

BID ADDENDUM #5

October 18, 2023

To:
Prospective Bidders/Planholders

**Groundwater Recharge Station Project
California State University Stanislaus
One University Circle, Turlock, CA 95382**

Bid / Project Number..... 21-381
Bid Proposal Opening Date (2nd Revision) October 26, 2023
Bid Proposal Opening Time.....2:00 p.m.

This Addendum forms a part of the contract documents and modifies the original bidding documents. Addendum shall be noted as received and acknowledged on the Bid Proposal Form when submitted as outlined in the Bid Package referenced above.

Any corrections, additions, deletions, and/or modifications to the above package, by this reference, shall be incorporated therein along with clarification provided within the Questions and Answers herein. Also included in this Addendum are the following exhibits:

Exhibit A – Revised Section 01 10 00 Summary of Work
Exhibit B – Revised Section 27 15 23 Fiber Optic Cabling and Devices
Exhibit C – Revised Section 32 31 00 Chain-Link Fences and Gates
Exhibit D – Flow Meter FT-3200 Submittal and Data Sheet

QUESTIONS AND ANSWERS:

The following four (4) questions concern the Tree Protection Detail on Sheet C1.1.

- 1) **Is there any specification for the mulch to be used - or is any clean organic material acceptable?**

Please use Bark Mulch per Sheet L2.0.

- 2) **Where the mulch is to be placed, does the existing lawn need to be stripped?**

Bark Mulch is to be placed around the tree within the disturbed area. Bark shall not be placed over the existing lawn. Non-disturbed lawn within the tree protection area shall be replace if dead prior to project completion.

- 3) **Will the mulch need to be removed at the end of construction?**

Bark Mulch will not need to be removed.

- 4) **Is there a plant establishment and/or maintenance period for the turf sod or the hydroseeded areas?**

Per the Cost Estimate, the plants will need to be established and maintained for a period of 90 days after construction.

ADDITIONAL QUESTIONS AND ANSWERS:

- 1) **The contract time and duration are shown as 120 calendar starting June 2023. Can you please revise the section for a future date and a longer duration? Typical lead times for Tesco equipment are currently 12+ months.**

The contract duration has been revised to 545 Days, based on current lead times for materials.

- 2) **The project LDs are listed as \$3,000 per calendar day. This seems excessive given that this appears to be a “standalone”. Can the LD amount be revised to the actual amount of damages potentially incurred by the Trustees?**

The liquidated damages have been revised to \$1,500 per calendar day.

- 3) **A portion of the specifications for the Pump Station appear to be missing. Can you please provide specifications for the following?**

- **Pump station piping and pipe types.**
- **120” diameter wet well**
- **Submersible pumps**
- **Pump station accessories**
- **Pump Station Hatches**
- **Start and Testing requirements.**
- **Any requirement painting and coatings.**
- **Flow Meter Specification – See attached Exhibit D for University Preference.**
- **And any other specifications that are necessary to provide a complete bid.**

- 4) **Can you please provide a specification for the 30” storm drain diversion valve?**

Watts 30 IN High Performance Double Eccentric Butterfly Valve or approved equal.

- 5) **Can you please provide a detail for the storm drain headwall and gooseneck outlet?**

Storm Drain Headwall shall be constructed per Caltrans Standard Specifications Section 52 and Caltrans Standard Plan D89B.

- 6) **Can you please provide a specification for the chain link fence around the pump station?**

See Section 32-31-00

- 7) **Can you please provide a detail for the flow meter and flow meter vault?**

Insufficient time before Bid Closing to provide detail.

- 8) **Please advise if any check valves are needed on the 10” pump discharge pipes (none are shown).**

See sheet C5.0, Keynote 6.

- 9) The project soils reports states that no side slope subgrade prep is required if the sides of the basin are no steeper than 5:1. However, the project plans show side slopes of 4:1. Please advise if subgrade prep is required on the side slopes. If so, please provide a detail and/or recommendation for the 4:1 slope.

Subgrade stabilization will be achieved once sod has taken root. If subgrade stabilization is of concern to the contractor Jute Mesh can be implemented before planting.

8.1 Site Preparation and Grading

Provided the slopes of the sides of the retention basin are no steeper than 5 horizontal to 1 vertical, the side slopes and bottom of the basin should not require subgrade preparation. Note that the infiltration

SECTION 01 10 00 – SUMMARY OF WORK**PART 1 GENERAL****1.01 RELATED DOCUMENTS**

- A. Construction Drawings, Technical Specifications, Addenda, and general provisions of the Contract, including Contract General Conditions and Supplementary General Conditions and other Division One Specification Sections, apply to this Section..

1.02 SUMMARY

- A. The following subjects are included in this section:
 - 1. Project Description
 - 2. Project Phasing
 - 3. Contractor Use of Premises
 - 4. University Occupancy
 - 5. Review of Existing Conditions
 - 6. Hazardous Materials and Procedures
 - 7. Codes, Ordinances, and Regulatory Requirements
 - 8. Use of University Equipment
 - 9. Delays in Completion - Liquidated Damages
 - 10. Project Staff
 - 11. Project Coordination and Site Survey Requirements
 - 12. Work Sequence and Special Considerations

1.03 PROJECT DESCRIPTION

The project consists of modifications to the existing lawn area, as delineated on the project drawing set. Demolition includes excavation and removal of the existing landscaping, tree(s), irrigation, and subgrade to accommodate a groundwater recharge basin. New work includes installation of a pump system consisting of three pumps within a fenced enclosure with privacy slats. The pump system shall be connected to the existing Warriors Pond discharge pipe with the option to bypass the proposed pump system.

All new controls shall be connected to the existing system for control and monitoring by central plant facility staff.

1.04 PROJECT PHASING

- A. Phase the project work as necessary to maintain pedestrian and vehicle access around the work areas during the project construction.

1.05 CONTRACTOR USE OF PREMISES

- A. Limit use of site and premises to allow:
 - 1. University inspections and visits.
 - 2. Work by Others and Work by the University.
 - 3. Unimpeded access by fire fighting or rescue equipment.

4. Exiting from existing facilities for life safety.
- B. The University will designate spaces and routes for the storage of materials and the ingress and egress of workers and equipment to the project site. Materials and equipment shall be kept strict within these limits. Refer to Section 01 35 13 for additional information. During construction, entrances, and access to University facilities shall at all times be kept clean and clear of materials, equipment, dirt, refuse, etc.
- C. Keeping existing driveways and entrances serving the premises clear and available to the University's personnel at all times. Do not use these areas for parking or storage of materials.
- D. Provide ladders, and similar temporary access elements as required to properly execute the Work and to permit inspections.
- E. Do not unreasonably encumber the site with materials and equipment.
- F. All materials delivered to the site or University shall be received by the Contractor and inspected by the Contractor. It is not the responsibility of the University to receive or accept materials for the Contractor. Contractor shall notify vendors and subcontractors of the site location. The University shall not be held responsible for any damage to materials otherwise delivered.
- G. The Contractor shall assume full responsibility for protection and safekeeping of products stored on premises.
- H. The Contractor shall not be permitted to store products or equipment that interferes with operations of University or other contractors as directed by the University.
- I. The Contractor shall be responsible for project security at all times. No firearms will be permitted. Refer to Section 01 35 53 for additional information.
- J. The Contractor shall be responsible for all damage to on-campus roads, sidewalks, landscape, hardscape, etc., used by construction vehicles and trucks traveling to and from the job. Final decisions as to responsibility shall rest with the University when cases arise involving other construction projects on Campus.
- K. The size of the project boundary shall be as defined in the Contract Documents. The long-term storage of material and equipment shall be within the area designated by the University. The Contractor may elect to provide storage off campus. All associated costs shall be the Contractor's responsibility.
- L. The Contractor is required to observe all campus driving and access restrictions. Each driver must have a valid California driver's license. Contractor shall access campus interiors for specific service-related needs (i.e. unloading or emergency response only). The Contractor must never exceed posted speed limits and must use discretion when a slower speed may be more appropriate due to congestion. Contractor must use caution at pedestrian crossing (i.e., intersections, crosswalks, and other unmarked areas where frequent crossing occurs). Contractor must

remember that the pedestrian has the right of way. Contractor must park vehicles so as not to block traffic crosswalks, disabled access routes, fire lanes, building entrances, fire hydrants, and walkways. All vehicular traffic is prohibited on brick surfaces. Driving on lawns and landscaped areas is prohibited.

- M. The Contractor's and subcontractors' employees must park in the job site staging area designated by the University.
- N. The University has adopted the policy of prohibiting sexual or racial harassment of any kind on Campus. All employees of the Contractor, subcontractors, materials suppliers, etc., shall treat the students, faculty, staff, and visitors of the University with respect and act in a professional manner at all times. Any employee who is demeaning or treats students, faculty, staff, and visitors with disrespect shall be immediately removed from the project and barred from future project employment.
- O. The University has adopted the policy of a Smoke, Tobacco, and Vape-Free environment. The Contractor shall not allow employees or subcontractors, visitors, manufacturer's representatives, etc., to use any tobacco or vape products on University property. Drug use of any kind, including marijuana, is prohibited on campus.
- P. The Contractor shall maintain areas free of waste materials, debris, and rubbish and maintain site in a clean and orderly condition.
- Q. The Contractor shall remove from construction areas all trash or debris as it accumulates and dispose of it off campus. The Contractor shall not be allowed to use University equipment such as disposal bins or trash carts. The Contractor shall furnish all equipment necessary for refuse removal.
- R. Provide signs adequate to direct visitors to the job site.
- S. Do not allow posting of unauthorized signs.
- T. The Contractor must provide alternate disabled access where existing University access has been compromised during the course of the work and post pedestrian and vehicular detour signs and disabled accessible re-route signs as necessary to provide clear direction around any obstruction caused by the work.
- U. The Contractor must maintain all utilities affected by the construction of this project in an operable and functioning condition (including irrigation systems) to all buildings, facilities, and services on the campus. All costs for providing temporary utilities must be included in the base bid.
- V. The Contractor may not interrupt any campus utilities without 7 days' prior written permission from the Trustees.
- W. If any utility is interrupted which affects any occupied facility, the Contractor must provide a temporary connection to the affected utility/facility/area within the noted time frame with due diligence, at no additional cost to the University. If the contractor does not perform repairs with due diligence within the noted time frames, the

University will enforce the terms and conditions of the General Conditions for Contractor's failure to perform work in a timely manner.

1. Fire Alarm Systems: Within 4 hours of occurrence.
2. Telephone/Data Communications System (including payphones, fiber backbone, copper, etc.): Within 4 hours of occurrence.
3. Energy Management Control System: Within 4 hours of occurrence.
4. Exterior Lighting / Street Lighting: Within 4-hours of occurrence.
5. Building Power: Within 4-hours of occurrence.
6. Potable Water: Within 4-hours of occurrence depending on impact of loss of water.
7. Gas: Within 4-hours of occurrence.
8. Sewer: Within 4-hours of occurrence.
9. Storm Drain: Within 4-hours of occurrence.
10. Irrigation (including reclaimed water): Within 4 hours of occurrence; provide alternate methods of irrigation if needed during outages to prevent damage to landscape.

1.06 UNIVERSITY OCCUPANCY

- A. The University reserves the right, with prior approval of the State Fire Marshal, for beneficial occupancy and to install equipment in completed spaces provided such occupancy does not interfere with the completion of the Contractor's work. Such placing of equipment and partial occupancy shall not constitute acceptance of the total Work.

1.07 REVIEW OF EXISTING CONDITIONS

- A. An existing facilities plan is available for review by the Contractor at the Capital Planning and Facilities Management Offices in the Corporation Yard on Merced Way in the North Central portion of the campus. The hours are normally 8:00 a.m. to 5:00 p.m., Monday through Friday. Copies can be requested after Award of Contract and at the Contractor's expense. Requests for copies should be made a minimum of seven-(7) working days in advance of the Contractor's need for these documents. For further or more detailed information, Record Drawings are available at the same location.
- B. Examination of Site Conditions: Data in these Specifications and on the Drawings are as accurate as possible, but not guaranteed. Verify locations, levels, distances, and features that may affect the Work. No allowance will be made in the Contractor's behalf for any extra expense resulting from failure or neglect in determining the conditions under which Work is to be performed, or in the Contractor's interpretation of the information furnished by the Engineer.

1.08 HAZARDOUS MATERIALS PROCEDURES

- A. The Contractor is made aware that in buildings or portions thereof constructed prior to 1978 or thereabout, there is a possibility when it is altered or renovated that some existing construction materials may contain asbestos or other materials considered hazardous. See Campus Annual Asbestos Notification at the end of this section. PLEASE BE AWARE THIS LIST IS NOT COMPLETE.

- B. During the course of performing this Contract, in the event that the Contractor suspects that asbestos is present in the area of work and has not been identified in the Asbestos Survey Report, the Contractor shall immediately stop work in the affected area and notify the University.

1.09 CODES, ORDINANCES AND REGULATORY REQUIREMENTS

- A. During the entire construction period, it shall be the sole responsibility of the Contractor to maintain conditions at the project site to meet the requirements of the Federal Occupational Safety and Health Administration (OSHA). This provision shall cover the Contractor's employees and all other persons working upon or visiting the site. To this end, the Contractor shall inform themselves and the Contractor's representatives of the Federal OSHA standards.
- B. Obtain copies of the applicable regulations and keep at the project site for use of all parties.
- C. The Contractor shall provide an Injury and Illness Prevention Plan. All requirements of Title 8 - Cal-OSHA are to be adhered to. The Contractor and its subcontractors are to submit an Injury and Illness Prevention Plan (IIPP) for the University's review prior to the start of construction. The IIPP is a written program describing the policies used by an employer to provide a safe and healthy workplace for their employees. The IIPP is required to include, but is not limited to, the following information (per Title 8, CCR 3203):
 - 1. Identify the person responsible for implementing the plan by name.
 - 2. Include a system for ensuring employee compliance with the plan.
 - 3. Include a system for communicating health and safety information to employees.
 - 4. Include a procedure for correction of unsafe conditions.
 - 5. Include a procedure for investigating injuries and illnesses.
 - 6. Include procedures for identifying and evaluating workplace hazards, including inspections of work site; when the program is first established, whenever new substances, processes, or equipment changes occur; and whenever the employer is made aware of a new or unrecognized hazard.

1.10 USE OF UNIVERSITY EQUIPMENT

- A. The Contractor will not be allowed to use the University equipment such as disposal bins or trash carts.
- B. The Contractor shall furnish all equipment necessary for completion of work as outlined in Contract Documents.

1.11 DELAYS IN COMPLETION - LIQUIDATED DAMAGES

- A. Five hundred forty-five (545) calendar days shall be allowed for the completion of this project. The Time of Completion shall commence as directed by the University in the Notice to Proceed issued after the receipt of the fully executed Agreement. The project must be completed in all respects in accordance with the Contract Documents to the full satisfaction of the University within the noted calendar days or

liquidated damages in the amount of \$1,500.00 per calendar day shall be assessed. Refer to Item 7.02 of the General Conditions for additional information.

1.12 PROJECT STAFF

- A. The Contractor shall employ a competent Project Staff, including, without limitation, a Project Manager, an appropriate backup for the Project Manager, and an on-site working foreman. The foreman must be on site at all times while work is being performed. The project staff shall represent the Contractor, and all communications given to the project staff shall be binding as if given to the Contractor. Contractor shall provide a management organizational chart and a list of personnel comprising the project staff at time of contract award.
- B. With the exception of the Project Manager and the assigned backup, the project staff shall be in attendance at the project site not less than eight-(8) hours per day, five-(5) days per week, and/or at all times that any subcontractor is working on the project site, unless the work is stopped due to a general strike or conditions beyond the control of the Contractor or until termination of the Contract in accordance with the Contract Documents. The project staff shall be acceptable to the University, and each member shall continue in specified capacity of the duration of the project, unless said member ceases to be on the Contractor's payroll or the University otherwise agrees. The Contractor or any other entity shall not employ members of the project staff on any other project during the course of the work. Failure to provide appropriate documentation of qualifications and suitable experience (as stated elsewhere in these specifications) shall be sufficient reason for the University to disqualify and disallow such person for the required position of full-time Project Manager.
- C. Submit Project Manager qualifications showing the following:
 - 1. Six-(6) years experience as a Project Manager including experience with institutional type buildings and/or sports facilities similar to those found on a University or College Campus.
 - 2. A minimum of three-(3) projects, each totaling \$1,000,000 or more, mechanical, electrical, heating/ventilation/air conditioning, etc.
 - 3. A minimum of three-(3) references from Owners (preferably within an institutional setting similar to a University / College campus). The remaining references shall be from design consultants.
 - 4. Knowledge of Cal-OSHA safety regulations and procedures as they pertain to a similar type of project.
 - 5. Provide evidence of training in Cal-OSHA and asbestos / hazardous materials awareness.
 - 6. Knowledge of San Joaquin Air Quality Management District regulations and procedures as they pertain to a similar type of project.
 - 7. Knowledge of the local Water Quality Control Board regulations and procedures as they pertain to a similar type of project.
 - 8. Knowledge of all State Fire Marshal ordinances and regulations pertaining to construction on State property.
 - 9. Knowledge of computers and demonstrated computer literacy, and knowledge of computerized project management / inspection systems / software.
 - 10. Employed a minimum of two (2) years with Bidder.

- D. *removed*
- E. Submit Project Manager's back up person's qualifications showing years of experience, past projects, and references at time of contract award.
- F. Failure to Maintain a project foreman on the project site at all times work is in progress shall be considered a material breach of the contract, entitling the University to terminate the contract, or alternatively, issue a Stop Work Order until the foreman is on the project site. If, by virtue of issuance of said Stop Work Order, Contractor fails to complete the Contract on time, it will be assessed consequential damages in accordance with the Contract.
- G. *removed*

1.13 PROJECT COORDINATION AND SITE SURVEY REQUIREMENTS

- A. Coordinate the work and do not delegate responsibility for coordination to any subcontractor or manufacturer.
- B. Anticipate the interrelationship of all subcontractors and manufacturers and their relationship with the work.
- C. Resolve differences or disputes between the subcontractors concerning coordination, interference, or extent of work between sections.
- D. Coordinate the work of subcontractors so that portions are performed in a manner that minimizes interference with the progress of the work.
- E. Do not obstruct spaces and installations until they have been inspected and approved and required certificates of inspection issued.
- F. Do not obstruct spaces and installations that are required to be clear by Applicable Code Requirements.
- G. Remove and replace all work that does not comply with the Contract Documents. Repair or replace and other work or property damaged by these operations at no additional cost to the University.
- H. Whenever any cutting, removal, or alteration of existing work is required to form connections with new work or otherwise meet the requirement of the Contract Documents, perform such work so as not to damage the work that will remain in place. Perform patching and repairs occasioned thereby using materials, construction details, and finishes matching those of the existing work as closely as possible, and to the full satisfaction of the University. Refer to Section 01 73 29 for additional information.
- I. Perform a survey of the project site, and record conditions in and adjacent to the project sites. Contractor and Inspector of Record shall attend the pre-construction survey. Contractor shall video record areas of Work immediately prior to

construction with the Inspector of Record. Contractor shall provide one-(1) copy of pre-construction survey to the University in DVD or USB drive format. This copy shall act as the official record of verification of existing conditions.

1.14 WORK SEQUENCE AND SPECIAL CONSIDERATIONS

- A. Any suggestions a Bidder or Contractor may have to improve on the work sequencing and special considerations to meet the objectives of the University or to complete the project sooner than set out by the plan, shall be submitted in writing for review by the University. There is no guarantee of any kind, made or implied, that any suggestions will be considered and adopted. However, they are encouraged provided the Contractor has fully understood the implication on construction work and operations of the University. Any changes that might be made to the work sequence for whatever reason, and at any point in the project or prior to the Notice to Proceed, shall be incorporated into the Contractor's construction without any burden of direct or indirect costs to the University.

1.15 PROTECT THE WORK FROM VANDALISM

- A. During Work Hours: Protect the Work from theft, vandalism, and unauthorized entry. The Contractor shall have the sole responsibility for job site security.
- B. During Off-Work Hours: During all hours that Work is not being executed, furnish such watchman's services as Contractor may consider necessary to safeguard materials and equipment in storage on the Project site, including Work in place and in process of fabrication, against theft, acts of malicious mischief, vandalism, and other losses or damages.

1.16 ALTERATIONS WORK DESCRIPTION

- A. Alterations Work Description: Refer to RFP document and its Appendices for details.
- B. Refinishing: Refer to RFP document and its Appendices for details.

1.17 OWNER-FURNISHED/CONTRACTOR-INSTALLED PRODUCTS

- A. Owner-Furnished/Contractor-Installed (OFCI) Products: University will furnish, for installation by Contractor, products which are identified on the Drawings and in the Specifications as "OFCI (Owner-Furnished/Contractor-Installed)", "installed by General Contractor," or similar terminology. Refer to Section 016400 - Owner-Furnished Products.

- 1. Relationship to Work under the Contract: Work under the Contract shall include all provisions necessary to fully incorporate such products into the Work, including, as necessary: fasteners, backing, supports, piping, conduit, conductors and other such provisions from point of service to point of connection, and field finishing as shown on Drawings and specified herein.

1.18 PERMITS, LICENSES AND FEES

10/18/2023

- A. Permits, Licenses and Fees, General: Refer to Contract General Conditions, Article 4.11.
- B. Licenses: Contractor shall obtain and pay all licenses associated with construction activities such as business licenses, contractors' licenses, and vehicle and equipment licenses. All costs for licenses shall be included in the Contract Amount.
- C. Parking Fees: Contractor shall obtain and pay for all parking permits and fees for vehicles parked off of the Construction Site. Refer to Section 01 55 00 - Vehicular Access and Parking for additional parking requirements.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION 01 10 00

SECTION 27 15 23 – FIBER OPTIC CABLING AND DEVICES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes

1. Provide all labor, materials and equipment necessary to complete the installation required for the items specified under this Section, including but not limited to fiber optic-based data communication cabling systems which include:
 - a. Provide all necessary cabling and termination equipment for a complete cabling system.
 - b. Terminate, test and document fiber optic cabling as detailed within the Specifications.

B. Related sections

1. Where items specified in other Division 27 sections conflict with the requirements of this Section, the most stringent requirement shall govern.
 - a. 26 05 28 – Raceways and Boxes
2. The requirements of this Section apply to all Division 27 work, as applicable.
3. Consult all other sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete installation.

1.02 REFERENCES

A. Comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

1. ANSI –American National Standards Institute
 - a. INCITS 263; Fiber Distributed Data Interface (FDDI) - Token Ring Twisted Pair Physical Layer Medium Dependent (TP-PMD)
 - b. ISO/IEC 11801; Information technology - Generic cabling for customer premises
2. CCR –California Code of Regulations, Title 24
 - a. Part 3 -California Electrical Code(CEC); NFPA 70 National Electrical Code (NEC) with California amendments
3. CFR –Code of Federal Regulations
 - a. Title 7 –Agriculture, Part 1755 – Telecommunications Standards and Specifications for Materials, Equipment and Construction
 - b. Title 47 –Telecommunication, Part 68 – Connection of Terminal Equipment to the Telephone Network.
4. TIA/EIA –Telecommunications Industry Association/Electronic Industries Alliance
 - a. Fiber Optic Standards

- 1) TIA/EIA-455 Series; Fiber Optic Test Procedures including TIA/EIA-455-B; Standard Test Procedure for Fiber Optic Fibers, Cables, Transducers, Sensors, Connecting and Terminating Devices, and other Fiber Optic Components, and All latest FOTPs related to fiber optic cables, connectors and passive devices.
 - 2) TIA/EIA-4920000-B; Generic Specification for Optical Waveguide Fibers
 - 3) TIA/EIA-492A000-A; Sectional Specification for Class Ia Multimode, Graded-Index Optical Waveguide Fibers
 - 4) TIA/EIA-492AAAA-A; Detail Specification for 62.5µm Core Diameter/125µm Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers
 - 5) TIA/EIA-492AAAB; Detail Specification for 50µm Core Diameter/125µm Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers
 - 6) TIA/EIA-598-A; Optical Fiber Cable Color Coding
 - 7) TIA/EIA-604; Fiber Optic Connector Intermateability Standards
 - 8) TIA/EIA-4720000-A; Generic Specification for Fiber Optic Cable
 - 9) TIA/EIA-472C000-A; Sectional Specification for Fiber Optic Communications Cable for Indoor Use
 - 10) TIA/EIA-472D000-A; Sectional Specification for Fiber Optic Communications Cable for Outside Plant Use
 - 11) TIA/EIA-4750000-C; Generic Specification for Fiber Optic Connectors
 - 12) TIA-5150000; Generic Specification for Optical Fiber and Cable Splices
 - 13) TIA-515B000; Sectional Specification for Splice Closures for Pressurized Aerial, Buried, and Underground Fiber Optic Cables
 - 14) TIA-6090000; Generic Specification for Optical Fiber Splice
 - 15) TIA-609A000; Sectional Specification for Conventional, Permanent, Optical Fiber Splice
 - 16) TSB62; Informative Test Methods (ITMs) for Fiber-Optic Fibers, Cables, Opto-Electronic Sources and Detectors, Sensors, Connecting and Terminating Devices, and Other Fiber-Optic Components
- b. Wiring/Cabling Standards
- 1) TIA/EIA-568-B.1; Commercial Building Telecommunications Cabling Standard - Part 1: General Requirements
 - 2) TIA/EIA-568-B.3; Optical Fiber Cabling Components Standard
 - 3) TIA/EIA-569-A; Commercial Building Standards for Telecommunications Pathways and Spaces
 - 4) TIA/EIA-606; Administration Standard for the Telecommunications Infrastructure of Commercial Buildings

5. ICEA –Insulated Cable Engineers Association
 - a. S-83-596; Fiber Optic Premises Distribution Cable
 - b. S-87-640; Fiber Optic Outside Plant Communications Cable
6. IEEE –Institute of Electrical and Electronic Engineers
 - a. C2; National Electrical Safety Code (NESC)
 - b. 802.3; Information Technology -Local and Metropolitan Area Networks
7. NECA –National Electrical Contractors Association
 - a. NECA/BICSI 568; Standard for Installing Commercial Building Telecommunications Systems
8. Telcordia Documents
 - a. GR-20; Generic Requirements for Optical Fiber and Optical Fiber Cable
 - b. GR-409; Generic Requirements for Premises Fiber Optic Cable
 - c. GR-1435; Generic Requirements for Multi-Fiber Optical Connectors
 - d. GR-2961; Generic Requirements for Multi-Purpose Fiber Optic Cable
9. UL –Underwriters Laboratories, Inc.
 - a. 444; Communications Cables
 - b. 1651; Standard for Optical Fiber Cable
 - c. 1666; Standard Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
 - d. 1685; Standard for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
10. U.S. Department of Agriculture, Rural Utilities Service (RUS), formerly Rural Electrification Administration (REA) Standards
 - a. PE-90; Totally Filled Fiber Optic Cable
 - b. TE&CM Section 644; Design and Construction of Underground Cable

1.03 SYSTEM PERFORMANCE STANDARDS

- A. Fiber optic cabling:
 1. To applicable EIA/TIA standards using a digital cable analyzer and/or OTDR as specified herein.

1.04 SUBMITTALS

- A. Submit manufacturer's data for materials specified within this Section in accordance to Section 26 05 00.

1.05 QUALITY ASSURANCE

- A. All materials, equipment and parts comprising the materials specified herein shall be new and unused, bearing UL labels where applicable.

B. Installer Qualifications

1. The work performed under this Section shall be certified by the manufacturer of the equipment and components being furnished and be authorized by the manufacturer to install and convey the product warranty and performance guarantee to the Owner upon completion of Contract.
2. Installing Contractor must have a minimum of three years previous experience in data communications and/or telecommunication systems installation. All Contractors and/or Vendors supplying all or parts of the work described herein shall supply three project references within the Submittal package at the Engineer's request, which substantiate the Contractor/Vendors' previous experience as noted herein.

C. Testing Equipment

1. Furnish in conformance with the applicable requirements of this Section.
2. Test systems using at least one each of the following test measurement devices or approved functional equivalents:
 - a. Digital cable analyzer with applicable copper and/or fiber testing standards required within this Section.
 - b. Optical power meter and/or optical time domain reflectometer (OTDR) tester with applicable fiber testing standards required within this Section.
 - c. Any other items of equipment or materials required to demonstrate conformance with the Contract Documents.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Wire shall be in original unbroken package. Obtain approval of Inspector or Engineer before installation of wires.
- B. Handle carefully to avoid damage to internal components, enclosure and finish.
- C. Store in a clean, dry environment. Maintain factory packaging and, if required, provide an additional cover to protect enclosure in harsh environments.

1.07 WARRANTY

- A. Furnish guarantee in accordance with and in form required under Section 26 05 00.

PART 2 - PRODUCTS

2.01 FIBER OPTIC COMMUNICATIONS CABLES

A. General Requirements

1. Cabling construction and use shall comply with CEC/NEC Article 770.
2. Fiber count per cable to comply with minimum counts indicated on the Drawings.
3. All fiber optics shall comply with all applicable EIA and Telcordia standards including but not limited to EIA-455, EIA-492, EIA-598, GR-20 and GR-409.
4. All fibers shall be of grade index type.

5. Each fiber to be attenuation tested by the Manufacturer prior to shipping to indicate conformance of shipped cable to requirements herein. Manufacturer's test to be affixed to shipping reel.
 6. Maximum required bend radius at installation and long term application should not exceed manufacturer's recommended values.
 7. Minimum safe longitudinal load at installation and long term application should not exceed manufacturer's recommended values.
 8. Construction
 - a. All dielectric central and strengthen materials.
 - b. Fiberglass epoxy rod/Kevlar strengthening member(s).
 - c. Fiber coating to be mechanically strippable, dual layered, UV-cured acrylate applied by the fiber manufacturer.
 - d. Outer jacket shall be polyethylene, polyurethane or polyvinylchloride with 0.040" minimum thickness as required by application, listings and CEC/NEC requirements.
 - e. Tight Buffer Design
 - 1) Water blocking attributes per EIA-455.
 - 2) Optical fiber surrounding by 250µm primary polymer buffer and 900µm strippable PVC secondary buffer.
 - 3) Individual sub cables supported by being molded into the cable's overall protective jacket ("core locking" design), extruded onto the stranded cable core.
 - 4) Strippable and sliceable directly to loose tube construction 250µm primary coating cable with no interface loss or optical return in excess of standards specified elsewhere herein.
 - 5) Aramid yarn filler, precisely uniformly tensioned around fiber.
 - 6) Tensile Proof Test: 100kpsi (0.7GPa)
 9. Single-mode Fiber, General Specifications
 - a. Performance and Optical
 - 1) Maximum Attenuation
 - a) 1310nm Wavelength: 0.50dB/km
 - b) 1550nm Wavelength: 0.50dB/km
- B. Indoor/Outdoor, Riser (Type OFNR/OFNP)
1. Drawing Reference
 - a. Single-mode: ## FOS-R, where ## indicates fiber count
 2. Construction
 - a. Multi-mode or single-mode fibers as indicated in Drawings per General Requirements listed above.
 - b. Tight buffered, core lock construction per General Requirements listed above.

- c. Suitable and approved for indoor use within vertical shafts spaces.
- 3. Manufacturer
 - a. Single-mode: Berk-Tek PDR I/O OS2

2.02 FIBER CABLE TERMINATION DEVICES AND RELATED

A. Connectors

- 1. Types
 - a. Single-mode: LC type unless otherwise noted, shown or required.
- 2. Zirconia ceramic ferrule type to suit application.
- 3. Performance
 - a. Insertion Loss
 - 1) Single-mode: ≤ 0.20 dB, typical
 - b. Return Loss
 - 1) Single-mode: ≤ -55 dB, typical
- 4. Manufacturers
 - a. Leviton

B. Break-out and Fan-out Kits

- 1. Kits separate six or twelve 250 μ m fibers and route them into color-coded 900 μ m buffer tubes.
- 2. Manufacturers
 - a. Leviton.

C. Splices

- 1. Mechanical Splices
 - a. Permanent application, integral matching index gel.
 - b. Self-centering fiber alignment mechanism.
 - c. Performance
 - 1) Insertion loss, typical:
 - a) Multi-mode: ≤ 0.30 dB
 - b) Single-mode: ≤ 0.15 dB
 - 2) Manufacturer's guaranteed rating worst insertion loss for splice ≤ 0.5 dB.
 - 3) Return Loss
 - a) Flat cleave: ≤ -45 dB
 - b) Angled cleave: ≤ -60 dB
 - 4) Minimum fiber strain relief: 0.75 lbs

- d. Manufacturers
 - 1) Corning Optical System Camsplice, 3M Fiblok or approved equal.
- 2. Fusion Splices
 - a. Computerized optical aligner and tester with integral fuser.
 - b. Splice protected with a heat shrink cover.
 - c. Insertion loss, typical:
 - 1) Multi-mode: ≤ 0.30 dB, typical
 - 2) Single-mode: ≤ 0.20 dB, typical
 - 3) Manufacturer's guaranteed rating worst case for multi-mode or single-mode splice is ≤ 0.5 dB.
 - d. Manufacturers
 - 1) Corner Cable System or equal.

2.03 FIBER OPTIC TERMINATION EQUIPMENT AND RELATED

A. Fiber Terminal Cabinet, Wall Mount, Patch Panel/Splice Tray

- 1. Drawing Reference:
 - a. ##FTB: Fiber Terminal Box – Patch and cable storage only, where ## refers to fiber port count.
 - b. ##FSB: Fiber Splice Box – Splice only, where ## refers to fiber strand count.
- 2. Fiber Optic Terminal Cabinet
 - a. Provides a location for patching portable and rack mounted equipment to permanently installed fiber infrastructure.
 - b. Constructed of 0.125 inch minimum thick aluminum or powder coated steel with hinged, lockable door.
 - c. Holds a minimum of 4 fiber adapter plates that can each accommodate 6 to 12 single SC, ST or LC termination ports. Install blank adapters as required to fill spaces.
 - d. Two compartment
 - 1) Interior fiber coil rings/splice compartment.
 - 2) Connector interface compartment.
- 3. Manufacturers
 - a. Leviton.

B. Fiber Distribution Panels, Splice and Patch

- 1. Drawing References:
 - a. ##FDP – Splice and Patch Panel, where ## refers to fiber port count.
 - b. ##FPP – Patch Panel Only, where ## refers to fiber port count.
 - c. ##FSP – Splice only, where ## refers to fiber port count.

2. Features/Functions/Performance
 - a. Provides a location for splice, maintenance and cross-connecting of fiber optic cables.
 - b. 19" EIA rack mount with polycarbonate locking door suitable for housing fiber optic splices in a neat and orderly fashion and/or contain a patch panel front.
 - c. Incorporates cable tie downs and routing rings, and should store a minimum of one meter of cable without kinks or twists.
 - d. Suitable for re-entry, if required for future maintenance or modification without damage to the cable or splices.
 - e. All required splice organizer hardware, such as splice trays, protective glass shelves, and shield bond connectors shall be provided in the organizer kit.
 - f. Holds fiber adapter plates that can each accommodate SC, ST or LC termination ports. Install blank adapters as required to fill spaces. The minimum number of fiber terminations per rack unit is as follows:
 - 1) 1 rack unit = 16 fibers
 - 2) 2 rack units = 48 fibers
 - 3) 3 rack units = 96 fibers
 - 4) 4 rack units = 144 fibers
 - 5) 6 rack units = 192 fibers
3. Manufacturers
 - a. Leviton.
- C. Fiber Splice Closure
 1. Drawing Reference: FSC
 2. Functions/Features
 - a. Where indicated on plans, provides re-enterable underground splice closure.
 - b. Plastic construction – no corrodible materials.
 - c. Waterproof, suitable for direct burial
 - d. Fusion splice protection chamber
 - e. Grommet cable entrance and exits.
 3. Manufacturers
 - a. Corning Cable Systems SCF, 3M Fiber Optic Closure System LL or approved equal.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that all raceways have been de-burred and properly joined, coupled, and terminated prior to installation of cables. Verify that all raceways are clear of foreign matter and substances prior to installation of wire or cable.

- B. Inspect all conduit bends to verify proper radius. Comply with Code and cable manufacturer requirements for minimum permissible radius and maximum permissible deformation.

3.02 INSTALLATION

- A. All necessary interconnections, services, and adjustments required for a complete and operable system shall be provided. All installation work must be done in accordance with the safety requirements set forth in the general requirements of IEEE C2 and CEC/NEC 770.
- B. Fiber Installation:
 - 1. All fiber optic cable shall be continuous and splice-free for the entire length of run between designated connections or terminations.
 - 2. At designated splices, maintain conductor color code across all splices.
 - 3. Within buildings, make splices only in designated terminal cabinets and/or on designated equipment backboards.
 - 4. Outdoor splices shall not be permitted except where specifically noted or where required by the run length. Where run lengths require outdoor splices not noted on the drawings, notify Engineer in writing for direction before proceeding.
 - 5. Do not subject cable to tension greater than that recommended by the cable manufacturer. Use multi-spool rollers where cable is pulled in place around bends. Do not pull reverse bends.
 - 6. Provide a box loop for all cable routed through junction boxes or distribution panels. Provide tool formed thermal expansion loops at cable at manholes, handholes and at both sides of all fixed mounted equipment. Cable loops and bends shall not be bent at a radius greater than that recommended by the manufacturer.
 - 7. Secure all cable run vertically for continuous distances greater than thirty (30) feet with symmetrical conforming nonmetallic bushings or woven cable grips appropriate to weight of cable.
 - 8. Where drawings specifically permit use of exposed cable installation in Plenum and/or Suspended Ceiling voids, conform to the following:
 - a. Support: Provide support for all cabling. Do not place or attach directly to T-bar grid, concealed spline grid, flexible or rigid ductwork, HVAC registers, sprinkler piping or fixtures, light fixtures.
 - 1) Provide supports at least 48" on center, with cables installed with slight sag to ensure conformance with EIA TSB40 tensioning and stress limits.
 - b. Placement: Do not obscure access to access doors, hatches, air dampers, valves, cable trays, junction boxes, pull boxes or similar areas of access.
 - c. Place EMT pipe sleeves at all wall penetrations. Fire stop sleeves and cables where penetrating a rated wall with an approved UL assembly.
 - 9. Wiring practices
 - a. Land all non-coaxial field wiring entering each equipment rack at specified terminal devices prior to connection to any equipment or devices within racks.

At Contractor's option and at no additional costs to Owner, such terminals may be located in the equipment racks or in the terminal cabinets provided.

- b. Apply all crimp connectors only with manufacturer's recommended ratchet type tooling and correct crimp dies for connector and wire size; pliers type crimp tooling shall not be acceptable.
 - c. Coordinate insulation displacement (quick connect) terminal devices with fiber size and type. Comply with manufacturer's recommendations, and make connections with automatic impact type tooling set to a recommended force.
 - d. Dress, lace or harness all wire and cable to prevent mechanical stress on electrical connections. No wire or cable shall be supported by a connection point. Provide service loops where harness of different classes cross or where hinged panels are to be interconnected.
 - e. Correct any and all of the following unacceptable wiring conditions:
 - 1) Deformed, brittle or cracked insulation.
 - 2) Torn or worn cable jacket.
 - 3) Excessively scored cable jackets
 - 4) Insulation shrunken or stripped further than 1/8" away from the actual point of connection within a connector, or on a punch block.
 - 5) Ungrommated, unbushed, or uninsulated wire or cable entries.
 - 6) Deformation or improper radius of wire or cable.
 - f. Limit cable bends to a minimum radius of eight (8) times cable diameter except where otherwise noted herein.
 - g. At junction boxes, form circular radius bends of eight times cable diameter minimum. Up to two (2) flat bends of 90° or less are permitted in any single cable run where necessary to accommodate field wiring conditions. Flat bends exceeding 90° will not be accepted.
 - h. At the receptacle, a single bend of 90° or less and a 1 inch radius shall be permitted subject to the cable manufacturer certification of such an installation. Contractor to field verify the performance of the proposed installation in a mockup using the proposed cabling, jacks, raceway and listed test equipment prior to proceeding.
 - i. Tie wraps to be hand (not tool) tightened.
10. Labeling
- a. Provide permanent identification of run destination at all raceway terminations. Identify at each manhole, vault, handhole, terminal cabinet, pull box, equipment rack and receptacle/outlet.
 - b. Unless otherwise noted, conform to the standards and methods of EIA/TIA 606.
 - c. Identify all wire and cable clearly with permanent labels rapped about the full circumference within one (1) inch of each connection. Provide any of the following:

- 1) Continuous permanent imprint; equivalent to Clifford of Vermont, Inc. "Quick-Pull".
 - 2) Direct hot stamp.
 - 3) Heat shrinkable factory hot stamped; equivalent to Bradysleeve heat shrink.
 - 4) Adhesive strip printed labels wrapped the full circumference of the wire and sealed with clear heat shrink tubing; equivalent to Thomas Betts or Panduit Insta-code with clear heat-shrunk tubing equivalent to Alpha.
 - 5) Outside Plant, in Manholes or Pull Boxes. Panduit Fiber Optic Cable Marker Tags (Type PST-FO) or Lead tags, 2" square, drilled for cable attachment. Use cable ties or THWN #12 or 2 #14 wrapped twice around the cable bundle and secure to tag using a crimp fastener.
- d. Indicate:
- 1) Indicate the number designated on the associated field or shop drawing or run sheet, as applies. Assign wire or cable designations consistently throughout a given system. Each wire or cable shall carry the same labeled designation over its entire run, regardless of intermediate terminations.
 - 2) Indicate installation date.
- e. Terminal cabinet, pull box and manhole, handhole, vault or similar locations subject to abuse, label in accordance to Section 16050.
- 1) Patching Bays and Jacks and Receptacles containing six or fewer jacks/outlets: Provide designation strip holders with clear plastic covers to retain replaceable designation strips. Provide designation strips with block lettering on permanent background in contrasting color. Use photographic print, laser print on acid free paper, plotting ink on Mylar, or equivalent non-fading process. Alternatively, provide black on white adhesive labels equivalent to those produced by Brother Brand P-Touch Letter Machine. Embossed plastic (Dymo) labels shall not be acceptable. The presence of manufacturer provided silk screen iconic identification labels shall not relieve the contractor from the requirement to identify the receptacle with its associated cabling and circuit.

3.03 FIELD QUALITY CONTROL

A. General

1. Test and report on each intermediate cabling segment separately, including station cabling, horizontal distribution (each segment, if multiple) and telecommunications closet wiring.
2. Test each end to end cable link.
3. Submit copy of final results on paper and in machine readable form, organized by circuit number, consistent with circuit numbering scheme used in preparing submittal drawings and in labeling receptacles and terminations.
 - a. Submit machine-generated documentation and raw data of all test results on Contractor-provided, Owner approved forms; and in electronic format approved by the Owner.

- b. Where the machine-generated documentation requires use of a proprietary computer program to view the data, provide the Owner with 1 licensed copy of the software.
- c. Provide registered testing software used for the actual tests to the Owner/Engineer for review of test data as may be required.

B. Fiber Optic Cabling

- 1. Perform fiber optic cable testing on all installed fiber optic cabling. Notify Owner or Engineer in writing at least 48 hours in advance that fiber optic cable testing shall commence. Submit test results and calibration certification for testing equipment to be used.
- 2. Submit test report no later than five days after the cables are tested.
- 3. Attenuation Assessments
 - a. Submit power meter attenuation assessments test results on each fiber strand, in each cable, and in both directions under final installation conditions. Submit with the following information:
 - 1) Date of test
 - 2) Name of test personnel
 - 3) Fiber cable type and part number
 - 4) Fiber number
 - 5) TX wavelength
 - 6) TX location
 - 7) RX location
 - 8) TX model and serial number
 - 9) RX model and serial number
 - 10) Attenuation in Db
- 4. OTDR Distance and Attenuation Assessments (Contractor to provide only as required for troubleshooting or locating faults on the fiber).
 - a. Test and submit strip charts and/or tracer recordings on all strands in each cable in both directions. Submit with the following information:
 - 1) Date of test
 - 2) Name of test personnel
 - 3) Test wavelength
 - 4) Pulse duration(s) and scale range(s)
 - 5) Index of refraction
 - 6) Fiber cable type and part number
 - 7) Fiber tube and/or fiber strand number
 - 8) Direction of test
 - 9) Overall distance

10) Attenuation in dB

5. Acceptance Tests

a. Power Meter Attenuation Test

- 1) Perform the following measurement attenuation tests using the insertion method. Measure the attenuation of the fiber optic network inclusive of all splices and patch points called for on the Drawings.
 - 2) Measure attenuation between all the couplings using the insertion method.
 - 1) Perform a reference measurement in dBm to determine the injection power level of the stabilized source. Reference cable shall have the same core diameter as strands under test. Connect the optical source directly to the optical power level meter using 2 reference cables and a coupler.
 - 2) Connect the optical source to the strand under test using 1 of the 2 reference cables attached to the strand's terminal coupler.
 - 3) Connect the optical power level meter to the other end of the strand under test through its terminating coupler using the other reference cable.
 - 4) Obtain the measured attenuation (in dB) by subtracting the reference level (dBm) from the received level (dBm).
 - 5) Periodically during the acceptance tests, check and document the reference level.
 - 3) Test each fiber link for overall attenuation from end to end in both directions.
- b. Perform the attenuation acceptance test at the 850nm wavelength for multi-mode and 1310nm for single-mode.

END OF SECTION 27 15 23

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SECTION 32 31 00 - CHAIN-LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. PVC-coated, steel chain-link fabric.
 - 2. Polymer-coated, galvanized, steel framework.
 - 3. **Privacy slats.**
- B. Related Sections include the following:
 - 1. Division 2 Section "Earthwork" for filling and for grading work.
 - 2. Division 3 Section "Cast-in-Place Concrete" for concrete post footings.

1.3 DEFINITIONS

- A. CLFMI: Chain Link Fence Manufacturers Institute.

1.4 SUBMITTALS

- A. Product Data: Material descriptions, construction details, dimensions of individual components and profiles, and finishes.
- B. Maintenance Data: For the following to include in maintenance manuals specified in Division 1:
 - 1. Polymer finishes.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed chain-link fences and gates similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Fence Manufacturing Co.
 - b. Anchor Fence Div.
 - c. Boundary Fence and Railing Co.

2.2 CHAIN-LINK FENCE FABRIC

- A. Steel Chain-Link Fence Fabric: As indicated on the Drawings. Provide fabric fabricated in one-piece widths for fencing in height of 12 feet and less. Comply with CLFMI's "Product Manual" and with requirements indicated below:
 - 1. Mesh and Wire Size: 2-inch mesh, 0.148-inch diameter for PVC-coated wire.
 - 2. PVC-Coated Fabric: ASTM F 668, Class 2b over metallic-coated steel wire.
 - a. Metallic Coating: Aluminum.
 - b. Color: Black.
 - 3. Coat selvage ends of fabric that is metallic coated during the weaving process with manufacturer's standard clear protective coating.
- B. Selvage: Knuckled at both selvages.

2.3 INDUSTRIAL FENCE FRAMING

- A. Round Steel Pipe: Standard weight, Schedule 40, galvanized steel pipe complying with ASTM F 1083. Comply with ASTM F 1043, Material Design Group IA, external and internal coating Type A, consisting of not less than 1.8-oz./sq. ft. zinc; and the following strength and stiffness requirements:
 - 1. Line, End, Corner, and Pull Posts and Top Rail: Per requirements for Heavy Industrial Fence.
- B. Post Brace Rails: Match top rail for coating and strength and stiffness requirements. Provide brace rail with truss rod assembly for each gate, end, and pull post. Provide

two brace rails extending in opposing directions, each with truss rod assembly, for each corner post and for pull posts. Provide rail ends and clamps for attaching rails to posts.

- C. Top Rails: Fabricate top rail from lengths 21 feet or longer, with swaged-end or fabricated for expansion-type coupling, forming a continuous rail along top of chain-link fabric.
- D. Bottom Rails: Match top rail for coating and strength and stiffness requirements.

2.4 INDUSTRIAL SWING GATES

- A. General: Comply with ASTM F 900 for the following swing-gate types:
 - 1. Single gate.
 - 2. Double gate.
- B. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F 1083 and ASTM F 1043 for materials and protective coatings.
- C. Frames and Bracing: Fabricate members from round (double leaves) and square (single leaf) galvanized steel tubing with outside dimension and weight according to ASTM F 900 for the following gate fabric height:
 - 1. Gate Fabric Height: More than 6 feet.
- D. Frame Corner Construction: As follows:
 - 1. Welded.
- E. Gate Posts: Fabricate members from round galvanized steel pipe with outside dimension and weight according to ASTM F 900 for the following gate fabric heights and leaf widths:
- F. Hardware: Latches permitting operation from both sides of gate, hinges, center gate stops and, for each gate leaf more than 5 feet wide, keepers.
 - 1. Coordinate locking provisions with details on the Drawings.
 - 2. Latch (Typical): Forked type or plunger-bar type to permit operation from either side of gate, with padlock eye as an integral part of latch.
 - 3. Personnel gate shall be fabricated to accommodate housing box for keyed cylinder and deadbolt indicated on the Drawings.

2.5 FITTINGS

- A. General: Provide fittings for a complete fence installation, including special fittings for corners. Comply with ASTM F 626.
- B. Post and Line Caps: Hot-dip galvanized pressed steel or hot-dip galvanized cast iron. Provide weathertight closure cap for each post.

- C. Rail and Brace Ends: Hot-dip galvanized pressed steel or hot-dip galvanized cast iron. Provide rail ends or other means for attaching rails securely to each gate, corner, pull, and end post.
- D. Rail Fittings: Provide the following:
 - 1. Top Rail Sleeves: Hot-dip galvanized pressed steel or round steel tubing. Not less than 6 inches (153 mm) long.
 - 2. Rail Clamps: Hot-dip galvanized pressed steel. Provide line and corner boulevard clamps for connecting bottom rails in the fence line to line posts.
- E. Tension and Brace Bands: Hot-dip galvanized pressed steel.
- F. Tension Bars: Hot-dip galvanized steel, length not less than 2 inches (50 mm) shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.
- G. Truss Rod Assemblies: Hot-dip galvanized steel rod and turnbuckle or other means of adjustment.
- H. Tie Wires, Clips, and Fasteners: Provide the following types according to ASTM F 626:
 - 1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, complying with the following:
 - a. Hot-Dip Galvanized Steel: 0.148-inch- diameter wire.
 - 2. Power-driven fasteners.
 - 3. Round Wire Clips: Hot-dip galvanized steel or aluminum for attaching chain-link fabric to H-beam posts.

2.6 PRIVACY SLATS

- A. **Material: PVC, UV-light stabilized, not less than 0.023 inch thick, sized to fit mesh specified for direction indicated.**
- B. **Color: Black.**

2.7 POLYMER FINISHES

- A. Supplemental Color Coating: In addition to specified metallic coatings for steel framing, fittings and accessories, provide fence components with polymer coating.
- B. Metallic-Coated Steel Tension Wire: PVC-coated wire complying with ASTM F 1664, Class 2b.
- C. Metallic-Coated Steel Framing: Comply with ASTM F 1043 for polymer coating applied to exterior surfaces and, except for tubular shapes, to exposed interior surfaces.

1. Polymer Coating: Not less than 10-mil- thick PVC or 3-mil- thick polyester finish.
- D. Color: Black complying with ASTM F 934.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for a verified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance.
 1. Do not begin installation before final grading is completed, unless otherwise permitted by Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 INSTALLATION, GENERAL

- A. General: Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.
 1. Install fencing on established boundary lines inside property line.
- B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed or compacted soil.
- C. Post Setting: Hand-excavate holes for post foundations in firm, undisturbed or compacted soil. Set posts in concrete footing. Protect portion of posts aboveground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Using mechanical devices to set line posts per ASTM F 567 is permitted. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during placement and finishing operations until concrete is sufficiently cured.
 1. Dimensions and Profile: As indicated on Drawings.
 2. Concealed Concrete Footings: Stop footings a minimum of **2 inches** below grade to allow covering with surface material.

3.4 CHAIN-LINK FENCE INSTALLATION

- A. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more.
- B. Line Posts: Space line posts uniformly at **10 feet** o.c.
- C. Post Bracing Assemblies: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts. Locate horizontal braces at midheight of fabric on fences with top rail and at two-thirds fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.
- D. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended by fencing manufacturer.
- E. Bottom Rails: Install, spanning between posts, using fittings and accessories.
- F. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 2 inches between finish grade or surface and bottom rail. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
- G. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches o.c.
- H. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.
 - 1. Maximum Spacing: Tie fabric to line posts 12 inches o.c. and to braces 24 inches o.c.
- I. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side.
- J. **Privacy Slats: Install slats in direction indicated, securely locked in place.**
 - 1. **Vertically.**

3.5 GATE INSTALLATION

- A. General: Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.6 ADJUSTING

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- A. Gate: Adjust gate to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

END OF SECTION 32 31 00

FT-3200 SUBMITTAL AND DATA SHEET



DESCRIPTION

ONICON FT-3000 Series Inline Electromagnetic Flow Meters are suitable for measuring electrically conductive liquids in a wide variety of applications. The FT-3200 provides analog and digital outputs for flow rate and programmable pulse outputs for flow totalization and/or alarms.

APPLICATIONS

- HVAC hydronic applications including chilled water, heating hot water and condenser water
- Bi-directional flow for primary/secondary bypass and thermal storage applications
- Domestic cold and hot water applications
- Clean process flow applications with conductivities greater than 5 $\mu\text{S}/\text{cm}$

CALIBRATION

All FT-3000 series flow meters are wet calibrated in a flow laboratory accordance with ISO 9104:1991 and ISO 17025:2005 that are directly traceable to international standards. A certificate of calibration accompanies every meter.

GENERAL SPECIFICATIONS

| | |
|-------------------------------|--|
| PERFORMANCE | |
| Accuracy | $\pm 0.2\%$ of reading from 1.6 to 33 ft/s ± 0.0033 ft/s at flow rates < 1.6 ft/s |
| Sensing Method | Electromagnetic sensing (no moving parts) |
| Minimum Conductivity | 5 $\mu\text{S}/\text{cm}$ |
| Fluid Temperature | 0°F to 266°F - Based on liner material (Refer to Liner Selection Table) |
| Fluid Pressure | 580 psi - Based on flow body and liner material (Refer to Liner Selection Table) |
| ELECTRONICS ENCLOSURE | IP67 (NEMA 4X) painted aluminum enclosure with display |
| Display | 16-character, 8-line, 128x64 graphic backlit LCD |
| Ambient Condition | Transmitter: -4°F to 140°F |
| PROGRAMMING | Menu driven user interface via three (3) programming keys PC user interface via micro USB and downloadable software |
| ELECTRICAL CONNECTIONS | |
| Input Power | Removable terminal blocks for use with 14 - 22 gauge wire |
| I/O Signals | Removable terminal blocks for use with 18 - 24 gauge wire |
| FLOW SENSOR DESIGN | |
| Flow Tube | 304 SS |
| Flow Body | Carbon Steel, Stainless Steel or Polypropylene (Refer to Option Selection for additional information) |
| Electrodes | Qty: Three (3), round, 316 SS |
| APPROVALS | |
| CE | Transmitter: 2014/30/EU and 2014/35/EU LVD EMC Directive Flow Body: E97/23/CE PED Directive |
| NSF | Flow Body: 61 |

OPTION SELECTION

| | |
|---|--|
| INPUT POWER Available Options | Low Power, 24 VAC/DC, 50/60 Hz, 12 VA High Power, 120 - 240 VAC, 50/60 Hz, 12 VA |
| I/O SIGNAL Available Options | Two (2) digital outputs, one (1) digital input, and one (1) analog output Two (2) digital outputs, one (1) digital input, and two (2) analog output w/ MODBUS RTU (RS485) |
| ELECTRONICS ENCLOSURE Available Options | Integral mount Remote (wall) mount with 16ft of remote cable* Remote (wall) mount with 32ft of remote cable* Remote (wall) mount with 49ft of remote cable* Remote (wall) mount with 65ft of remote cable* Remote (wall) mount with 100ft of remote cable* *Up to 325 ft in fluids with conductivity $\geq 200 \mu\text{s/cm}$ |
| FLOW BODY Available Options | Carbon Steel Stainless Steel Polypropylene |
| FLOW LINER Available Options | PTFE Ebonite Polypropylene See Liner Selection Table Below |
| PROCESS CONNECTIONS Available Options | ANSI Class 150 flanged connections Wafer mount ANSI Class 300 flanged connections |

LINER SELECTION TABLE

| Material | Line Size Flanged and Wafer | Grade | Color | Temperature Range | Pressure Range Based on Liner | Abrasion Resistance (Carbon Steel = 100) |
|---------------|---|-------|-------|-------------------|-------------------------------|--|
| Ebonite | 8 - 48" | Food | Amber | 32°F - 175°F | 580 psi (1) | 90 - 118 |
| Polypropylene | 1 - 6" | Food | Gray | 32°F - 140°F | 232 psi | 122 |
| PTFE | 1 - 48" | Food | White | 0°F - 266°F (3) | 580 psi (1,2) | 78 |
| Notes | Description | | | | | |
| 1 | Flanged meter pressure rating is the lesser of 580 psi or the flange rating. | | | | | |
| 2 | Wafer style meters above 6" are limited to 232 psi. | | | | | |
| 3 | Remote mount electronics option required for application temperature above 212°F. | | | | | |

FT-3200 SUBMITTAL AND DATA SHEET

METER ORDERING INFORMATION

GG H I JK L BC D E SPC

Model FT-32

FLOW SENSOR CONFIGURATION INFORMATION

| GG = Meter Size (inches) | | | | |
|---------------------------|----------|---------|----------|----------|
| Flanged and Wafer Models | | | | |
| 01 = 1" | 15 = 1½" | 02 = 2" | 25 = 2½" | 03 = 3" |
| 04 = 4" | 05 = 5" | 06 = 6" | 08 = 8" | 10 = 10" |
| nn = Meter Size, 12 - 48" | | | | |

H = Liner Material

| |
|--------------------------------|
| 1 = PTFE |
| 2 = Polypropylene ¹ |
| 3 = Ebonite ² |

I = Process Connection

| |
|-----------------------------------|
| 0 = Wafer connection ³ |
| 1 = ANSI 150 flanges |
| 3 = ANSI 300 flanges |

JK = Body Material

| |
|------------------------------------|
| 11 = Carbon Steel w/ SS Electrodes |
| 41 = 304 SS w/ SS Electrodes |
| 51 = 316 SS w/ SS Electrodes |

L = Electronics Enclosure Mounting Configuration

| |
|--------------|
| 1 = Integral |
| 2 = Remote |

TRANSMITTER CONFIGURATION INFORMATION

BC = Outputs

| |
|--|
| 10 = One (1) AO, two (2) DO and one (1) DI |
| 21 = Two (2) AO, two (2) DO and one (1) DI w/ MODBUS RTU (RS485) |

D = Electronics Enclosure

| |
|--|
| 2 = IP67 (NEMA4X) painted Al enclosure w/display |
|--|

E = Input Power

| |
|-------------------------------|
| 1 = Low power, 24 VAC/VDC |
| 2 = High power, 120 - 240 VAC |

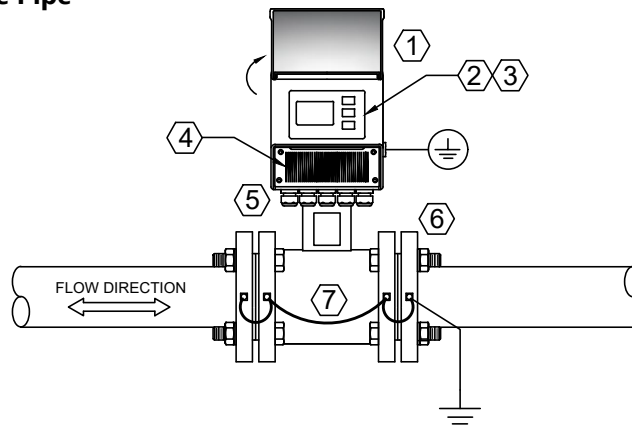
SPC = Special Configurations

| |
|--------------------------|
| 101 = 4GB SD Memory, RTC |
|--------------------------|

1. Polypropylene liner available through 6"
2. Ebonite liner available in sizes 8" and larger
3. Wafer connection available for meter sizes 1" – 4"

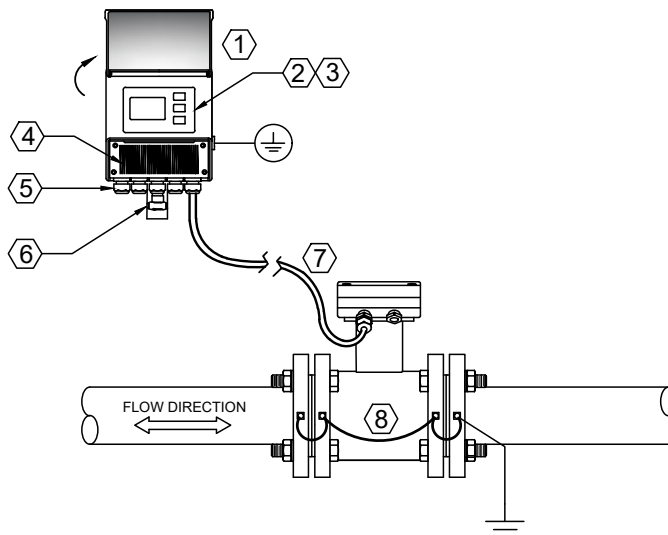
INSTALLATION DETAILS

A. Integral Mount in Conductive Pipe



1. IP67 (NEMA 4X) enclosure with protection cover available in integral or remote mount version
2. 16-Character, 8-Line graphic backlit LCD display
3. Menu driven user interface via three (3) programming keys
4. Wiring connections via pluggable terminal blocks located beneath the front access cover
5. Five (5) threaded conduit/ strain relief openings located at the bottom of the enclosure
6. Process connection available in flanged (ANSI 150 or ANSI 300) or wafer models
7. Flange grounding kit for flanged or wafer versions

B. Remote Mount in Conductive Pipe

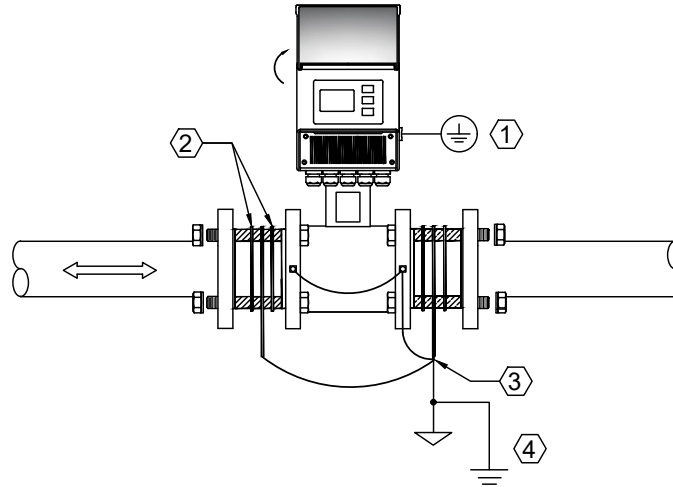


1. IP67 (NEMA 4X) enclosure with protection cover available in integral or remote mount version
2. 16-Character, 8-Line graphic backlit LCD display
3. Menu driven user interface via three (3) programming keys
4. Wiring connections via pluggable terminal blocks located beneath the front access cover
5. Five (5) threaded conduit/ strain relief opening located at the bottom of the enclosure
6. Remote mount hardware kit
7. Remote mount cable
8. Flange grounding kit for flanged or wafer versions

INSTALLATION DETAILS (CONTINUED)

C. Optional Grounding Rings Accessory in Non-Conductive Pipe

Grounding rings are required whenever meters are installed in non-metallic or lined pipes. Grounding rings placed before and after the meter eliminate electrical noise that will interfere with the proper operation of the meter. ONICON provides grounding rings as an optional accessory.

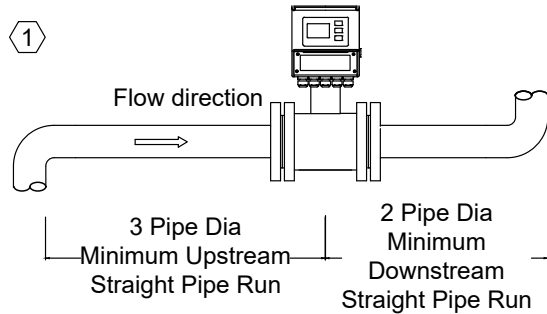


1. Protection ground connection
2. Required gaskets (4pl) to be provided by installing contractor
3. Grounding rings required for non-conductive (non-metallic) or lined pipes (2pl)
4. Earth ground connection

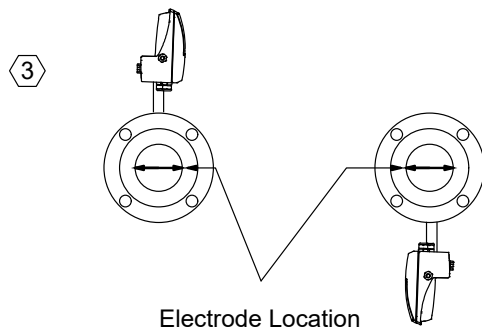
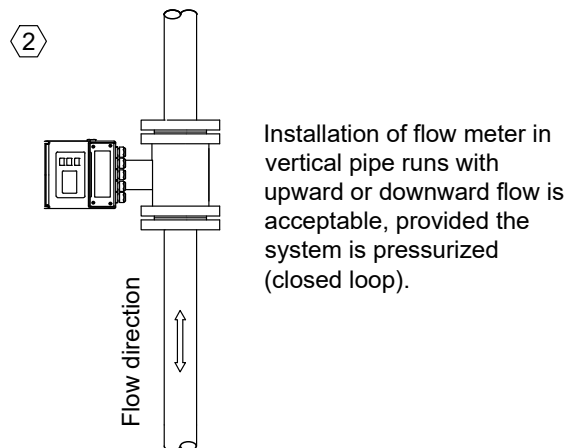
MINIMUM STRAIGHT RUN REQUIREMENTS

The straight run requirements presented below represent the minimum requirements for accurate flow measurement. For optimum performance, provide as much additional straight run as possible.

RECOMMENDED INSTALLATION

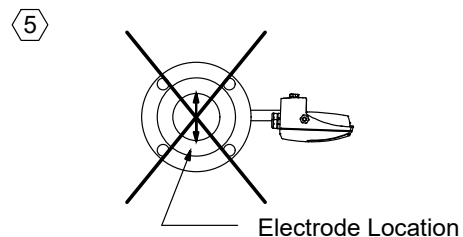
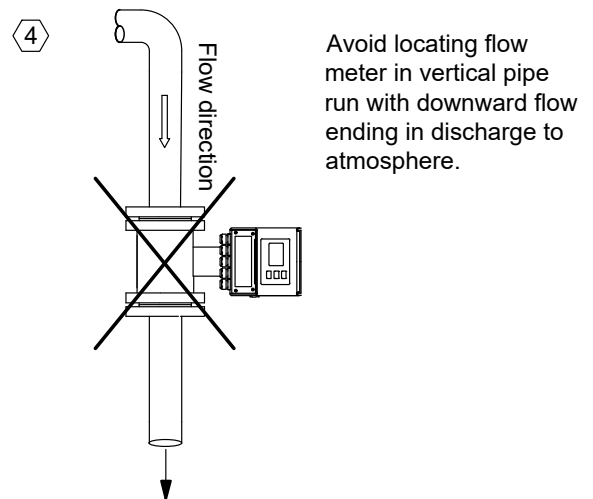


Locate flow meter in a straight run of pipe, free of bends, tees, valves and other obstructions.



Locate flow meter in horizontal pipe run with electrodes at the 3 and 9 o'clock position.

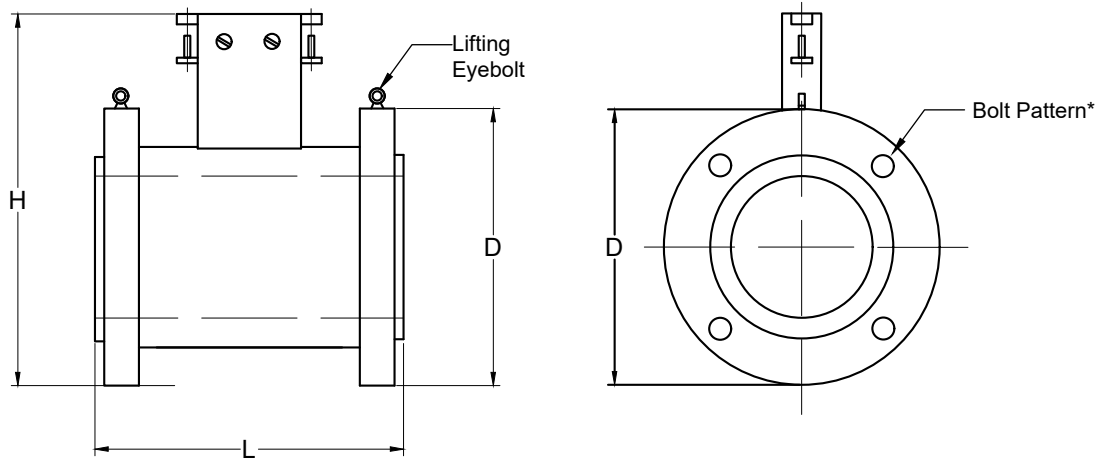
INSTALLATION TO BE AVOIDED



Sediment or entrained air can affect the electrodes in the 12 and 6 o'clock position.

DIMENSIONS

A. Flanged Sensor Dimensions and Weights



*Bolt pattern is dependent on the type and size of the flanges

| ANSI Class 150 Flanged Sensor Size | | | | | | | | | | | | |
|------------------------------------|------|-------|------|------|------|------|-------|------|-------|-------|-------|-------|
| Nominal Diameter | 1" | 1.25" | 1.5" | 2" | 2.5" | 3" | 4" | 5" | 6" | 8" | 10" | 12" |
| Length (L above) | 7.87 | 7.87 | 7.87 | 7.87 | 7.87 | 7.87 | 9.84 | 9.84 | 11.81 | 13.78 | 17.72 | 19.68 |
| Height (H above) | 7.13 | 7.55 | 8.15 | 8.74 | 9.64 | 10.2 | 11.34 | 12.4 | 13.43 | 15.79 | 18.15 | 20.75 |
| Flange Dia (D above) | 4.24 | 4.64 | 5 | 5.98 | 7 | 7.52 | 9.02 | 10 | 10.98 | 13.5 | 15.98 | 19.02 |
| Weight in lbs | 6.6 | 6.6 | 7.7 | 13.2 | 17.6 | 24.2 | 35.2 | 39.6 | 57.2 | 88 | 132 | 220 |

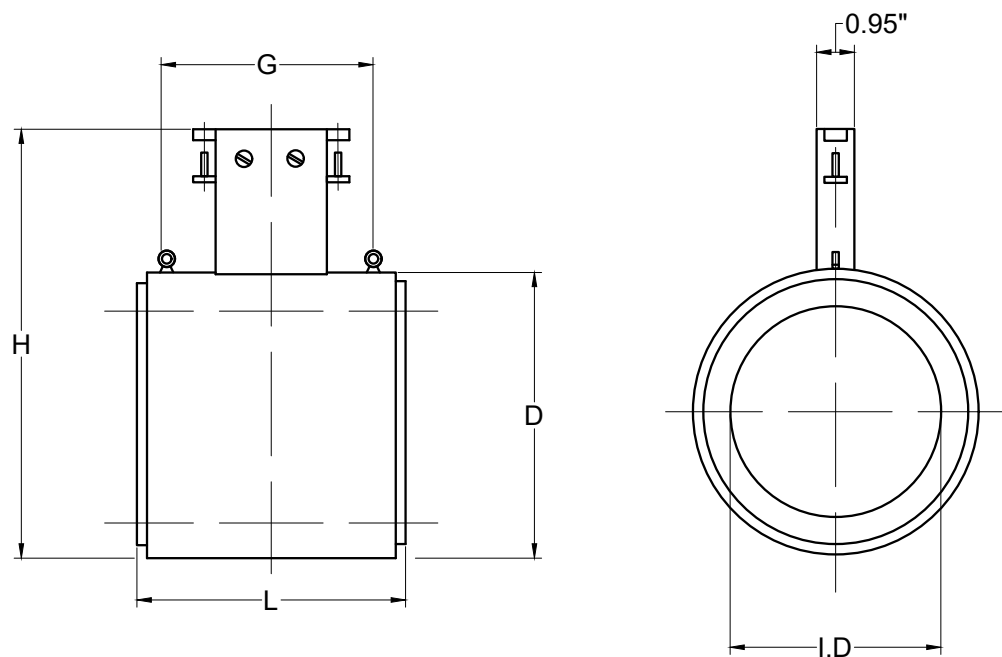
| ANSI Class 150 Flanged Sensor Size | | | | | | | | | | | |
|------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Nominal Diameter | 14" | 16" | 18" | 20" | 24" | 26" | 30" | 34" | 36" | 42" | 48" |
| Length (L above) | 21.65 | 23.62 | 23.62 | 23.62 | 23.62 | 25.59 | 29.53 | 33.46 | 35.43 | 41.33 | 47.24 |
| Height (H above) | 22.91 | 25.16 | 27.08 | 29.57 | 34.09 | 36.26 | 40.63 | 45.24 | 47.48 | 53.34 | 60.23 |
| Flange Dia (D above) | 20.98 | 23.5 | 25 | 27.52 | 32.01 | 34.25 | 38.74 | 43.74 | 45.98 | 53 | 59.49 |
| Weight in lbs | 275 | 396 | 484 | 550 | 650 | 726 | 990 | 1276 | 1320 | 2112 | 2500 |

| ANSI Class 300 Flanged Sensor Size | | | | | | | | | | | | |
|------------------------------------|------|-------|------|------|------|-------|-------|-------|-------|-------|-------|-------|
| Nominal Diameter | 1" | 1.25" | 1.5" | 2" | 2.5" | 3" | 4" | 5" | 6" | 8" | 10" | 12" |
| Length (L above) | 7.87 | 7.87 | 7.87 | 7.87 | 7.87 | 7.87 | 9.84 | 9.84 | 11.81 | 13.78 | 17.72 | 19.68 |
| Height (H above) | 7.48 | 7.83 | 8.7 | 8.98 | 9.88 | 10.55 | 11.81 | 12.91 | 14.17 | 16.54 | 18.9 | 21.5 |
| Flange Dia (D above) | 4.88 | 5.24 | 6.14 | 6.5 | 7.52 | 8.27 | 10 | 10.98 | 12.52 | 15 | 17.52 | 20.51 |
| Weight in lbs | 11 | 11 | 15.4 | 19.8 | 24.2 | 28.6 | 44 | 52.8 | 66 | 154 | 220 | 286 |

| ANSI Class 300 Flanged Sensor Size | | | | | | | | | |
|------------------------------------|-------|-------|-------|-------|-------|-------|---------|---------|---------|
| Nominal Diameter | 14" | 16" | 18" | 20" | 24" | 26" | 30" | 34" | 36" |
| Length (L above) | 21.65 | 23.62 | 23.62 | 23.62 | 23.62 | 25.59 | 29.53 | 33.46 | 35.43 |
| Height (H above) | 23.9 | 26.14 | 28.58 | 30.31 | 36.06 | 39.45 | 44.13 | 48.43 | 50.87 |
| Flange Dia (D above) | 22.99 | 25.51 | 27.99 | 30.51 | 35.98 | 38.27 | 42.99 | 47.52 | 50 |
| Weight in lbs | 396 | 528 | 805 | 970 | 1489 | 1712 | Inquire | Inquire | Inquire |

DIMENSIONS (CONTINUED)

B. Wafer Style Sensor Dimensions and Weights

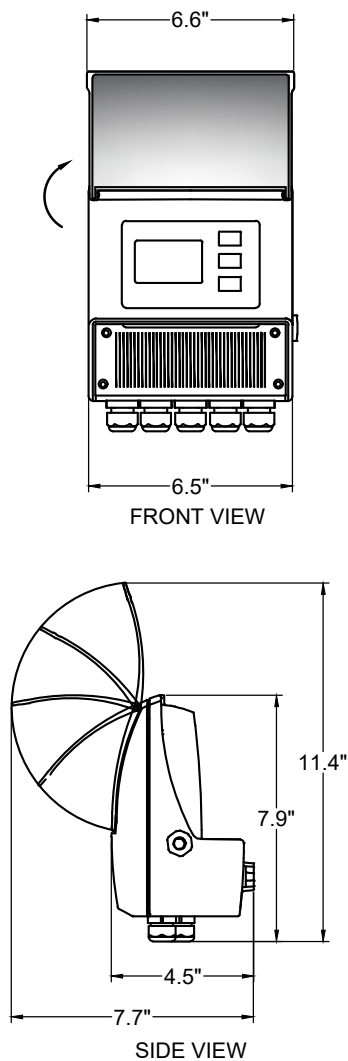


| Wafer Style Sensor Size | | | | | | |
|-------------------------|------|------|------|------|------|------|
| Nominal Dia | 1" | 1.5" | 2" | 2.5" | 3" | 4" |
| Length (L) | 3.94 | 3.94 | 3.94 | 5.90 | 5.90 | 5.90 |
| Height (H) | 5.79 | 6.34 | 6.97 | 7.83 | 8.23 | 9.25 |
| Wafer Dia (D) | 2.20 | 2.76 | 3.39 | 4.25 | 4.65 | 5.67 |
| Net Weight in lbs | 2.60 | 4 | 4.40 | 7.90 | 8.40 | 11 |

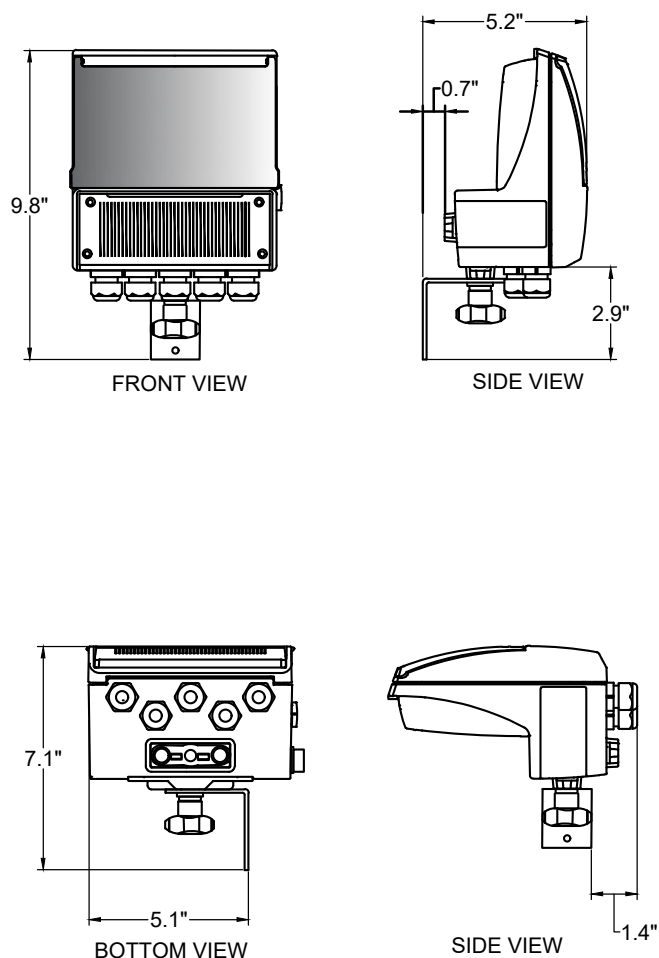
DIMENSIONS (CONTINUED)

C. Overall Dimensions

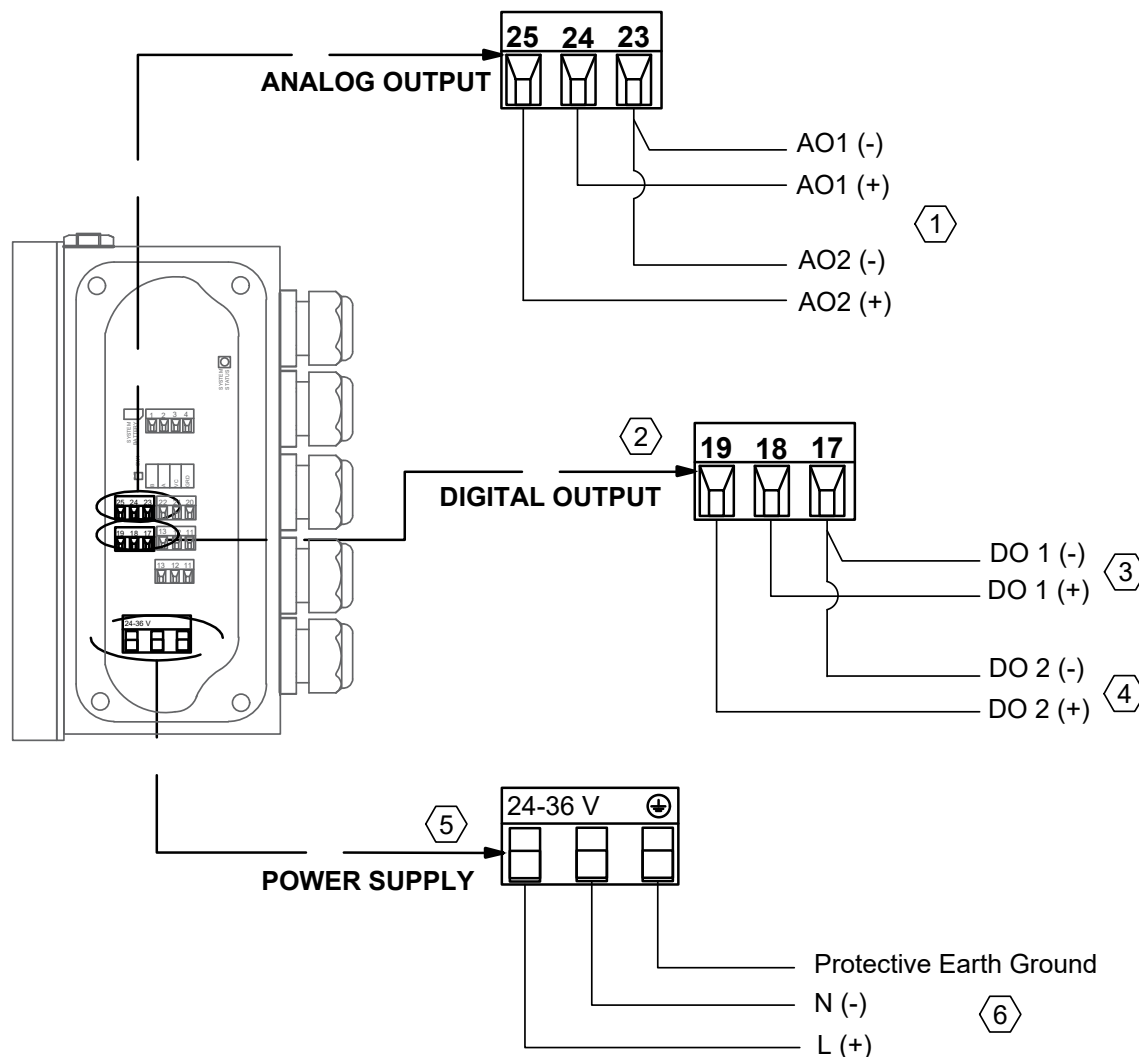
Integral Mount Overall Dimensions



Remote Mount Overall Dimensions



WIRING CONNECTIONS



1. Provide two (2) wires for use with one (1) or two (2) 4-20mA active analog output
2. Open collector switch output with 1250 Hz, 100 mA, 30 VDC max
3. Provide two (2) wires for use with DO 1, typically configured as a frequency output for use with ONICON peripheral equipment
4. Provide two (2) wires for use with DO 2, configured as a scaled pulse for totalizing flow or as a flow direction switch
5. Power supply voltage must be selected at time of order, it cannot be changed in the field. Input power options:
 - Low power, 24 VAC/DC, 50/60 Hz, 12 VA
 - High power, 120-240 VAC, 50/60 Hz, 12 VA
6. Provide a three (3) wire service including one (1) dedicated conductor for protective earth grounding

FT-3200 SUBMITTAL AND DATA SHEET



| ITEM | TAG/QTY | APPLICATION | LIQUID TYPE | DESIGN FLOW | METER MODEL SELECTION | GROUNDING RINGS | REFERENCE SHEET | ASSOCIATED PERIPHERAL | NOTES |
|------|---------|-------------|-------------|-------------|-----------------------|-----------------|-----------------|-----------------------|-------|
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

FT-3200 SUBMITTAL AND DATA SHEET

TO:

DATE:

PROJECT NAME:

CONTRACTOR:

ENGINEER:

ONICON REP:

SUBMITTAL FOR:

RECORD

APPROVAL

APPROVED BY:

RELEASED FOR:

MANUFACTURING AND SHIPMENT

HOLD FOR RELEASE

APPROVED

APPROVED AS NOTED

DISAPPROVED

EXPLANATION:

PLEASE RETURN APPROVED DRAWINGS TO:

ATTENTION:

SUBMITTED BY:



END OF ADDENDA #5