (1200)	220,143	176,115	17,611	1,127	704	17,611	1,761	1,101
52 (1350)	346,726	277,381	27,738	1,775	1,110	27,738	2,773	1,733
54 (1400)	346,726	277,381	27,738	1,775	1,110	27,738	2,773	1,733
60 (1500)	346,726	277,381	27,738	1,775	1,110	27,738	2,773	1,733
66 (1600)	346,726	277,381	27,738	1,775	1,110	27,738	2,773	1,733
68 (1650)	346,726	277,381	27,738	1,775	1,110	27,738	2,773	1,733
77 (1800)	550,358	440,287	44,029	2,818	1,761	44,029	4,403	2,752
77 (1950)	550,358	440,287	44,029	2,818	1,761	44,029	4,403	2,752
78 (2000)	550,358	440,287	44,029	2,818	1,761	44,029	4,403	2,752
78 (2000)	550,358	440,287	44,029	2,818	1,761	44,029	4,403	2,752
84 (2200)	880,573	704,459	70,446	4,509	2,818	70,446	7,045	4,403
96 (2400)	880,573	704,459	70,446	4,509	2,818	70,446	7,045	4,403

*Size is dependent on flange specification

WaterMaster reduced-bore meter (FER) flow performance – m^3/h (gal/min)

				Class 2 specification				Class 1 specification			
Size		Q_4	Q_3	$Q_{0.4\ \%}$	Q_2	Q_1	R	$Q_{0.2\ \%}$	Q_2	Q_1	R
mm	in.	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)		m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	
40	1 1/2	31 (138)	25 (110)	0.83 (1.05)	0.063 (0.28)	0.04 (0.18)	630	1.7 (7.48)	0.1 (0.44)	0.063 (0.28)	400
50	2	50 (220)	40 (176)	1.0 (4.40)	0.1 (0.44)	0.063 (0.28)	630	2.0 (8.8)	0.16 (0.7)	0.1 (0.44)	400
65	2 1/2	79 (347)	63 (277)	1.6 (7.04)	0.16 (0.7)	0.1 (0.44)	630	3.2 (10.56)	0.25 (1.1)	0.16 (0.7)	400
80	3	125 (550)	100 (440)	2.0 (8.80)	0.25 (1.1)	0.16 (0.7)	630	4.0 (17.6)	0.4 (1.76)	0.25 (1.1)	400
100	4	200 (880)	160 (704)	3.2 (10.56)	0.41 (1.8)	0.25 (1.1)	630	6.4 (28)	0.64 (2.8)	0.4 (1.76)	400
125	5	200 (880)	160 (704)	3.2 (10.56)	0.41 (1.8)	0.25 (1.1)	630	6.4 (28)	0.64 (2.8)	0.4 (1.76)	400
150	6	500 (2200)	400 (1760)	8.0 (35.20)	1.0 (4.4)	0.63 (2.77)	630	16 (70.4)	1.6 (7)	1.0 (4.4)	400
200	8	788 (3470)	630 (2770)	13.0 (57.2)	1.6 (7.04)	1.0 (4.4)	630	25 (110)	2.5 (11)	1.6 (7)	400
250	10	1250 (5500)	1000 (4400)	20 (88)	2.5 (11.01)	1.6 (7)	630	40 (176)	4.0 (17.6)	2.5 (11)	400
300	12	2000 (8810)	1600 (7045)	32 (140.8)	4.1 (18.05)	2.5 (11)	630	64 (281.6)	6.4 (28)	4.0 (17.6)	200
350	14	2000 (8810)	1600 (7045)	32 (140.8)	6.4 (28.18)	4.0 (17.6)	400	64 (281.6)	12.8 (56)	8.0 (35.2)	200
375	15	2000 (8810)	1600 (7045)	32 (140.8)	6.4 (28.18)	4.0 (17.6)	400	64 (281.6)	12.8 (56)	8.0 (35.2)	200
400	16	3125 (13760)	2500 (11007)	50 (220)	10 (44)	6.3 (27.7)	400	100 (440)	20 (88)	12.5 (55)	200
450	18	3125 (13760)	2500 (11007)	50 (220)	10 (44)	6.3 (27.7)	400	100 (440)	20 (88)	12.5 (55)	200
500	20	5000 (22014)	4000 (17610)	80 (352)	16 (70.45)	10 (44)	400	160 (70.4)	32 (141)	20 (88)	200
600	24	7875 (34670)	6300 (27740)	126 (554.4)	25.2 (110.9)	15.8 (70)	400	252 (1108)	50.4 (222)	31.5 (138.7)	200

Specification – sensor

Functional specification

Pressure limitations

As per flange rating – non approved
PN16 for OIML R49, MID Approved

Pressure equipment directive 97/23/EC

This product is applicable in networks for the supply, distribution and discharge of water and associated equipment and is therefore exempt.

Temperature limitations

Ambient temperature
Remote transmitter –20 to 70 °C (–4 to 158 °F)
Integral transmitter –20 to 60 °C (–4 to 140 °F)

Process temperature See table below.
0.1 to 50 °C (32.2 to 122 °F) – OIML R49 T50 Approved

			Medium temperature °C (°F)	
Code	Lining	Flange material	Minimum	Maximum
FEF, FEW3	Hard rubber	Carbon steel	–10 (14)	90 (194)
		Stainless steel	–10 (14)	90 (194)
FEW1	PTFE	Carbon steel	–10 (14)	130 (266)
		Stainless steel	–25 (–13)	130 (266)
FEW3	PTFE	Carbon steel	–10 (14)	130 (266)
		Stainless steel	–10 (14)	130 (266)
FEW3	Elastomer	Carbon steel	–5 (23)	80 (176)
		Stainless steel	–5 (23)	80 (176)
FEF, FER	Elastomer	Carbon steel	–6 (21)	70 (158)
FEV	Polypropylene		–6 (21)	70 (158)

IP rating

IP68 (NEMA 6) to 7 m (20 ft.) depth
Note. Not sizes DN10 to DN32 ($^3/_8$ – $1^1/_4$ in. NB)

IP67 (NEMA 4X) – DN10 to DN32 ($^3/_8$ – $1^1/_4$ in. NB)

Buriable (sensor only)

FEV, FEF and FEW – DN450 to 2400 (18 to 96 in. NB) to 5 m (16 ft.) depth

Conductivity

>5µS cm^{-1}

Transmitter mounting

Integral (not FEF) or remote

Electrical connections

20 mm glands

$^1/_2$ in. NPT
20 mm armored glands

Sensor cable

ABB WaterMaster cable available in two forms – standard and armored
Maximum length 200 m (660 ft.)

Physical specification

Wetted parts

Electrode material

Stainless steel 316 L / 316 Ti

Super-austenitic steel

Hastelloy® C-22 and Hastelloy C4

(other electrode materials available on request)

Potential equalizing rings

Minimum of 1 recommended

Lining material / potable water approvals

			Potable Water Approvals					
Code	Size Range	Liner	WRAS	WRAS 60°C	ACS	DVGW	NSF	AZ/ NZS 4020
FEW1	DN10 – 32 ($^3/_8$ – $1^1/_4$ in. NB)	PTFE	4					
FEW3	DN10 – 600 ($^3/_8$ – 24 in. NB)	PTFE						
FEW3	DN40 – 2400 ($1^1/_2$ – 96 in. NB)	Elastomer	4					4
FEW3	DN40 – 2400 ($1^1/_2$ – 96 in. NB)	Hard rubber	4	4		4	NSF approved material	
FEV	DN40 – 200 ($1^1/_2$ – 8 in. NB)	Poly-propylene	4		4	4	NSF-61	4
FEF	DN250 – 600 (10 – 24 in. NB)	Elastomer	4		4	4	NSF-61	4
FEF	DN250 – 600 (10 – 24 in. NB)	Hard rubber	4	4		4	NSF approved material	
FER	DN40 – 600 ($1^1/_2$ – 24 in. NB)	Elastomer	4		4	4		4

*Size is dependent on flange specification

Lining protection plates

Not required

Installation conditions (recommended)

	Straight pipe requirements	
	Upstream	Downstream
FEW / FEF	5 x DN	2 x DN
FEV	5x DN	0 x DN
FER	0 x DN	0 x DN

Pressure loss

Negligible at Q3	All full bore meters
<0.25 bar (<3.62 psi) at Q3	FEV (DN40 to 200 [$1^1/_2$ to 8 in. NB])
<0.63 bar (<9.13 psi) at Q3	FER (DN40 to 600 [$1^1/_2$ to 24in. NB])

Non-wetted parts

Flange material

Carbon steel	DN20 to DN2400 (3/4 to 96 in. NB)
Stainless steel	DN10 to DN2400 (3/8 to 96 in. NB)
SG iron	FEV – DN40 to DN150 [1 1/2 to 6 in. NB) FER – DN40 to DN150 [1 1/2 to 6 in. NB)

Housing material

Carbon steel	FEV – DN40 to 200 (1 1/2 to 8 in. NB) FEW – DN450 to 2400 (18 to 96 in. NB)
Plastic	FEF – DN250 to 600 (10 to 24 in. NB)
Aluminium	FEW – DN10 to 400 (3/8 to 16 in. NB)

Terminal box material

Polycarbonate

Cable gland material

Plastic, brass

Paint specification

Paint coat ≥70 µm thick RAL 9002 (light grey)

Specification – transmitter

Functional specification

Power supply

Mains	85 to 265 V AC @ <7 VA
Low voltage	24 V AC +10 % /–30 % @ <7 VA
DC	24 V ±30 % @ <0.4 A

Supply voltage fluctuations within the specified range have no effect on accuracy

Digital Outputs (3)

Rating 30 V @ 220 mA, open collector, galvanically isolated *

Maximum output frequency 5250 Hz

1 off dedicated to Alarm / Logic, programmable function

2 off configurable to either Pulse / Frequency or Alarm/Logic function

Current output – HART FEX100 variant

4 to 20 mA or 4 to 12/20 mA, galvanically isolated *

Maximum loop resistance 750 Ω

HART protocol Version 5.7 (HART registered)

Signal levels compliant with NAMUR NE 43 (3.8 to 20.5 mA)

Low alarm 3.6 mA, High alarm 21.8 mA

Additional accuracy

±0.1 % of reading

Temperature coefficient: typically <±20 ppm/°C

RS485 Communications – PROFIBUS FEX100-DP variant

Registered name: FEX100-DP

RS485 (9.6kbps to 1.5Mbps), galvanically isolated

DPV0, DPV1

PA Profile 3.01

Standard idents: 9700, 9740, 9741

FEX100-DP specific ident: 3431

3 Concurrent MS2 master connections

RS485 Communications – MODBUS FEX100-MB variant

MODBUS RTU protocol

RS485 (9.6kbps to 115.2kbps), galvanically isolated

Electrical connections

20 mm glands 1/2 in. NPT, 20 mm armored glands

Temperature limitations

Ambient temperature	–20 to 60 °C (–4 to 140 °F)
Temperature coefficient	Typically <±10 ppm/°C @ Vel ≥0.5 mls

Environmental protection

Humidity: 0 to 100 %

Rating: IP67 (NEMA 4X) to 1m (3.3 ft.) depth

Tamper-proof security

Write access prevented by internal switch combined with external security seals for MID applications

Languages

English, French, German, Italian, Spanish, Polish

Infrared service port

USB adapter (accessory), USB 1.1. and 2.0 compatible

Driver software for Windows 2000, XP, 7 (32-bit) and Vista

Housing material

Powder-coated aluminium with glass window

Paint specification

Paint coat ≥70 µm thick RAL 9002 (light grey)

Transmitter vibration testing

Vibration level: 7 m/s^2

Frequency range: 20 to 150 Hz

No. of sweeps in 3 orthogonal planes: 20

Undetectable shift in transmitter span or zero performance

Hazardous approvals (HART variant only)

FM & FMc Class 1 Div 2

(FM listing NI / 1 / 2 / ABCD / T4, S / II, III / 2 / FG /T4,
Ta=60C; Type 4X, IP67 – for transmitter and integral mounting
Ta=70C, Type 6P, IP68 – for remote sensor type,
IP67 on DN10 to 32 [3/8 to 1 1/4 in.NB])

(FMc listing NI / 1 / 2 / ABCD / T4, DIP / II, III / 2 / FG /T4,
Ta=60C; Type 4X, IP67 – for transmitter and integral mounting
Ta=70C, Type 6P, IP68 – for remote sensor type, IP67 on
DN10 to 32 [3/8 to 1 1/4 in.NB])

FET, FEV, FEW and FEF DN700 to 2200 (27/28* to 84 in. NB) only

*Size is dependent on flange specification

ATEX* Zone 2, 21 & 22

II 3 G Ex nA IIC T5 Gc
II 2 D Ex tb IIIC T100°C Db
TA = –20°C to +60°C (integral transmitter)
TA = –20°C to +70°C (remote sensor)

IECEx* Zone 2, 21 & 22

Ex tb IIIC T100°C Db
Ex nA IIC T5 Gc
TA = –20°C to +60°C (integral transmitter)
TA = –20°C to +70°C (remote sensor)

*FEW, FEV, FET and FEF ≥700 (27/28 in. NB) only

Declaration of Conformance

Copies of CE certification will be available on request.

WaterMaster has OIML R49 Certificate of Conformity to accuracy class 1 and 2 (FEV DN40 to 200 [1 1/2 to 8 in.NB]). Copies of accuracy certification are available on request.

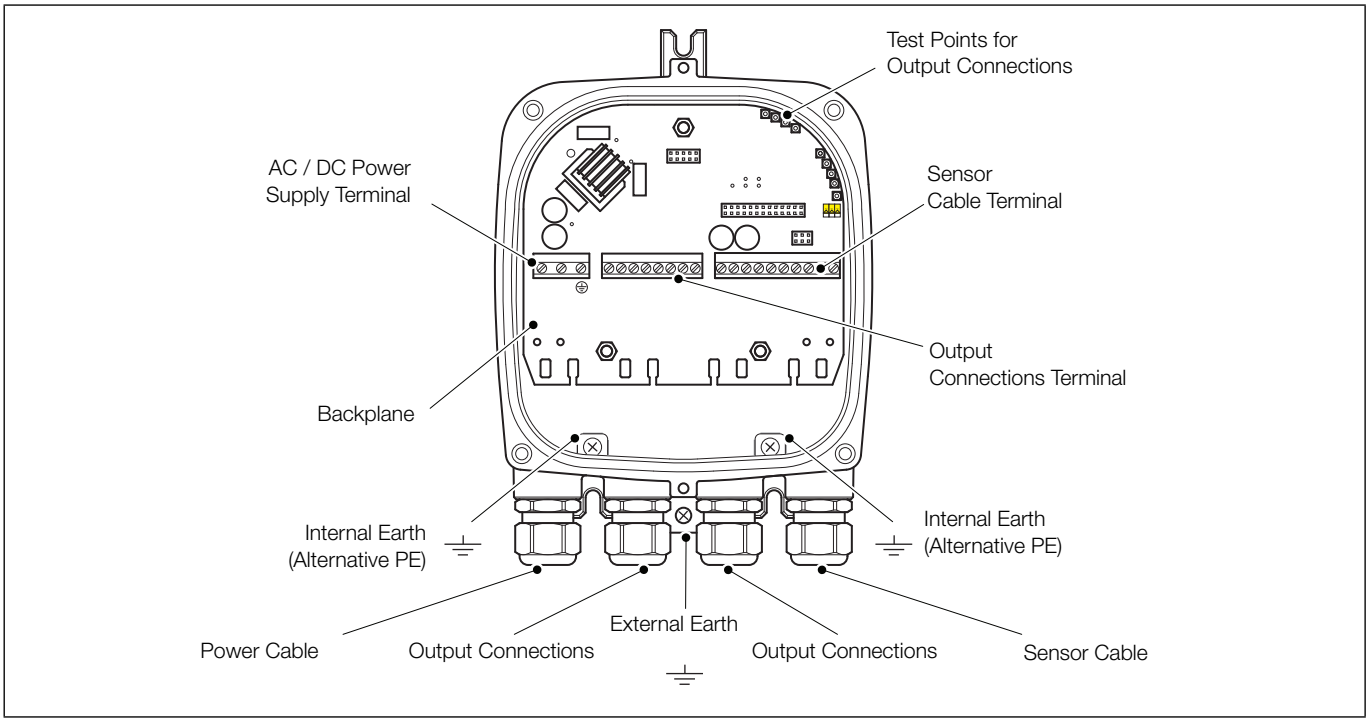
WaterMaster (FEV DN40 to 200 [1 1/2 to 8 in.NB]) has been type examined under directive MID 2004/22/EC, Annex MI-001. Copies of this certificate are available on request.

* When installed, do not leave galvanically isolated circuits (pulse and current) floating.

Transmitter connections

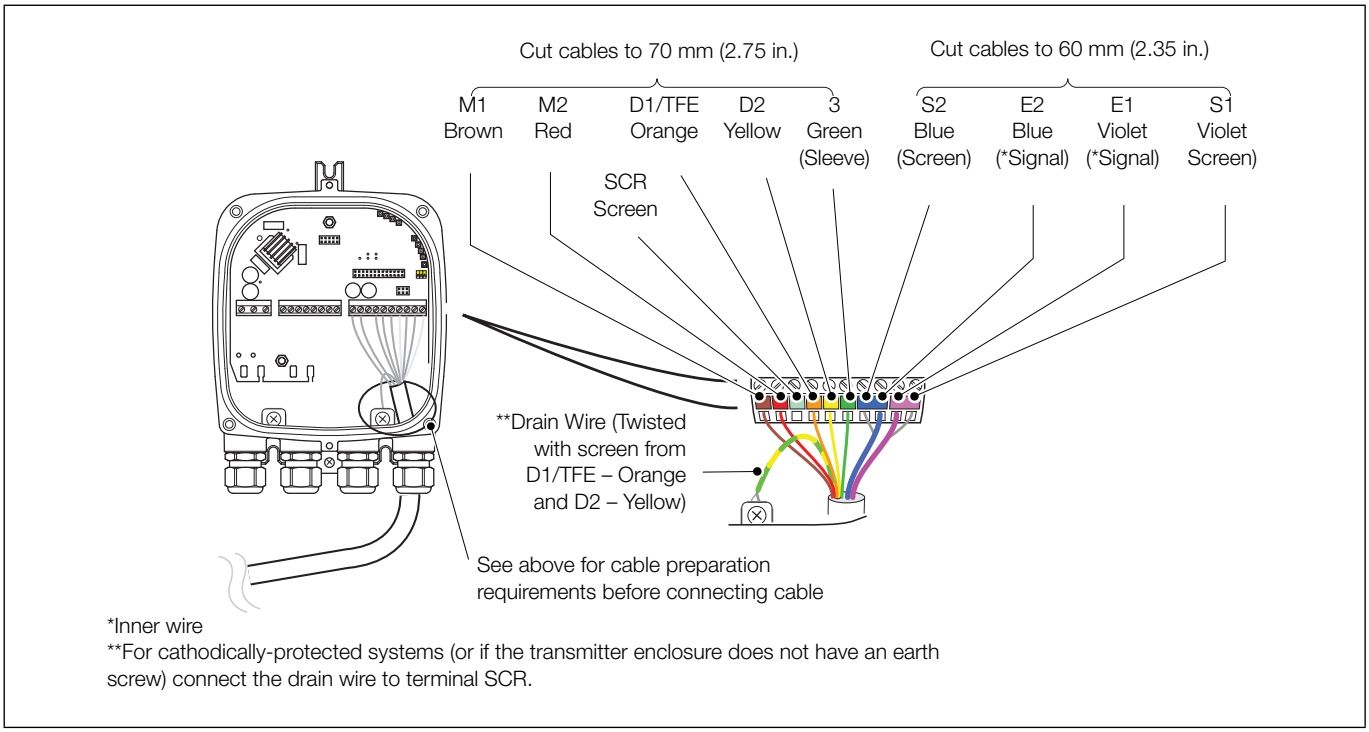
Transmitter terminal connections overview

This section is intended to give an overview of installation of a flowmeter. For Installation requirements, technical information and Health and safety precautions – refer to the User Guide OI/FET100–EN.



Cable gland / conduit entry (Remote transmitter shown)

Sensor cable terminal connections and recommended cable lengths

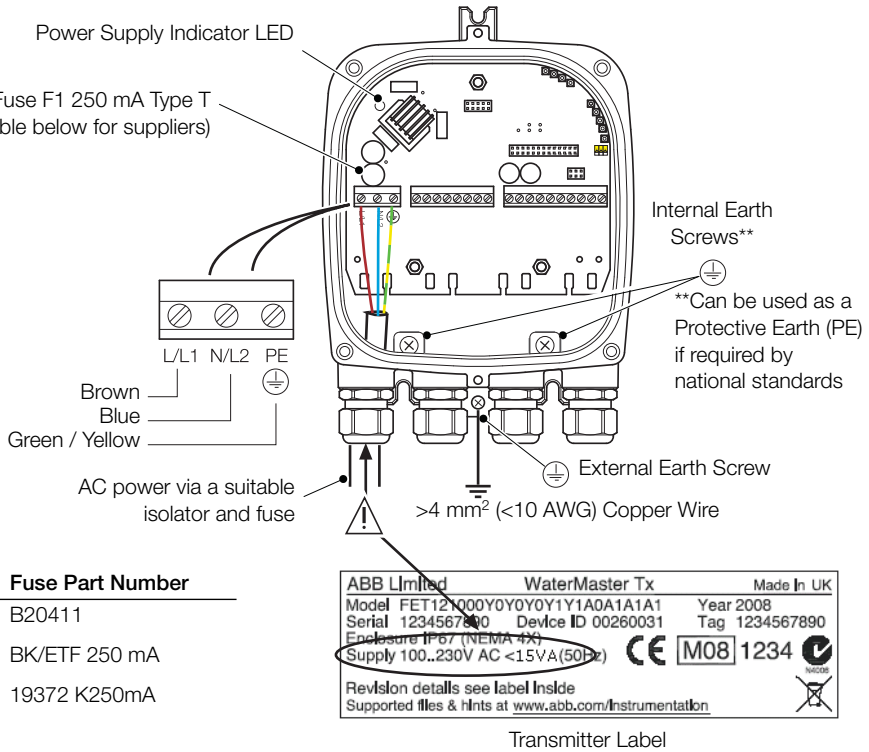


*Inner wire
**For cathodically-protected systems (or if the transmitter enclosure does not have an earth screw) connect the drain wire to terminal SCR.

Sensor cable connections at transmitter terminal block – remote transmitter

Power supply connections

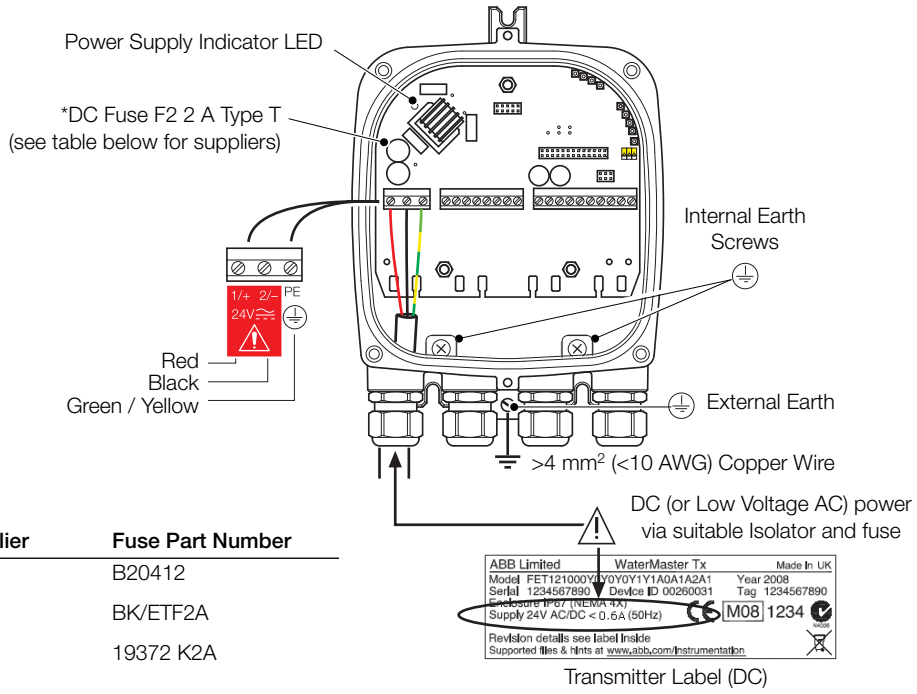
AC power supply



*Fuse Supplier	Fuse Part Number
ABB	B20411
Bussmann	BK/ETF 250 mA
Wickmann	19372 K250mA

AC power supply connections

DC (and low voltage AC) power supply



*Fuse Supplier	Fuse Part Number
ABB	B20412
Bussmann	BK/ETF2A
Wickmann	19372 K2A

DC (and low voltage AC) power supply connections

Configuration DIP switches

Three configuration DIP switches are mounted on the transmitter backplane board.

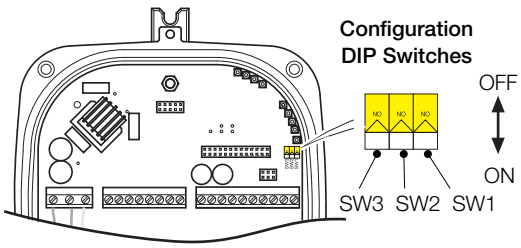
These are factory-set as follows:

- Remote transmitter – all OFF
- Integral transmitter – SW3 ON

For MID-compliant flowmeters the read-only / MID protection switch is set to 'ON' to ensure the meter is secure from tampering.

For HART software versions prior to 01.02.XX, this switch (set after commissioning) prevents login via the keypad or bus at any security level.

From HART software version 01.03.XX onwards and for all PROFIBUS software versions, on MID meters, all metrological-related parameters are locked and inaccessible at the Service level. Standard and Advanced user level parameters can still be modified via the HMI or bus.



DIP Switch Functions

SW1 – Read-only / MID Protection

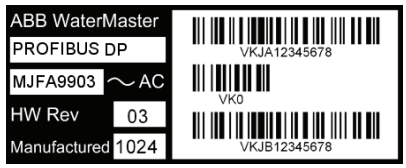
SW2 – (Future Product)

SW3 – Internal Sensor Memory

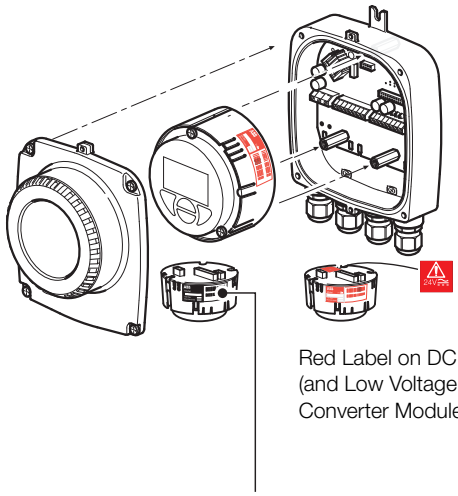
Configuration DIP switches

Transmitter module identification

Note. The communications bus type is HART FEX100 if not specified on the transmitter module label. An example of the PROFIBUS FEX100-DP variant transmitter module label is shown below.



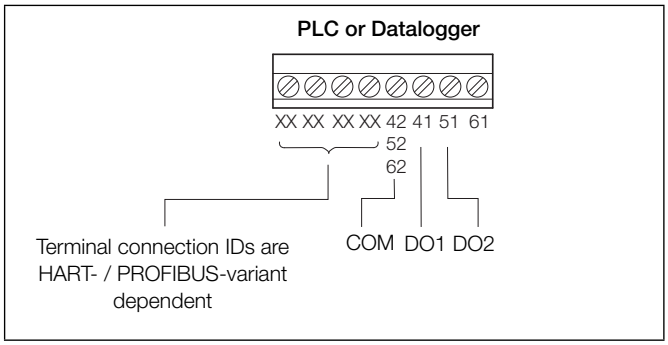
PROFIBUS FEX-100P Label



Transmitter module identification

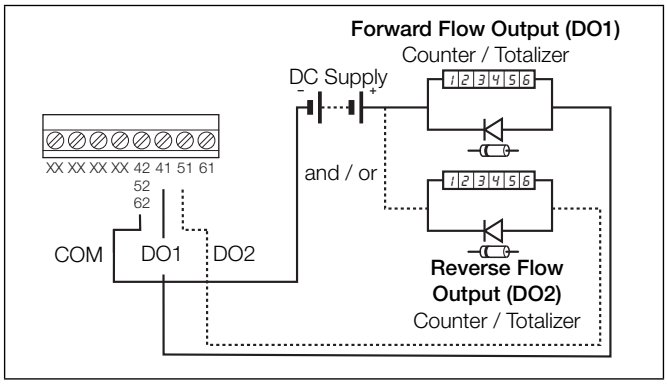
Output connections

Frequency outputs

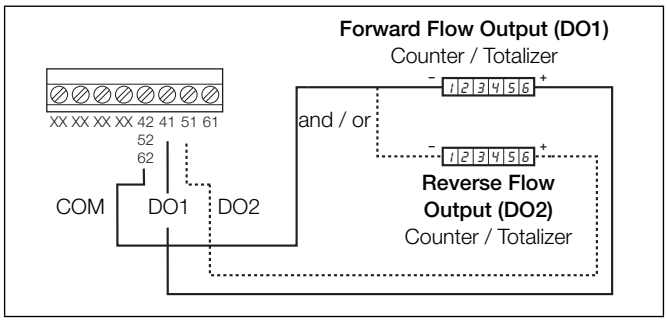


PLC / Datalogger connections

Note. Digital outputs DO1 and DO2 are polarity sensitive. The common (negative) connection for these outputs is designated 'COM'.

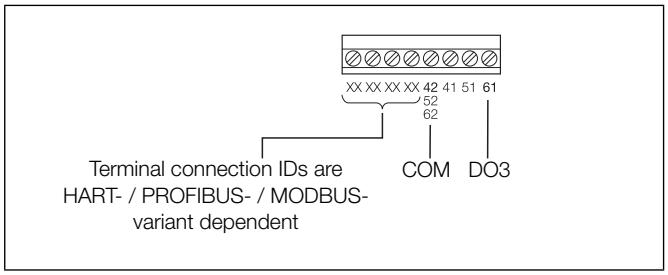


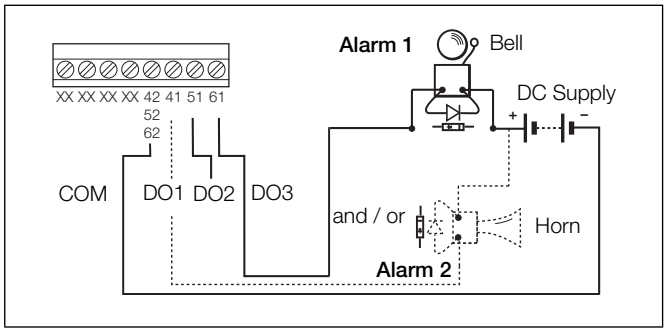
Electromechanical connections



Telemetry / Electronic counters connections

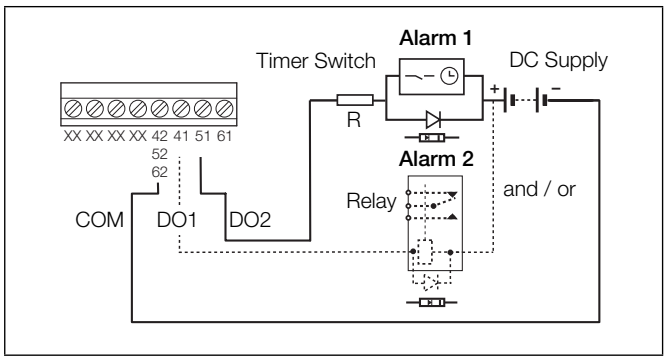
Alarm outputs





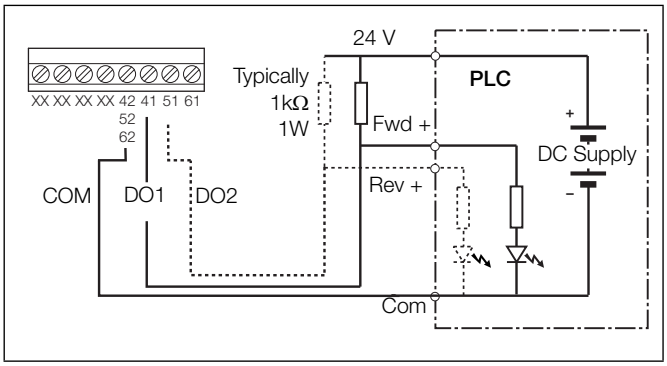
Note.

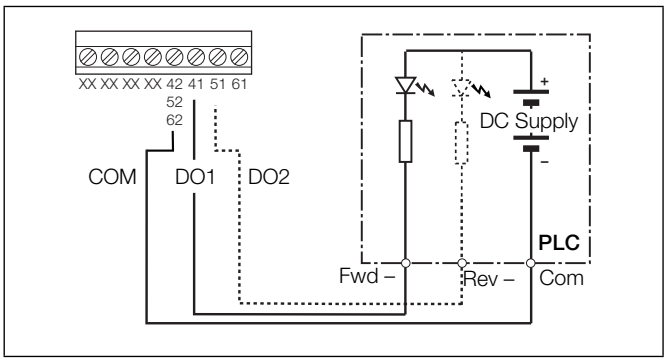
- Normal alarm / logic output is from DO3 (terminal 61). DO1 (41) and DO2 (51) can also be configured as alarms if required but are then NOT available as frequency / pulse outputs as shown in *Electromechanical connections* and *Telemetry / Electronic counters connections*, opposite.
- Bell and horn shown for example only. Any suitable alarm device may be used (for example, lamp, siren, buzzer etc.).



Note. Relay and timer switch shown for example only.

PLC interface

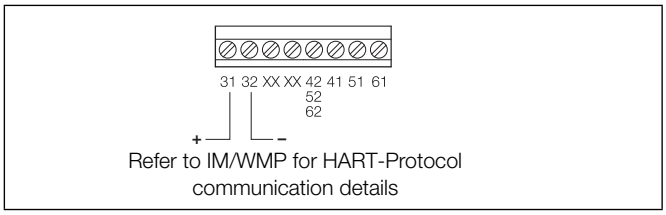




Note.

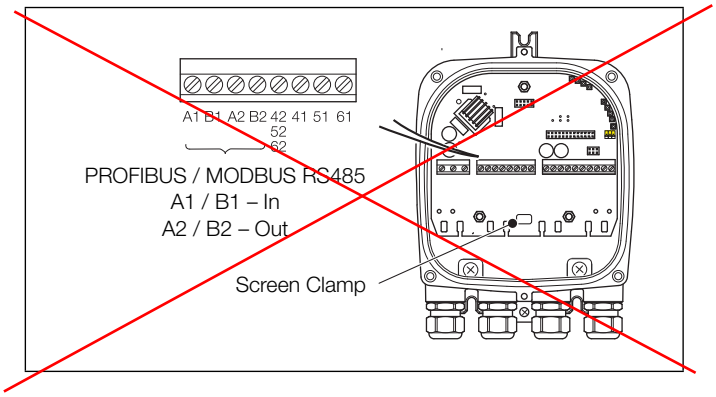
- WaterMaster digital outputs are NPN optocoupled transistors used as switches.
- Maximum allowed voltage at collector is 30 V DC
- Maximum allowed current across transistor is 220 mA.

Current output (4 to 20 ma) – HART (FEX100) variant



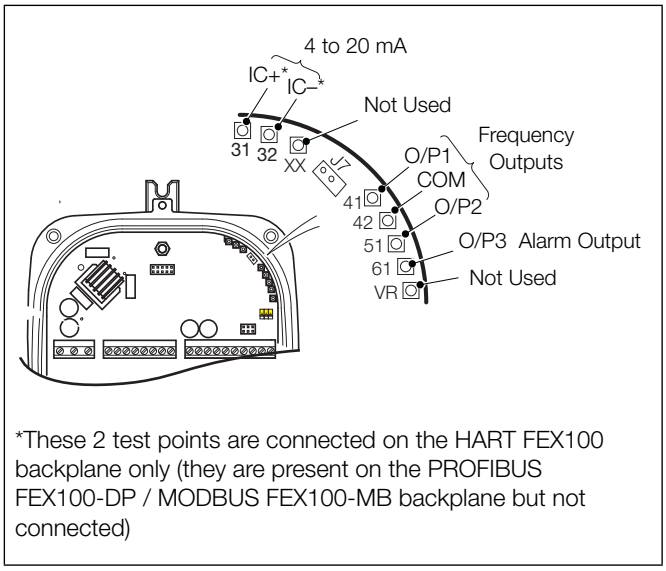
Current output (4 to 20 mA) – HART (FEX100) variant

RS485 communications – PROFIBUS (FEX100-DP) and MODBUS (FEX100-MB) variants



Test point access

Note. A typical DVM probe can access (fit) the PCB's test holes.



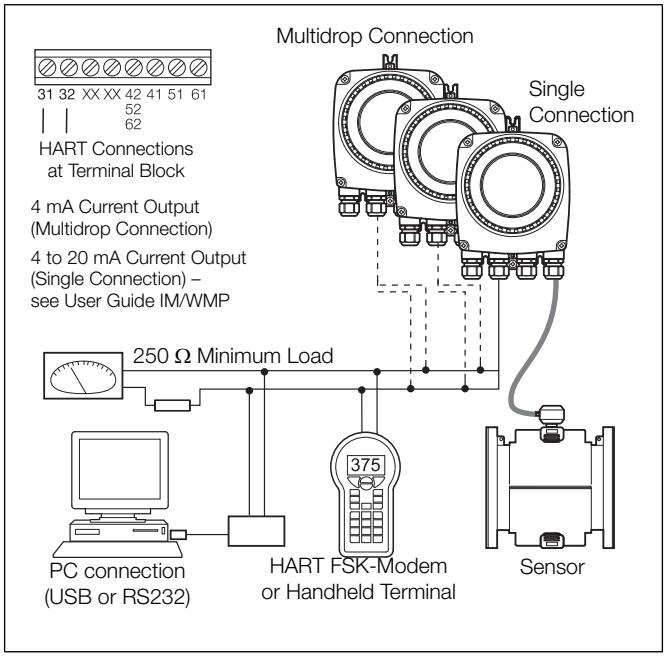
*These 2 test points are connected on the HART FEX100 backplane only (they are present on the PROFIBUS FEX100-DP / MODBUS FEX100-MB backplane but not connected)

Digital communication

The transmitter has the following options for digital communication.

HART protocol

The unit is registered with HART Communication Foundation.



HART protocol	
Configuration	Directly on the Device Software Asset Vision Basic (+ HART -DTM)
Transmission	Install a HART modem (FSK [Frequency Shift Keyed]-Modem) for HART-Communication when connecting to a PC. The HART-Modem converts the analog 4 to 20 mA signal into a digital output signal (Bell Standard 202) and connects to the PC using a USB (or RS232C) connector
Max. signal amplitude	1.2 mA
Current output load	Min. 250Ω, max. = 560Ω
Cable	AWG 24 twisted
Max. cable length	1500 m (4921 ft.)
Baud rate	1.200 baud

System integration

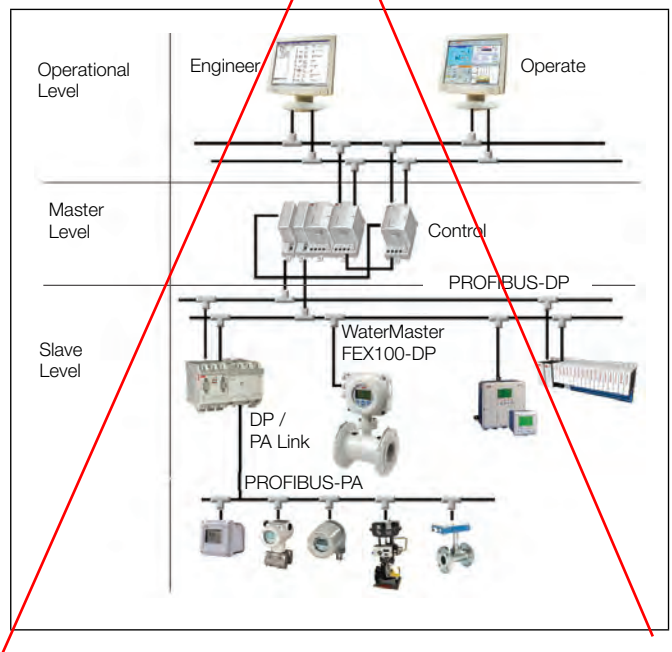
WaterMaster can be integrated into control systems and configuration devices using any Frame application, such as ABB AssetVision or similar third-party applications. ABB Device Type Managers (DTMs) for WaterMaster provide a unified structure for accessing device parameters, configuring and operating the devices and diagnosing problems. FDT (Field Device Tool) technology standardizes the communication and configuration interface between all field devices and host systems.

PROFIBUS DP protocol

PROFIBUS is a manufacturer-independent, open Fieldbus standard for a wide range of applications in manufacturing, process and building automation. Manufacturer independence and openness are ensured by the international standard EN 50170.

PROFIBUS DP ID no.	0x3431
Alternative standard ID no.	0x9701 or 0x9741
Configuration	Directly on the device Software Asset Vision Basic (+PROFIBUS DP-DTM)
Transmission signal	Accuracy to IEC 61158-2
Cable	Shielded, twisted cable (accurate to IEC 61158-2, types A or B)

All devices are connected in a bus structure ('line') as shown in below. Up to 32 stations (master or slaves) can be linked to create one 'segment', although it is recommended not to install more than 16 devices on a single segment. Each end of a segment must be terminated by an active bus terminating resistor. Both bus terminators must always be powered to ensure fault-free operation, therefore it is strongly recommended that they are connected to a back-up power supply. The use of bus amplifiers (repeaters) and segment couplers can be used to extend the network.



System integration

The GSD file for WaterMasters specifies the device-specific Ident No. 3431. It conforms to the PROFIBUS standard, providing a clear and comprehensive description of each instrument in a precisely defined format.

This enables the system configuration tool to use the information automatically when configuring a PROFIBUS bus system.

The ABB GSD file (Ident No. 3431) is divided into 2 sections:

- General specifications

  Identification of the device, together with hardware and software versions, baud rates supported and the possible time intervals for monitoring times.

- DP slave-related specifications

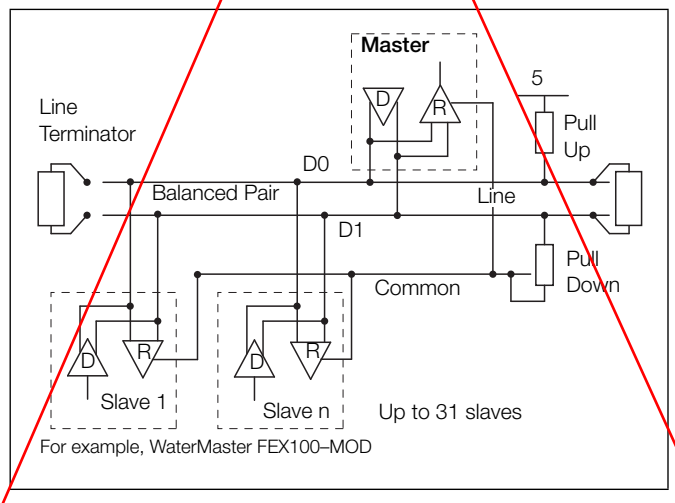
  Information about the user parameter block for device-specific configuration and modules containing details of the input and output data that can be exchanged cyclically with a PROFIBUS master.

The WaterMaster GSD file (ABB_3431.gsd) is available for download from the ABB website at: www.abb.com/fieldbus (follow the link for PROFIBUS DP field devices).

MODBUS protocol

MODBUS is an open standard that is owned and administered by an independent group of device manufacturers called the Modbus Organization (www.modbus.org).

Using the MODBUS protocol, devices from different manufacturers exchange information on the same communications bus without the need for special interface equipment. WaterMaster FEX100-MB follows the specification for Modbus Over Serial Line V1.02, using 2-wire TIA/EIA-485 (RS485) physical layer.



Cable Properties

The end-to-end length of the trunk cable must be limited. The maximum length depends on the Baud rate, the cable (gauge, capacitance or characteristic impedance), the number of loads on the daisy chain and the network configuration (2-wire or 4-wire).

For 9600 Baud rate and AWG26 (or wider) gauge, the maximum length is 1000 m (3280 ft.). Where 4-wire cabling is used as a 2-wire cabling system the maximum length must be divided by 2. The tap cables must be short, never more than 20 m (65.6 ft.). If a multi-port tap is used with n derivations, each one must have a maximum length of 40 m (131 ft.) divided by n.

The maximum serial data transmission line length for RS485 systems is 1200 m (3937 ft.). The lengths of cable that can be used are determined by the cable type, typically:

- Up to 6 m (19.7 ft.) – standard screened or twisted pair cable.
- Up to 300 m (984 ft.) – twin twisted pair with overall foil screen and an integral drain wire – for example, Belden 9502 or equivalent.
- Up to 1200 m (3937 ft.) – twin twisted pair with separate foil screens and integral drain wires – for example, Belden 9729 or equivalent.

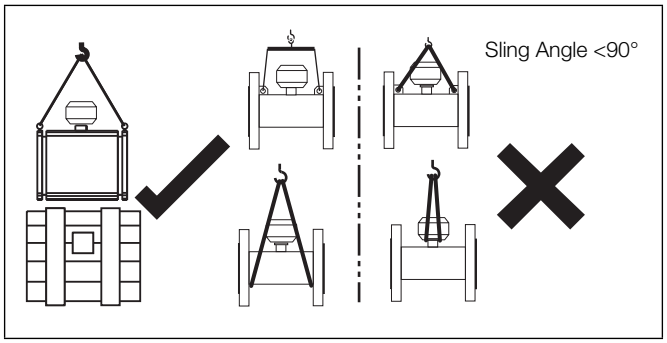
Category 5 cables may be used for RS485-MODBUS to a maximum length of 600 m (1968 ft.). For the balanced pairs used in an RS485-system, a characteristic impedance with value higher than 100Ω is preferred especially for 19200 and higher Baud rates.

Installation requirements

This section is intended to give an overview of installation of a flowmeter. For Installation requirements, technical information and Health and Safety precautions refer to User Guide OI/FEF/FEV/FEW–EN.

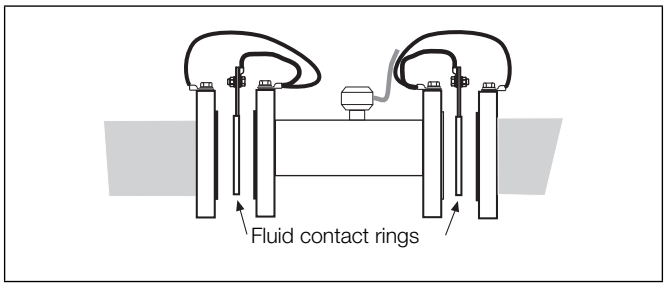
Unpacking the flowmeter

Care must be taken when lifting the flowmeter to use the lifting hooks provided or sling under the body of the meter. Never lift using the terminal connection box of the sensor cable as this will cause damage and invalidate warranty.



Grounding

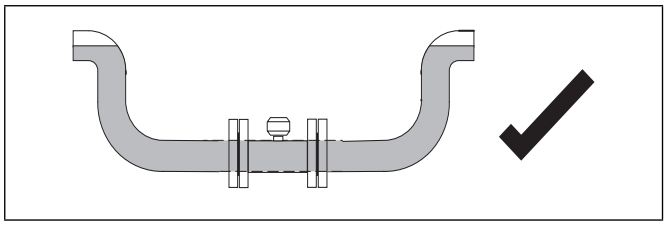
The flowmeter sensor must be cross-bonded to the upstream and downstream pipes and fluid. For technical reasons, this potential should be identical to the potential of the metering fluid. For plastic or insulated lined pipelines, the fluid is grounded by installing a minimum of 1 earthing rings. When there are stray potentials present in the pipeline, an earthing ring is recommended on both ends of the meter sensor.



Mounting

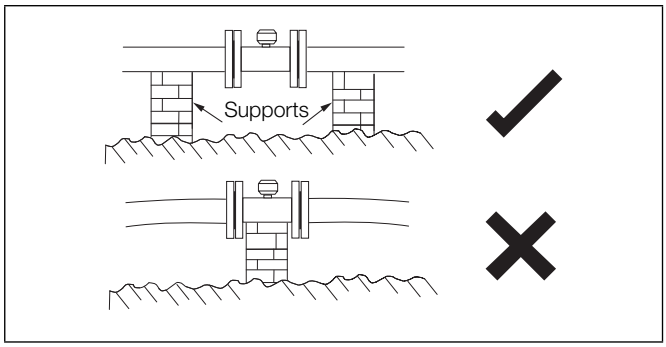
The installation conditions shown below must be observed to achieve the best operational results.

The sensor tube must always be completely full.

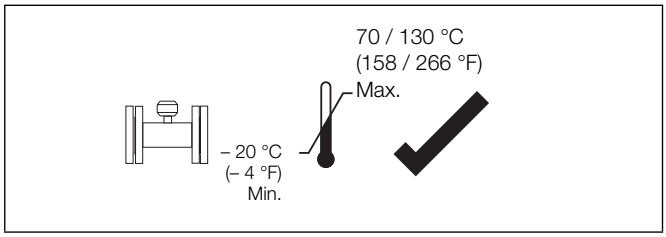


The flow direction must correspond to the identification plate. The device measures the flowrate in both directions. Forward flow is the factory setting.

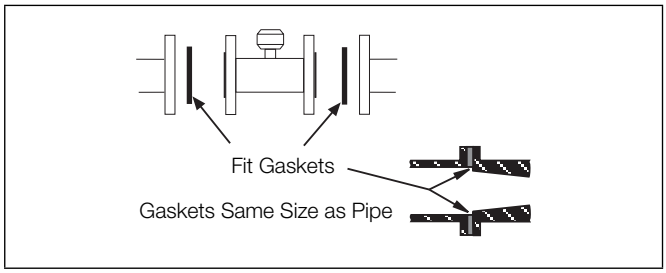
The devices must be installed without mechanical tension (torsion, bending). If required support the pipeline.



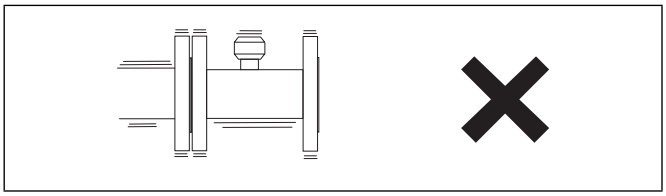
The flange seals must be made from a compatible material for the fluid and fluid temperatures if required.



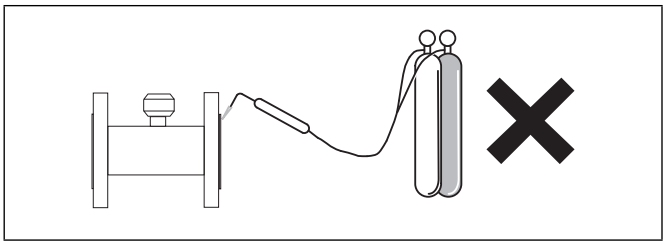
Seals must not extend into the flow area since possible turbulence could influence the device accuracy.



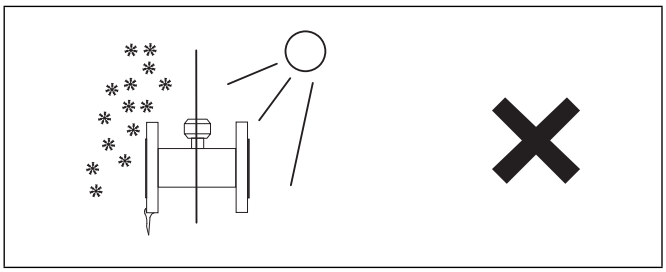
The pipeline may not exert any unallowable forces and torques on the device, such as vibration.



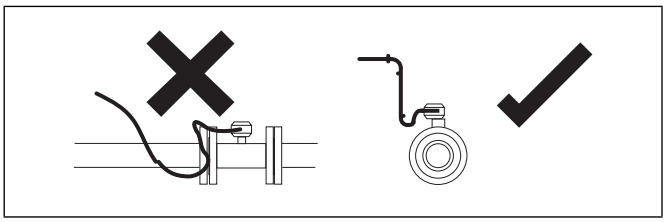
The flowmeter must not be submitted to any localized heat during installation; take care to remember this is a measuring instrument.



The flowmeter must not be exposed to direct sunlight or provide for appropriate sun protection where necessary.

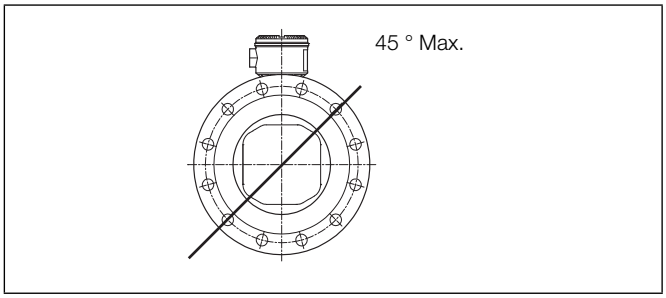


The cable to the flowmeter should be installed neatly or within a conduit, both loose or conduit should have a u shape below the terminal connection box height to allow any water run off to avoid any capillary action into the flowmeter sensor.



Electrode axis

Electrode axis should be horizontal if at all possible or no more than 45° from horizontal.



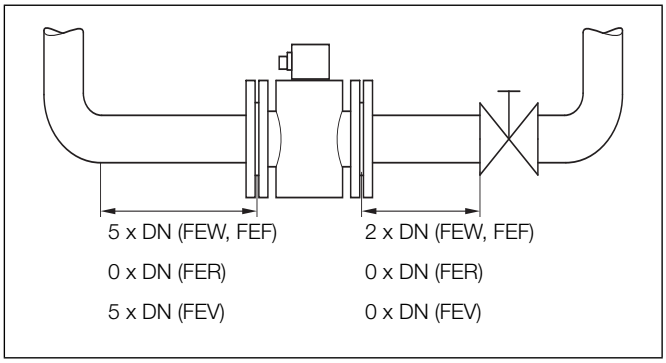
Upstream and Downstream pipe sections

The metering principle is tolerant of the flow profile.

- Wherever possible do not install fittings (for example, manifolds, valves) directly in front of the flowmeter sensor.
- Butterfly valves should be installed so that the valve plate does not extend into the flowmeter sensor.
- Valves or other turn-off components should be installed in the Downstream pipe section.

Experience has shown that, in most installations, straight upstream sections 3 x DN long and straight downstream sections 2 x DN long are normally sufficient. We would recommend conditions of 5 x DN straight upstream and 2 x DN straight downstream where possible.

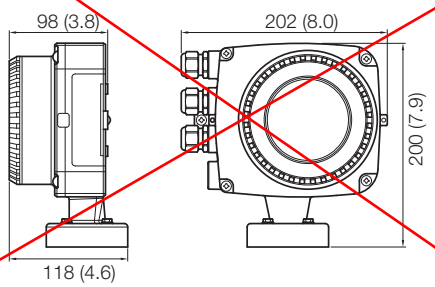
For reduced-bore meters (FER), these straight pipe sections are often not necessary.



Transmitter dimensions

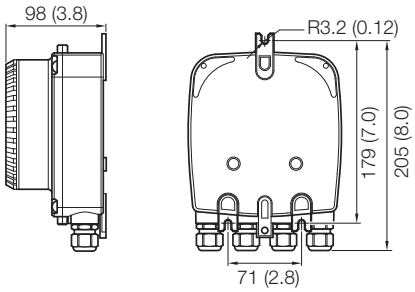
Integral transmitter

Dimensions in mm (in.)



Remote transmitter

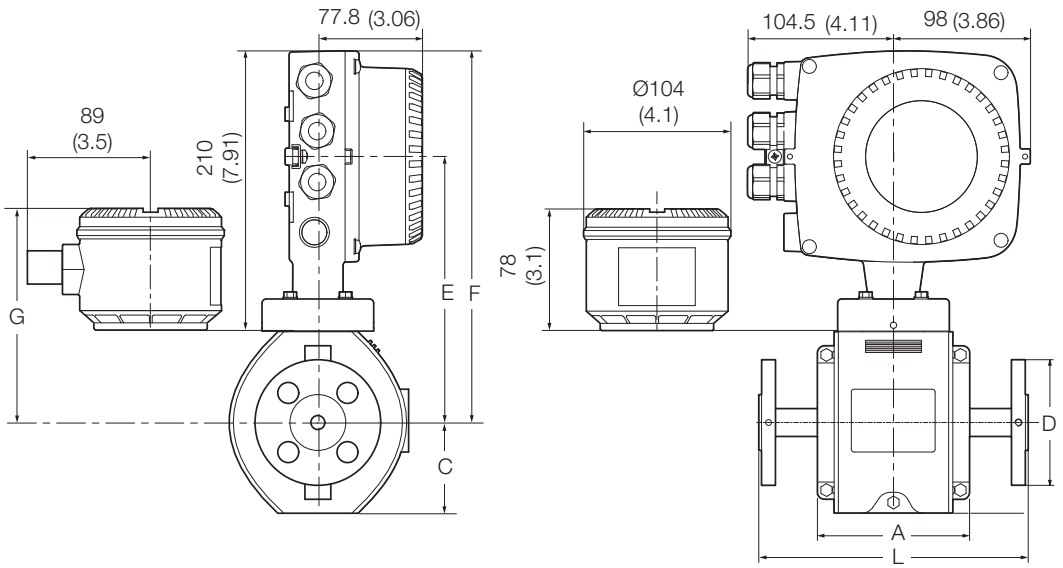
Dimensions in mm (in.)



Sensor dimensions

FEW – DN10 to 125 (3/8 to 5 in. NB)

Dimensions in mm (in.)



DN10 to 125 (3/8 to 5 in. NB) (FEW)

Electromagnetic flowmeter WaterMaster – FEW31, FEW32 and FEW38

Product coding field number	1 … 5	6	7 … 9	10	11	12	13	14, 15	16	17	18	19	20	21	22	23	24	25	26	27	Options
Flowmeter system – full bore, integral mount	FEW31																				
Flowmeter system – full bore, remote mount	FEW32	X	XXX	X	X	X	X	XX	X	X	X	X	X	X	X	X	X	X	X	X	
Full bore sensor only – for use with WaterMaster transmitter / remote	FEW38																				
Design																					
Non-hazardous areas		1																			
Hazardous areas		5																			
Bore diameter																					
DN10 (3/8 in.)			010																		
DN15 (1/2 in.)			015																		
DN20 (3/4 in.)			020																		
DN25 (1 in.)			025																		
DN32 (1 1/4 in.)			032																		
DN40 (1 1/2 in.)			040																		
DN50 (2 in.)			050																		
DN65 (2 1/2 in.)			065																		
DN80 (3 in.)			080																		
DN100 (4 in.)			100																		
DN125 (5 in.)			125																		
DN150 (6 in.)			150																		
DN200 (8 in.)			200																		
DN250 (10 in.)			250																		
DN300 (12 in.)			300																		
DN350 (14 in.)			350																		
DN400 (16 in.)			400																		
DN450 (18 in.)			450																		
DN500 (20 in.)			500																		
DN600 (24 in.)			600																		
DN700 (28 in.)			700																		
DN750 (29 in.)			750																		
DN760 (30 in.)			760																		
DN800 (32 in.)			800																		
DN900 (36 in.)			900																		
DN1000 (40 in.)			001																		
DN1050 (42 in.)			051																		
DN1100 (44 in.)			101																		
DN1200 (48 in.)			201																		
DN1350 (54 in.)			351																		
DN1400 (56 in.)			401																		
DN1500 (60 in.)			501																		
DN1600 (64 in.)			601																		
DN1650 (66 in.)			651																		
DN1800 (72 in.)			801																		
DN1950 (78 in.)			951																		
DN2000 (80 in.)			002																		
DN2100 (84 in.)			102																		
DN2200 (88 in.)			202																		
DN2400 (96 in.)			402																		
Others			999																		
Liner material																					
PTFE – DN10 to 600 (3/8 to 24 in. NB)				A																	
Hard rubber – DN40 to 2400 (1 1/2 to 96 in. NB)				H																	
Elastomer – DN40 to 2400 (1 1/2 to 96 in. NB)				K																	
Electrode design																					
Standard					1																
Other					9																
Measuring electrodes material																					
Hastelloy® C-4 (2.4610)						D															
Stainless steel 316Ti/316L						S															
Hastelloy C-22						C															
Grounding accessories																					
Not required							0														
Standard							1														
One potential equalizing ring (stainless steel)							3														
Two potential equalizing rings (stainless steel)							4														

Continued on next page…

Product coding field number	1 … 5	6	7 … 9	10	11	12	13	14, 15	16	17	18	19	20	21	22	23	24	25	26	27	Options
Flowmeter system – full bore, integral mount	FEW31																				
Flowmeter system – full bore, remote mount	FEW32	x	xxx	x	x	x	x	xx	x	x	x	x	x	x	x	x	x	x	x	x	
Full bore sensor only – for use with WaterMaster transmitter / remote	FEW38																				
Process connection type (refer to pages 21 to 26)																					
Flanges ASME B16.47 series B / B16.5 Class 150								A1													
Flanges ASME B16.47 series B / B16.5 Class 300								A3													
Flanges ASME B16.47 series A Class 150								B1													
Flanges ASME B16.47 series A Class 300								B3													
Flanges AWWA C207 Class B								C1													
Flanges AWWA C207 Class D								C2													
Flanges AWWA C207 Class E								C3													
Flanges AWWA C207 Class F								C4													
Flanges JIS 10K								J1													
Flanges JIS 5K								J2													
Flanges AS 4087 PN 16								E1													
Flanges AS 2129 Table E								E4													
Flanges AS 2129 Table D								E5													
Flanges AS 4087 PN 35								E8													
ISO 7005, DIN, EN 1092-1 PN6								S0													
ISO 7005, DIN, EN 1092-1 PN10								S1													
ISO 7005, DIN, EN 1092-1 PN16								S2													
ISO 7005, DIN, EN 1092-1 PN25								S3													
ISO 7005, DIN, EN 1092-1 PN40								S4													
Process connection material																					
Carbon steel flanges									B												
Stainless steel flange									D												
Usage certifications																					
Standard (without PED)										1											
Calibration type																					
Class 2 calibration – standard accuracy 0.4 %											A										
Class 1 calibration – high accuracy 0.2 %											B										
Temperature range installation / ambient temperature range																					
Standard design/ –20 … 60 °C (–4 … 140 °F)												1									
Nameplate																					
Adhesive													A								
Signal cable length and type																					
Without signal cable														0							
5 m (15 ft.) cable														1							
10 m (30 ft.) cable														2							
20 m (60 ft.) cable														3							
30 m (100 ft.) cable														4							
50 m (165 ft.) cable														5							
80 m (260 ft.) cable														6							
100 m (325 ft.) cable														7							
150 m (490 ft.) cable														8							
Special length or cable type														9							
Explosion protection certification*																					
General purpose (non-Ex design)															A						
FM Class 1 Div. 2															G						
usFMc Class 1 Div. 2															P						
ATEX / IECEx Zone 2, 21 & 22															M						

Continued on next page…

Product coding field number	1 … 5	6	7 … 9	10	11	12	13	14, 15	16	17	18	19	20	21	22	23	24	25	26	27	Options
Flowmeter system – full bore, integral mount	**FEW31**	X	XXX	X	X	X	X	XX	X	X	X	X	X	X	X	X	X	X	X	X	
Flowmeter system – full bore, remote mount	**FEW32**																				
Full bore sensor only – for use with WaterMaster transmitter / remote	**FEW38**																				

Protection class transmitter / protection class sensor

IP67 (NEMA 4X) / IP67 (NEMA 4X) – cable not fitted and not potted to sensor	1
IP 67 (NEMA 4x) / IP68 (NEMA 6P) – cable not fitted and not potted to sensor	2
IP 67 (NEMA 4x) / IP68 (NEMA 6P) – cable fitted and potted to sensor	3

Cable conduits **

M20 x 1.5 (plastic)	A
NPT ½ in. (blanked when cable not fitted)	B
M20 SWA (armored)	D
M20 SWA sensor, M20 x 1.5 (plastic) power / output	F
Without	Y

Power supply

Without	0
108.. 230 V AC, 50 Hz	1
24 V AC or 24 V DC, 50 Hz	2
100 ... 230 V AC, 60 Hz	3
24 V AC or 24 V DC, 60 Hz	4

Input and output signal type

HART + 20 mA + pulse + contact output	A
PROFIBUS DP RS485 physical layer + pulse + contact output (general-purpose design only)	G
MODBUS RTU RS485 physical layer + pulse + contact output (general-purpose design only)	M
Without	Y

Configuration type / diagnostics type

Not required	0
Factory default / Standard	1

Options***

Accessories

Configuration lead	AC

Documentation language

German	M1	Chinese	M6
Italian	M2	Swedish	M7
Spanish	M3	Finnish	M8
French	M4	Portuguese	MA
English	M5 (default)	Danish	MF
		Norwegian	MN

Lay length

ISO length – DN10 to 600 (3/8 to 24 in.) and 1.25D DN1800 to 2400 (72 to 96 in.)	JB
1.3D DN700 to 2400 (28 to 96 in.) – see dimensional pages 25, 26, 27	JK
1.0D DN700 to 1600 (28 to 64 in.) – see dimensional pages 25, 26, 27	JH

Verification type

Without fingerprint	V0
VeriMaster	V3

Potable water approval

WRAS cold water approval	CWA
DVGW	CWD
WRAS 60 °C (140 °F) water approval	CWK
NSF material approval	CWM
Without	CWY

Power supply frequency (sensor FEW38 only)

50 Hz	F5
60 Hz	F6

* FM approval in process. FEF product still available with full FM approval

** The type of signal cable supplied (standard or armored) depends on the type of cable conduit (variant digit number 24) ordered. For FM or FMC Approved versions, NPT only permitted.

*** Add codes for options.

Common accessories

Accessory	Item Number
WaterMaster AC Fuse F1 Type T 250 mA A/S TR5	B20411
WaterMaster DC Fuse F2 Type T 2 A A/S TR5	B20412
WaterMaster Infra Red Comms Pack	MJBX9932
WaterMaster Backplane PCB Board (STD)	WATX2505
WaterMaster Sensor PCB Board	WATX2506
WaterMaster Comms Cable	WEBC2500
Signal cable for remote WaterMaster transmitter 5 m (15 ft.) 10 m (30 ft.) 20 m (60 ft.) 30 m (100 ft.) 50 m (165 ft.) 80 m (260 ft.) 100 m (325 ft.) 150 m (490 ft.) 500 m (1650 ft.)	 STT4500/05 STT4500/10 STT4500/20 STT4500/30 STT4500/50 STT4500/80 STT4500/100 STT4500/150 STT4500/500
Armored signal cable for remote WaterMaster transmitter 5 m (15 ft.) 10 m (30 ft.) 20 m (60 ft.) 30 m (100 ft.) 50 m (165 ft.) 80 m (260 ft.) 100 m (325 ft.) 150 m (490 ft.) 500 m (1650 ft.)	 STT4501/05 STT4501/10 STT4501/20 STT4501/30 STT4501/50 STT4501/80 STT4501/100 STT4501/150 STT4501/500

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Burns & McDonnell Project 95307

CITY OF CHATTANOOGA, TENNESSEE

The following responses are provided to bidder requests for information:

1) Specification Section 00 11 16 – Advertisement for Bid

   Question: Currently we have two jobs bidding on June 29, 2017 and one other bidding the day before. In an effort to provide a competitive bid we request the bid due date be extended.

   Response: No Change.

   Question: This section states that the time allotted for construction is 365 days. Section 00 52 00-4.02 states the Work will be substantially completed within 330 days and project final completion is 365 days. Section 01 35 00-1.06.C states that the duration of an Administration Period for this project is 60 consecutive days after which time the Construction Period shall automatically begin. Please confirm the administration period happens outside the 365-day construction period. Otherwise, please consider adding 60 days to the overall project time.

   Response: Construction Duration as indicated in Section 00 11 16 is equal to Contract Time as indicated in Section 00 52 00. Construction Duration begins upon receipt of Notice to Proceed, and includes Administration Period and Construction Period as defined by Section 01 35 00. Construction Duration has been changed from 365 calendar days to 425 calendar days. Refer to Addendum 5 Items 1 and 3.

2) Specification Section 01 35 00 – Unique Requirements

   Question: Specification 01 35 00-1.06.B.5 refers to software delivery and training required by specification 01 31 29. Specification 01 31 29 is not included in the contract documents. Please advise.

   Response: Per Addendum 2 Item 2, Section 01 35 00 Paragraph 1.06.B.5 has been deleted.

   Question: Reference drawing C107 and spec sections 01 35 00-1.05.A.1/8/9 regarding the sequencing of pumped flows from the existing Citico PS through the existing 48" & 30" force mains across the Tennessee River. There appears to be no valving on the existing PS header or in the yard to divert/force all pumped flows to the existing 30" force main to enable the installation of the new 48" plug valve on the existing 48" force main. Further, it appears

that, in order to divert/force pumped flow only to the existing 30" force main, only 1 pump is currently valved/plumbed to do so. The referenced specs state in one place (1.05.A.7) that "During connection of EBPS piping to existing 48" force main, isolate and divert Citico Pump Station flow to 30" force main only and tie in to 48" force main while flow is diverted" and, in another place (1.05.A.8), that "During connection of EBPS piping to existing 30" force main, isolate and divert Citico Pump Station flow to 48" force main only and tie in to 30" force main." This implies that flows can be "simply" isolated and diverted – but it does not appear that the existing PS is plumbed to do so. Should there not be some discussion or guidance from the Engineer and/or Owner on how/when flows can be temporarily "isolated and diverted" – in particular, diverting all flows to the 30" force main to allow the 48" plug valve to be installed. Please advise.

Response: Prior to the commencement of construction for this contract (W-16-013-201), the City of Chattanooga will complete the installation of isolations valve(s) and piping in order to accommodate individual force main isolation as indicated in the above section. Improvements to the existing header to accommodate this work shall be treated as existing conditions, however record drawings do not reflect this work.

3) Specification Section 01 51 43 – Temporary Bypass Pumping

Question: Can the engineer provide a variation of flow between the 48-inch and 72-inch gravity line that enters Junction Box 3? This may be important depending on how we isolate the flow in the two gravity lines. It will be important to know how the 45 MGD flow is distributed between the two lines.

Response: A breakdown of the flow coming from the Downtown Interceptor distinct from the Lower Amnicola Interceptor has been provided in Section 01 53 43. Refer to Addendum 5 Item 8.

Question: If needed can we use the Diversion Chamber at TN American Water and area around it to stage pumps and perform work?

Response: Use of the existing junction box (refer to STA 4+23.70, Contract No. 37D1 Interceptor Sewer System Lower Amnicola Parallel Interceptor 1) will be allowed provided coordination is undertaken with Tennessee American Water to notify them of temporary closure of the adjacent boat ramp. Refer to Section 01 53 43, Refer to Addendum 5 Item 8.

Question: Due to the size of this bypass, the pumps will need to be installed on the River Walk and be in a highly public area. Will the City require a Sound Attenuated Pumps?

Response: Pumping equipment must be sound attenuated, refer to Section 01 53 43, Addendum 5 Item 8.

Question: 1.05 Sequencing Constraints Section 9 States the following: "Pre-screen and bypass pump wastewater from manhole on 72" interceptor upstream of EBPS and pump

directly to 48" forcemain via new access point. Demolish 72" interceptor within EBPS and install 72" slide gate." How important is the "Pre-screen" of the bypassed Sewer? With the limited space to place pump suction tubes, screening will be near impossible without building temporary structures.

Response: Pre-screening will not be required. Maximum solids-passing capability of bypass pumps is limited to 3 inches, refer to Section 01 53 43. Refer to Addendum 5 Item 8.

4) Specification Section 07 16 00 – Bituminous Dampproofing

Question: Please confirm whether the exterior and/or interior immersed concrete for the new pump station structure requires dampproofing per this Section. This section implies that all the concrete (immersed and below grade exterior) should be dampproofed, but does not confirm. Paragraph 1.01.A refers to this application of all aluminum in contact with concrete via Drawing Sheet M503.

Response: The exterior and/or interior immersed concrete for the new pump station structure does not require dampproofing. The concrete (immersed and below grade exterior) does not require dampproofing. Dampproofing shall be furnished where the aluminum mechanical equipment comes in contact with the concrete as indicated in the Drawings.

5) Specification Section 08 31 00 – Floor Hatches and Frames

Question: EBPS Hatch 5 is scheduled to have a clear opening of 15'x4', a single framed unit cannot be provided of this size with a one-piece fall protection grating. Can 3 individual doors be provided at this location? Please advise.

Response: Contractor shall provide rigid safety grating subject to the requirements of Section 08 31 00 with a minimum of two separate leaves within Hatch No. 5. Due to the dimensions of the basis-of-design grinders, three individual hatch frames cannot be installed without inhibiting access to hoist the grinders through the hatch. The design intent is to provide a solution whereby the hatch leaves can be opened by a single user. A 15-foot-long single leaf would require two users present to open the hatch, as the hatch release mechanisms are too far apart to be simultaneously engaged by a single user.

6) Specification Section 09 90 00 – Protective Coatings

Question: Paragraph 2.04.B.2 references painting galvanized steel doors and frames. The only new door on the project is FRP. Is this door and frame required to be painted? If so, please provide the coating system or confirm B4 should be used.

Response: There are no steel doors and frames that are required to be painted. Refer to Addendum 5 Item 10.

7) Specification Section 23 42 00 – Air Phase Filtration

Question: We do not see a specification for the Odor Control system, please provide.

Response: Refer to Section 23 42 00 – Air Phase Filtration.

8) Drawing Sheet G003 – General Notes

Question: Per general note 30 on Sheet G003, all salvageable material shall remain the property of the City of Chattanooga and must be delivered to owner at a to-be-determined location. Can the City provide a maximum number of miles to which salvageable material will be delivered? Or is demolition waste property of Contractor per Section 02 41 19 Paragraph 1.06.A?

Response: Contractor shall be responsible for delivering salvageable material within ten (10) miles. Refer to Drawings for items indicated for salvage. Demolition waste shall become the property of the Contractor subject to the specifications.

9) Drawing Sheet C101 – Overall Site Plan

Question: Regarding Keyed Note 3, how often is the dumpster removed/emptied for screenings removal?

Response: Averages once per month.

10) Sheet C107 – Utility Plan

Question: Per response to bidder RFI in Addendum No. 3, the response for RFI #10 included a photo dated 3/20/91 showing the installation of the 72" RCP. In the photo, the 72" RCP sitting on a cast in place concrete cradle. I have not found this detailed in the reference drawings provided. Based on the current design the cradle will need to be demolished. Can dimensions for this cradle be provided? Please advise.

Response: Construction details of the concrete cradle are not available, and information other than what is seen in the reference photograph is not available.

11) Drawing Sheet S301 – Structural Sections 1

Question: Section A shows the submersible pumps being installed on non-shrink grout. It also shows the floor being sloped toward the pumps with non-shrink grout. Considering that non-shrink grout comes in 1/3 cubic foot bags and requires hand mixing, this process does not appear to be the most efficient and cost effective way to slope the flor and mount/anchor submersible pumps. Can standard ready-mix grout be used in place of the non-shrink grout in these two applications?

Response: Contractor shall provide fill concrete subject to requirements in Section 03 30 00 and Drawing Sheets S101, S301, and S303. Refer to Addendum 5 Items 9 and 16-18.

12) Project Manual Appendices

Question: Please provide the as built drawings for the existing Citico Pump Station structure. This is necessary because we are building the new pump station adjacent to the existing, we are tying temporary shoring to the existing structure, and improvements are being made to the existing pump station.

Response: Record Drawings for the Citico Pump Station have been included for reference in the Appendices to the Project Manual. These drawings are provided in PDF format on the flash drive containing the bid documents which can be purchased from the City.

END OF QUESTION AND RESPONSE NO. 3