
SECTION 5
SPECIFICATIONS

SECTION 011100 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 LOCATION OF THE PROJECT

- A. The project is located in the Village of Hiram.

1.2 PROJECT DESCRIPTION

- A. The project consists of installing a complete, turn-key Advanced Metering Infrastructure (AMI) system for measuring potable water usage on all 286 utility meter accounts on the Village's water system.

1.3 SPECIFICATIONS

- A. In general, these Specifications describe the work to be performed by the various trades, other than work specifically excluded. It shall be the responsibility of the Contractor and Subcontractors to perform all work incidental to their trade, whether or not specific mention is made of each item, unless such incidentals are included under another Item.
- B. It is advised that the Contractor and all Subcontractors familiarize themselves with the contents of the complete Specifications, particularly for the trades preceding, following, related or adjacent to their work.

END OF SECTION 011100

SECTION 011423 - ADDITIONAL WORK, OVERTIME

PART 1 - GENERAL

1.1 NIGHT, SUNDAY AND HOLIDAY WORK

- A. No work will be permitted at night, Sunday or legal holidays except as noted on the plans or in the case of emergency and then only upon written authorization of the Engineer. Where no emergency exists, but the Contractor feels it advantageous to work at night, Sunday or legal holidays, the Contractor shall notify the Engineer at least two (2) days in advance, requesting written permission. Any work performed during the absence of the Engineer will be done at the Contractor's risk and responsibility and may be subject to rejection upon later inspection.

END OF SECTION 011423

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements governing Alternates.

1.3 DEFINITIONS

- A. Definition: An alternate is an amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate the Alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

- A. Coordination: Modify or adjust affected adjacent Work as necessary to completely and fully integrate that Work into the Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.
- B. Notification: Immediately following the award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate whether alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- C. Execute accepted alternates under the same conditions as other Work of this Contract.
- D. Schedule: A "Schedule of Alternates" is included at the end of this Section.

Specification Sections referenced in the Schedule contain requirements for materials necessary to achieve the Work described under each alternate.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. 1A: AMI System Integration, Setup, Training, and SAAS Hosting Agreement (Years 1-4)
- B. Alternate No. 2A: Annual Service or Maintenance Agreements for all products, extended warranties, etc. (Years 5-6)
- C. Alternate No. 2B: Annual Service or Maintenance Agreements for all products, extended warranties, etc. (Years 7-8)
- D. Alternate No. 2C: Annual Service or Maintenance Agreements for all products, extended warranties, etc. (Years 9-10)
- E. Alternate No. 23A: Customer Interface Portal Software, First 2 Years

END OF SECTION 012300

SECTION 012513 – PRODUCT SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 MATERIALS AND EQUIPMENT

- A. In the specifications and on the Engineer's drawings, are specified and shown certain pieces of equipment and materials deemed most suitable for the service anticipated. This is not done to eliminate other equipment and materials equally as good and efficient. The Contractor shall prepare his bid on the particular materials and equipment specified. Following the award of the contract, should the Contractor desire to use other equipment and materials, he shall submit to the Owner a written request for such change and state the advantage to the Owner and the savings or additional cost involved by the proposed substitution. The determination as to whether or not such change will be permitted rests with the Owner and the Engineer. Use forms included in Specification Section 013323 Paragraph 1.4.
- B. Each major item of equipment shall be inspected by a manufacturer's representative during installation and upon completion of the work. The Contractor shall supply the Engineer with a certificate of such inspection.
- C. For the purpose of standardization, equipment of any one type shall be the products of one manufacturer.
- D. Provide interchangeable components of the same manufacture for components being replace.

END OF SECTION 012513

SECTION 013216 – CONSTRUCTION PROGRESS SCHEDULE

PART 1 - GENERAL

1.1 PROGRESS SCHEDULE

- A. Immediately after signing the Contract, the General Construction Contractor shall prepare a graphic progress schedule, indicating the work to be executed during each month and the rate of expected progress to secure completion on the agreed-upon completion date. The progress schedule shall be approved by the Engineer and Owner prior to starting work on the site. Copies of such graphic progress charts, upon which has been indicated the actual progress, shall be furnished to the Engineer with each requisition for payment.
- B. Should the rate of progress fall materially behind the scheduled rate of progress, and unless the delay is authorized by the Engineer, each offending Contractor shall furnish additional labor, work overtime, or take other necessary means required for completion of the work on the scheduled date. No additional compensation beyond the set Contract price shall be paid for action taken or overtime expense incurred in maintaining scheduled progress.

END OF SECTION 013216

SECTION 013323 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 - GENERAL

1.1 GENERAL

- A. The Contractor shall submit detailed drawings, acceptable catalog data, specifications and material certifications for all equipment and materials specified or required for the proper completion of the work.
- B. The intent of these items is to demonstrate compliance with the design concept of the work and to provide the detailed information necessary for the fabrication, assembly and installation of the work specified. It is not intended that every detail of all parts of manufactured equipment be submitted, however sufficient detail will be required to ascertain compliance with the specifications and establish the quality of the equipment proposed.

Shop Drawings shall be sufficiently clear and complete to enable the Engineer/Architect and Owner to determine that items proposed to be furnished conform to the specifications and that items delivered to the site are actually those that have been reviewed.

- C. It is emphasized that the Engineer/Architect's review of Contractor's submitted data is for general conformance to the contract drawings and specifications but subject to the detailed requirements of drawings and specifications. Although the Engineer/Architect may review submitted data in detail, such review is an effort to discover errors and omissions in Contractor's drawings. The Engineer/Architect's review shall in no way relieve the Contractor of his obligation to properly coordinate the work and to Engineer/Architect the details of the work in such manner that the purposes and intent of the contract will be achieved. Such review by the Engineer/Architect shall not be construed as placing on him or on the Owner any responsibility for the accuracy and for proper fit, functioning or performance of any phase of the work included in the contract.
- D. Shop Drawings shall be submitted in proper sequence and with due regard to the time required for checking, transmittal and review so as to cause no delay in the work. The Contractor's failure to transmit appropriate submittals to the Engineer/Architect sufficiently in advance of the work shall not be grounds for time extension.
- E. The Contractor shall submit Shop Drawings for all fabricated work and for all manufactured items required to be furnished in the Contract in accordance with the General Provisions and as specified herein. Shop Drawings shall be submitted in sufficient time to allow at least twenty-one (21) calendar days after receipt of the Shop Drawings from the Contractor for checking and processing by the Engineer/Architect.
- F. It is the responsibility of each Prime Contractor to furnish to all other Prime Contractors and especially the General Construction Contractor reviewed Shop Drawings for guidance in interfacing the various trades; i.e., sleeves, inserts, anchor bolts, terminations, and space requirements.

- G. No work shall be performed requiring Shop Drawings until same have been reviewed by Engineer/Architect.
- H. Accepted and reviewed Shop Drawings shall not be construed as approval of changes from Contract plan and specification requirements.
- I. The Engineer/Architect will review the first and second Shop Drawing item submittals at no cost to the Contractor. Review of the third submittal and any subsequent submittal will be at the Contractor's expense. Payment will be deducted from the Contract amount at a rate of 2.8 times direct labor cost plus expenses.

1.2 SUBMITTAL PROCEDURE

- A. As a minimum, submittals are required for the following items:

Section No.	Equipment or Material	Shop Drawings Required	O&M Manual Required
330908.01	Meter Transmission Units	X	X
330908.01	Data Collection Units	X	X
331900.01	Utility Meters	X	X
330908.01	Web hosted software	X	

Submittals for additional items shall be submitted when required by other specification sections and/or deemed necessary by the Engineer.

- B. All required submissions shall be made to the Engineer/Architect by the Prime Contractor(s) only. Any data prepared by subcontractors and suppliers and all correspondence originating with subcontractors, suppliers, etc., shall be submitted through the Contractor.
- C. Contractor shall review and approve all Shop Drawings prior to submission. Contractor's approval shall constitute a representation to Owner and Engineer/Architect that Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data or assumes full responsibility for doing so, and that Contractor has reviewed or coordinated each Shop Drawing or sample with the requirements of the work and the Contract Documents.
- D. Submittal Preparation: Mark each submittal with a permanent label or page for identification. Provide the following information on the label for proper processing and recording of action taken:
 - 1. Location
 - 2. Project Name
 - 3. Contract
 - 4. Name and Address of Engineer/Architect
 - 5. Name and Address of Contractor
 - 6. Name and Address of Subcontractor
 - 7. Name and Address of Supplier

8. Name of Manufacturer
9. Number and Title of appropriate Specification Section
10. Drawing Number and Detail References, as appropriate.
11. Submittal Sequence or Log Reference Number.

- a. Provide a space on the label for the Contractor's review and approval markings and a space for the Engineer/Architect's "Action Stamp".

- E. Each Shop Drawing, sample and product data submitted by the Contractor shall have affixed to it the following Certification Statement including the Contractor's Company name and signed by the Contractor:

Certification Statement: By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements.

Signature

Date

Company

- F. Shop Drawings shall be submitted in not less than six (6) copies to the Engineer/Architect at the address specified at the Preconstruction Conference. Single mylar or sepia reproducible copies of simple Shop Drawings may be submitted with prior approval of the Engineer/Architect.
- G. At the time of each submission, Contractor shall in writing identify any deviations that the Shop Drawings or samples may have from the requirements of the Contract Documents.
- H. Drawings shall be clean, legible and shall show necessary working dimensions, arrangement, material finish, erection data, and like information needed to define what is to be furnished and to establish its suitability for the intended use. Specifications may be required for equipment or materials to establish any characteristics of performance where such are pertinent. Suitable catalog data sheets showing all options and marked with complete model numbers may, in certain instances, be sufficient to define the articles which it is proposed to furnish.
- I. For product which require submittal of samples, furnish samples so as not to delay fabrication, allowing the Engineer reasonable time for the consideration of the samples submitted. Properly label samples, indicating the material or product represented, its place of origin, the names of the vendor and Contractor and the name of the project for which it is intended. Ship samples prepaid. Accompany samples with pertinent data required to judge the quality and acceptability of the sample, such as certified test records and, where required for proper evaluation, certified chemical analyses.

1.3 REVIEW PROCEDURE

- A. Engineer/Architect will review with reasonable promptness all properly submitted Shop Drawings. Such review shall be only for conformance with the design concept of the Project and for compliance with the information given in the plans and specifications and shall not extend to means, methods, sequences, techniques or procedures of construction or to safety precautions or programs incident thereto.
- B. The review of a separate item as such will not constitute the review of the assembly in which the item functions. The Contractor shall submit entire systems as a package.
- C. All Shop Drawings submitted for review shall be stamped with the Engineer/Architect's action and associated comments.
- D. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Engineer/Architect will review each submittal, mark to indicate action taken, and return accordingly. Compliance with specified characteristics is the Contractor's responsibility.

Action Stamp: The Engineer/Architect will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken:

- 1. If Shop Drawings are found to be in general compliance, such review will be indicated by marking the first statement.
 - 2. If only minor notes in reasonable number are needed, the Engineer/Architect will make same on all copies and mark the second statement. Shop Drawings so marked need not be resubmitted.
 - 3. If the submitted Shop Drawings are incomplete or inadequate, the Engineer/Architect will mark the third statement, request such additional information as required, and explain the reasons for revision. The Contractor shall be responsible for revisions, and/or providing needed information, without undue delay, until such Shop Drawings are acceptable. Shop Drawings marked with No. 3 shall be completed resubmitted.
 - 4. If the submitted Shop Drawings are not in compliance with the Contract Documents, the Engineer/Architect will mark the fourth statement. The Contractor will be responsible to submit a new offering conforming to specific products specified herein and/or as directed per review citations.
- E. No submittal requiring a Change Order for either value or substitution or both, will be returned until the Change Order is approved or otherwise directed by the Owner.

1.4 APPLICATIONS FOR ALTERNATIVE MATERIALS

- A. If equipment or materials are not available as specified, and/or if Contractor believes that the use of different equipment or materials are necessary for any reason as defined above or as included in Specification Section 012513, he may use the applications noted below, as appropriate to request review and approval.
 - 1. Application for Use of Substitute Item
 - 2. Application for Use of “Or Equal” Item

END OF SECTION 013323

APPLICATION FOR USE OF SUBSTITUTE ITEM

TO: _____

PROJECT: _____

SPECIFIED ITEM:

Page	Paragraph	Description
A.		The undersigned requests consideration of the following as a substitute item in accordance with Article 6.05 of the General Conditions.
B.		Change in Contract Price (indicate + or -) \$ _____
C.		Attached data includes product description, specifications, drawings, photographs, references, past problems and remedies, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified. For consideration of the attached data as SHOP DRAWINGS, submittal shall be in accordance with requirements of Section 013323.
D.		Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The undersigned certifies that the following paragraphs, unless modified by attachments are correct:

1. The proposed substitute does not affect dimensions shown on Drawings.
2. The undersigned will pay for changes to the building design, including engineering design, detailing, and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse affect on other contractors, the construction schedule, or specified warranty requirements. (If proposed substitution affects construction schedule, indicate below using + or -)

_____ CONSECUTIVE CALENDAR DAYS

4. Maintenance and service parts will be locally available for the proposed substitution.

The undersigned further states that the function, appearance, and quality of the proposed substitution are equivalent or superior to the specified item, and agrees to reimburse the OWNER for the charges of the ENGINEER for evaluating this proposed substitute item.

E. Signature:

Firm:

Address:

Telephone:

Date:

Attachments:

For use by ENGINEER:

_____ Accepted as evidenced by affixed SHOP DRAWING REVIEW stamp.

_____ Accepted as evidenced by included CHANGE ORDER.

_____ Not accepted as submitted. See Remarks.

_____ Acceptance requires completion of submittal as required for SHOP DRAWINGS.

_____ Not accepted. Do not resubmit.

By:

Date:

Remarks:

APPLICATION FOR USE OF "OR-EQUAL" ITEM

TO: _____

PROJECT: _____

SPECIFIED ITEM:

Page	Paragraph	Description
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A. The undersigned requests consideration of the following as an "or-equal" item in accordance with Article 6.05 of the General Conditions.

B. Change in Contract Price (indicate + or -) \$ _____

C. Attached data includes product description, specifications, drawings, photographs, references, past problems and remedies, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified. For consideration of the attached data as SHOP DRAWINGS, submittal shall be in accordance with requirements of Section 013323.

D. Signature:

Firm: _____

Address: _____

Telephone: _____

Date: _____

Attachments: _____

For use by ENGINEER:

_____ Accepted as evidenced by affixed SHOP DRAWING REVIEW stamp.

_____ Accepted as evidenced by included CHANGE ORDER.

_____ Not accepted as submitted. See Remarks.

_____ Acceptance requires completion of submittal as required for SHOP DRAWINGS.

_____ Not accepted. Do not resubmit.

By: _____ Date: _____

Remarks: _____

SECTION 013326 – PRODUCT TESTING AND CERTIFYING

PART 1 - GENERAL

1.1 QUALITY OF MATERIALS

- A. Where the specifications call for mill or shop tests, the Contractor shall furnish duplicate copies of attested manufacturer's certificates showing details of quality or performance sufficient to demonstrate conformity to contract requirements. Mill, shop or witness tests shall be subject to view by the Engineer's representative, but the Engineer's representation shall not relieve the Contractor from the necessity of furnishing certificates specified. The Engineer shall be notified by the Contractor in writing, sufficiently in advance of the time of making tests, so that proper arrangements may be made. Waiving of witness of tests by the Engineer may be in writing only by the Engineer. All costs for travel, lodging, food and transportation that are necessary for the Engineer's representative and the Owner's representative to attend witness tests shall be included in the Contractor's bid for those item(s) specifically designated as being subject to witness testing.
- B. Unless otherwise specified, all materials, equipment and articles shall be erected, installed, applied, or connected, used, cleaned and conditioned in accordance with the printed instructions and directions of the manufacturer.
- C. The installation shall be so made that its several component parts will function together as a workable system. It shall be complete with all accessories necessary for its operation and shall be left with all equipment properly adjusted and in working order.
- D. The work shall be executed in conformity with the best practice and to contribute to efficiency of operation, minimum maintenance, accessibility and sightliness. It shall also be executed so that the installation will conform and accommodate itself to the building structure, its equipment and usage.
- E. Whenever in the contract documents a particular brand, make of material, device or equipment is shown or specified, such brand, make of material, device or equipment is to be regarded merely as a standard and such trade name shall be followed by "or equal".

1.2 QUALITY ASSURANCE

- A. The equipment and materials to be furnished under this Contract shall be the products of well-established and reliable firms, which have had ample experience for at least five (5) years in the manufacture of equipment or materials similar in design and of equal quality to that specified. If required, the manufacturer shall submit a list of installations of similar equipment, which have been in successful operation for at least five (5) years.

1.3 EXPERIENCE CLAUSE REQUIREMENT AND PERFORMANCE BONDS FOR MANUFACTURER

- A. For every piece of equipment furnished under this Contract, the manufacturer will be required to have a minimum of five (5) years of experience in providing this specific type of equipment. In lieu of this experience requirement, the manufacturer will be required to provide performance bond(s) for the faithful performance of the equipment and guarantee payment in a sum of not less than one hundred and fifty percent (150%) of the total equipment price for the completed work for that item. In the absence of verifiable experience, the manufacturer will be required to provide the performance bond(s) for the same number of years that the manufacturer was found lacking in experience from the specified five (5) year period. The performance bond(s) shall be from an approved surety company, to the satisfaction of the Owner's Law Director.
- B. Agents of bonding companies which write bonds for the performance and payment of the contract shall furnish power of attorney bearing the seal of the company, evidencing such agent's authority to execute the particular type of bond to be furnished, and evidencing also the right of the surety company to do business in the State of Ohio. Copy of this proof shall be attached to each copy of the contract.
- C. The bond shall be purchased through a surety company with a local agent upon whom service of process can be made.
- D. In event of failure of surety or co-surety, the manufacturer shall immediately furnish a new bond, as required herein. The manufacturer's bond will not be released until all provisions of the contract have been fulfilled.
- E. The surety used for the bid bond and performance bond shall be listed in the latest U.S. Treasury Circular 570 and the Penal Sums shall be within the maximum specified for such company in said Circular 570.

END OF SECTION 013326

SECTION 013543 - ENVIRONMENTAL PROTECTION

PART 1 - GENERAL

1.1 UNNECESSARY NOISE, DUST AND ODORS

- A. The Contractor's performance of this contract shall be conducted so as to eliminate all unnecessary noise, dust and odors.

1.2 SEWAGE, SURFACE AND FLOOD FLOWS

- A. The Contractor shall take whatever action is necessary to provide all necessary tools, equipment and machinery to adequately handle all sewage, surface flows and flood flows which may be encountered during the performance of the work. The entire cost of and liability for handling such flows is the responsibility of the Contractor and shall be included in the price for the appropriate item.

1.3 WORK IN FREEZING WEATHER

- A. Written permission from the Engineer shall be obtained before any work is performed which, in the judgment of the Engineer, may be affected by frost, cold, or snow. When work is performed under such conditions, the Contractor shall provide facilities for heating the materials and for protecting the finished work.

1.4 POLLUTION CONTROL

- A. It shall be the responsibility of the Contractor to prevent or limit pollution of air and water resulting from his operations.
- B. The Contractor shall perform work required to prevent soil from eroding or otherwise entering onto all paved areas and into natural watercourses, ditches, and public sewer systems. This work shall conform to all local ordinances and/or regulations, if any, and if not otherwise regulated by local ordinances or regulations shall at a minimum conform to the Ohio EPA General Storm Water NPDES Permit for Construction Activities and the Ohio Department of Natural Resources Rainwater and Land Development manual. This work may consist of but not be limited to construction and continual maintenance of silt fence, bio bag filters, sedimentation traps, stilling basins, check dams, temporary seeding, temporary mulching, erosion mats and other means to clarify waters containing suspended materials from excavations, embankments, cleared and grubbed or stripped areas, stockpiles, well points, and disposal sites and shall be commensurate with the contractor's schedule, sequence of work, means and methods. If a SWPPP plan is not required for the project, the contractor shall at a minimum submit a plan of his proposed erosion control prevention methods for approval by the Owner and/or other regulatory authorities having jurisdiction prior to starting any construction activities which may cause erosion.

- C. The Contractor shall perform work required to prevent dust attributable to his operations from entering the atmosphere. Dust on unsurfaced streets or parking areas and any remaining dust on surfaced streets shall be controlled with water and/or calcium chloride dust palliative as needed.
- D. Any material removed from sanitary or storm sewers shall be disposed in accordance with all applicable regulations.

END OF SECTION 013543

SECTION 014323 – QUALIFICATIONS OF TRADESMEN

PART 1 - GENERAL

1.1 CHARACTER OF WORKMEN AND EQUIPMENT

- A. The Contractor shall employ competent and efficient workmen for every kind of work. Any person employed on the work who shall refuse or neglect to obey directions of the Engineer or his representative, or who shall be deemed incompetent or disorderly, or who shall commit trespass upon public or private property in the vicinity of the work, shall be dismissed when the Engineer so orders, and shall not be re-employed unless express permission be given by the Engineer. The methods, equipment and appliances used on the work and the labor employed shall be such as will produce a satisfactory quality of work, and shall be adequate to complete the contract within the specified time limit.

- B. In hiring of employees for the performance of work under this Contract, or any Subcontract hereunder, no Contractor or Subcontractor, nor any person acting on behalf of such Contractor or Subcontractor, shall, by reason of race, sex, creed or color, discriminate against any citizen of the State of Ohio in the work to which the employment relates. No Contractor, Subcontractor, nor any person on his behalf shall, in any manner, discriminate against or intimidate any employee hired for the performance of work under this contract on account of race, creed, sex or color.

END OF SECTION 014323

SECTION 016600 - PRODUCT HANDLING AND PROTECTION

PART 1 - GENERAL

1.1 DELIVERY AND STORAGE OF MATERIALS

- A. The Contractor shall be responsible for delivery and storage of all materials.
- B. The Contractor shall coordinate with the Engineer on the arrangement for storing construction materials and equipment. Deliveries of all construction materials and equipment should be made at suitable times.
- C. The Contractor shall store all materials required for the performance of this contract at sites designated by the Engineer.
- D. All stockpiles shall be neat, compact, completely safe, and barricaded with warning lights if necessary.
- E. Precautions shall be taken so that no shade trees, shrubs, flowers, sidewalks, driveways or other facilities will be damaged by the storage of materials. The Contractor shall be responsible for the restoration of all stockpile sites to their original condition.
- F. Materials, tools and machinery shall not be piled or placed against shade trees, unless they shall be amply protected against injury therefrom. All materials, tools, machinery, etc. stored upon public thoroughfares must be provided with red lights at night time so as to warn the traffic of such obstruction.
- G. Materials shall be so stored as to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, shall again be inspected prior to their use in the work. Stored materials shall be located so as to facilitate their prompt inspection. Approved portions of the construction site may be used for storage purposes and for the placing of the Contractor's plant and equipment, but any additional space required therefore must be provided by the Contractor at his expense. Private property shall not be used for storage purposes without written permission of the property owner or lessee, and copies of such written permission shall be furnished the Engineer. All storage sites shall be restored to their original condition by the Contractor at his expense.

END OF SECTION 016600

SECTION 017517 - STARTING OF SYSTEMS / COMMISSIONING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. This Section includes general requirements for the commissioning of the Work and start-up and operation of systems and equipment.

1.2 SUMMARY

- A. Starting, testing, and operating the completed Work including systems and equipment until Substantial Completion is achieved and operation of the completed Work including systems or equipment are accepted by the Owner. Contractor shall cooperate and coordinate with the Owner in the operation, maintenance, and adjustment of the Work.

1.3 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and other Division 1 Specifications Sections, apply to this Section.

1.4 DEFINITIONS

- A. Commissioning: Commissioning is the series of activities, or process, necessary to ensure that systems and equipment are designed, installed, functionally tested, started up and capable of being operated and maintained to perform in conformity with the design intent for the facility improvements. Commissioning includes, but is not limited to factory testing, field testing, dry testing, wet testing, performance testing, manufacturer's checkout, start-up, and Operational Demonstration.

- B. Factory Testing: Factory Testing is performance testing, operation testing, or documentation verification conducted in the production facilities, or specialized test facilities, of the equipment supplier. Such testing shall conform to the requirements of the individual sections of the Contract Documents.

"Witnessed" Factory Testing shall mean that the testing is witnessed by the Owner or his designated representative.

- C. Field Testing: Field Testing is performance testing, operation testing, or documentation verification conducted in the field after installation, to provide comparison with the results obtained in the Factory Testing.

- D. Dry Testing: Dry Testing is performed by the Contractor without introducing either process material or other test material into the component, system, or unit process.
- E. Wet Testing: Wet Testing is testing performed by the Contractor utilizing test material in the component, system, or unit process. Tankage shall be filled with test material to operating level.
- F. Performance Testing: Performance Testing is performed by the Contractor to demonstrate system performance in accordance with the Project Manual requirements.
- G. Manufacturer's Check-Out: Field inspection, testing, adjustments, and sign off by the approved representative of the Manufacturer, indicating that the component, system, or unit process meets the manufacturer's requirements.
- H. Start-Up: Narrowly defined as placing a component, system, or unit process on-line. Start-up can be a commissioning activity or a normal operating activity.
- I. Operational Demonstration: A commissioning activity performed by the Contractor wherein the Contractor operates and maintains a fully functional component, system, or unit process for a period of time after stable operation has been achieved.

1.5 SUBMITTALS

- A. Quality Control Submittals:
 - 1. Field Installation Reports – Submit reports by Manufacturer's Representative in accordance with Paragraph 3.4 of this Section.
- B. Commissioning Documentation: Contractor shall prepare and submit all documentation for review and approval. The documentation shall include, but not be limited to, the following:
 - 1. Certification by the preparer that he/she is the person responsible for the data, and that the data is authentic and accurate.
 - 2. Certification by the Contractor or equipment or unit process systems supplier that the equipment or the unit process systems were operated continuously for the specified period and that the equipment or unit process systems operated in compliance with the specified operating conditions, parameters and performance: and that the equipment or unit process systems are suitable for Performance Testing.
 - 3. Pertinent background information shall include, but not be limited to, the following:

- a. Equipment or unit process systems Started-Up and Commissioned
- b. Start-Up and Commissioning dates
- c. Items or performance criteria tested clearly showing requirements and field data that verify requirements were met.
- d. Names of witnesses for Start-Up and Commissioning.
- e. Any repairs, corrections, or modifications required for the equipment or unit process systems to successfully complete Start-Up and Commissioning.
- f. Loop diagrams accurately depicting the installed condition of instrumentation and controls.
- g. Any other important background information.

4. Appendix

- a. A summary of all data used in the calculation, including source, formulas with all terms defined.
- b. Calculations for all data submitted, fully defined.
- c. Copies of all raw field data sheets, including those indicating sampling point locations, and notes.
- d. Production and/or operational data.
- e. Calibration procedures and worksheets for sampling equipment.
- f. Copies of calibration records for instrumentation.
- g. PLC Ladder logic documented with comments.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION AND VERIFICATION OF CONDITION

- A. The Contractor shall inspect systems and equipment prior to each start-up and verify their readiness for start-up. Conditions hazardous to equipment or personnel shall be corrected by the Contractor prior to start-up of equipment.
 - 1. Start-up operations shall not proceed using temporary power or temporary instrumentation and control wiring. All electrical and control connections shall be permanent and complete, and all such electrical components and equipment fully functional.
 - 2. Use of repair parts during start-up operations shall not be permitted, except in such situations where the actual on-site verification of such repair parts' operability is specified.
 - 3. The Contractor shall verify that all initial copies of the Maintenance and Operating Instructions have received an acceptable disposition as defined in Section 013323, and the only outstanding item is the field verification of the Instructions.

- B. On successful completion of Start-up, process flows and solids shall be used for commissioning the equipment and unit process systems to show the equipment and unit process systems function properly. Commissioning shall confirm the proper operation of the equipment and unit process systems with process fluids and process solids, adjustment shall be made, and the equipment or unit process systems shall be optimized and brought into compliance with design criteria in preparation for Operational Demonstration.
- C. The Contractor shall coordinate all Start-up and Commissioning activities for equipment and unit processes. The Contractor shall develop a detailed start-up and commissioning plan that includes the following as a minimum:
 - 1. Description of the overall general start-up and commissioning process.
 - 2. List of equipment and unit process systems included for start-up and commissioning activities.
 - 3. Detailed start-up and commissioning sequence of activities.
 - 4. Listing of staff and responsibilities for activities.
 - 5. Contractor shall use a form that will be provided by the Owner.

3.2 PREPARATION

- A. Prior to start-up of equipment or systems, all necessary test equipment shall be in place and operable.
- B. Approved representative(s) of the Manufacturer and Contractor shall be present for the initial start-up of systems or equipment.
- C. The Contractor shall request permission to start-up equipment, including electrical gear, and notify the Owner using a standard Start-Up Request form.
 - 1. The Start-Up Request shall be submitted to the Owner a minimum of 72 hours before the scheduled start-up. Requests shall be made during normal working hours.
 - 2. The Contractor shall provide all information in the first Section of the Start-Up Request form.
 - 3. The Owner will indicate approval or disapproval of the request.
 - 4. Approval of the request is based solely on impact on plant operations. Approval does not relieve the Contractor of any responsibility for plant and personnel safety.
 - 5. The Contractor shall obtain the approved Start-Up Request prior to the system or equipment start-up.
 - 6. If training is to be conducted in conjunction with the start-up this should be indicated on the Start-Up Request form. All requirements of Section 019215, Instruction of Owner's Personnel must be met for training sessions.
 - 7. Start-ups performed at the direction of the Contractor, per paragraph 3.3(G) of this Section, do not require advance notification to the Engineer.

D. Normal installation checks, such as for rotation, are not considered start-ups and do not normally require start-up notification. For all equipment and systems so designated in the Contract Documents, or so designated by the Engineer, such checks shall be under the supervision of the approved representative of the manufacturer, and shall be reviewed by the Engineer.

1. All electrical apparatus which is energized shall be clearly marked.

3.3 CONDUCT OF START-UP AND COMMISSIONING

A. Start-up:

1. All initial start-ups of equipment or systems shall be performed under the technical direction of the approved representative of the manufacturer.
2. Any lack of readiness of associated systems or failure of a system or equipment previously started prior to the date of Final Completion of the Project shall require additional initial start-up service to be performed, under the direction of the approved representative of the manufacturer.
3. The Contractor shall repair, replace or modify any equipment or system which fails to perform as specified in the Contract Documents. Such repair, replacement or modification of deficient work shall be performed under the terms of the General Conditions.
4. Manufacturer's start-up services are required for Data Collector Units and Web Hosted Software. Additional requirements are specified in 330908.01.

B. The Contractor shall be responsible for commissioning all work. Final acceptance shall be by the Owner.

C. The Contractor is responsible for the performance and operation of the systems and equipment during commissioning.

D. When Owner personnel are operating systems or equipment, the Contractor shall make available, at all times, persons knowledgeable about the systems or equipment to direct the Owner personnel in its operation.

E. The Contractor shall make all adjustments and corrections necessary to achieve normal, stable operation of systems. Adjustment and corrections shall be in accordance with the individual Specification Sections.

F. Any failures of equipment or systems operated under the direction of the Contractor shall be considered deficiencies and shall be corrected in accordance with the General Conditions.

3.4 QUALITY CONTROL

A. Reports of the Approved Representative of the Manufacturer:

1. The approved representative of the manufacturer shall prepare a daily report on each site visit for each system or item of equipment inspected, adjusted, started-up, or worked on.
2. The report shall state the purpose of the visit, the representative's observations and conclusions, and recommendations for further visits or action.
3. The reports shall be submitted in accordance with Section 013323, Shop Drawings, Product Data and Samples within three (3) days of the visit.

END OF SECTION 017517

SECTION 017800 - FINAL COMPLIANCE AND SUBMITTALS

PART 1 - GENERAL

- 1.1 The following forms and related sign-offs shall be documented in accordance with provisions of the contract. These forms shall be completed by the Contractor and approved by the Owner before final retainer is approved for release. Forms for Items A to E will be attached to the Contractor's executed copy of the contract.
- A. Certificate of Substantial Completion (To be submitted at time of Substantial Completion).
 - B. Contractor's Certification of Completion.
 - C. Contractor's Affidavit of Prevailing Wage.
 - D. Consent of Surety Company for Final Payment.
 - E. Affidavit of Final Acceptance Date and Correction Period.
 - F. Before the OWNER will approve and accept the work and release the retainer, the CONTRACTOR will furnish the OWNER a written report indicating the resolution of any and all property damage claims filed with the CONTRACTOR by any party during the construction period. The information to be supplied shall include, but not be limited to, name of claimant, date filed with CONTRACTOR, name of insurance company and/or adjuster handling claim, how claim was resolved and if claim was not resolved for the full amount, a statement indicating the reason for such action.

END OF SECTION 017800

SECTION 017821 - CLEANING AND PROTECTION

PART 1 - GENERAL

1.1 GENERAL

- A. On or before the completion date for the work, the Contractor shall tear down and remove all temporary structures built by him, all construction plant used by him, and shall repair and replace all parts of existing embankments, fences or other structures which were removed or injured by his operations or by the employees of the Contractor. The Contractor shall thoroughly clean out all buildings, sewers, drains, pipes, manholes, inlets and miscellaneous and appurtenant structures, and shall remove all rubbish leaving the grounds in a neat and satisfactory condition.
- B. As circumstances require and when ordered by the Engineer, the Contractor shall clean the road, driveway, and/or sidewalk on which construction activity under this contract has resulted in dirt or any other foreign material being deposited with an automatic self-contained mechanical sweeper with integral water spray, vacuum and on-board or supplementary containment.
- C. Failure to comply with this requirement when ordered by the Engineer or his representative, may serve as cause for the Engineer to stop the work and to withhold any monies due the Contractor until such order has been complied with to the satisfaction of the Engineer.
- D. As the work progresses, and as may be directed, the Contractor shall remove from the site and dispose of debris and waste material resulting from his work. Particular attention shall be given to minimizing any fire and safety hazard from form materials or from other combustibles as may be used in connection with the work, which should be removed daily.
- E. The Contractor shall wash all windows and other glass surfaces, leaving all areas free from putty marks, paint, etc.
- F. During and after installation, the Contractor shall furnish and maintain satisfactory protection to all equipment against injury by weather, flooding or breakage thereby permitting all work to be left in a new condition at the completion of the contract.

END OF SECTION 017821

SECTION 017839 - PROJECT RECORDS, DRAWINGS

PART 1 - GENERAL

1.1 RECORD DOCUMENTS

- A. Maintain on site one set of the following Record Documents:
 - 1. Drawings (annotated to show all changes made during construction)
 - 2. Specifications
 - 3. Addenda
 - 4. Change Orders and other modifications to the Contract
 - 5. Reviewed Shop Drawing and Samples
 - 6. Manufacturers' instructions for assembly, installation, and adjusting
 - 7. Testing and Inspection Reports
 - 8. Manufacturers' Service Representative's Reports.

- B. Store Record Documents separate from documents used for construction.

1.2 SERVICE CONNECTION RECORDS

- A. The Contractor shall record the location of all service and property connections, new or existing, made to utilities constructed under this contract. Such records shall be turned over to the Owner upon completion of the work. The cost of making such records shall be included in the various unit or lump sum prices stipulated for the various items of the work.

END OF SECTION 017839

SECTION 330908.01 – AUTOMATIC METER READING INFRASTRUCTURE AMI SYSTEM

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Section includes: Design, provide, install, and implement a fully functional single Advance Metering Infrastructure (AMI) fixed based utility meter reading system to include:
 - 1. Utility Meters and Encoder Register (follow Section 331900.01); and AMI Endpoints - as a turn-key project
 - 2. Fixed Base Automatic Meter Reading System
 - a) Wall and Pit Meter Interface Units
 - b) Tower Gateway Base Stations - Data Collection Hardware
 - 3. Hosted Software Services
 - 4. Compatible with Sensus, Neptune (ProRead), Badger (ADE), and Elster (Incorporating Sensus protocols) utility meters equipped with absolute encoder registers.
 - 5. Compatible with utility meters to be provided under Specification Section 331900.01.
 - 6. Integration with existing billing software: Fundbalance by Tyler Technologies.
- B. Train Owner personnel in operation and maintenance of the products and systems.
- C. Optical reading of the existing registers is not acceptable.
- D. This will be a turnkey project. The Installer shall demonstrate that they are an authorized agent for the products proposed and shall be capable of performing the supply of AMI MTUs & collectors, project management, installation of the meters (Section 331900.01), and controlling all aspects of the project. The Contractor shall also be authorized to implement and support the AMI system for its life.

1.2 REFERENCES

- A. American Water Works Association:
 - 1. AWWA C706 -10 Standard for Direct-Reading, Remote-Registration Systems for Cold Water Meters.
 - 2. AWWA C707 -10- Standard for Encoder-Type, Remote-Registration Systems for Cold Water Meters.
- B. International Organization for Standardization:
 - 1. ISO 9001 - Standards of Quality Management Systems.
- C. National Sanitation Foundation, NSF International:

1. NSF 61 - Standards for Drinking Water System Components.
2. NSF 372 - American National Standard for Lead Content in Plumbing Products.

D. Materials and workmanship shall be in accordance with the following Standards:

1. ANSI - American National Standards Institute
2. AWS - American Welding Society
3. CSA- CSA International - Product Testing and Certification Services
4. FCC - Federal Communications Commission
5. MIL-STD-810 - United States Military Standard for Environmental Engineering Considerations and Laboratory Test Standards Emphasizing Environmental Design and Test Limits.
6. NEC - National Electrical Code
7. NEMA - National Electrical Manufacturers Association
8. UL - Underwriters Laboratory
9. Regulatory Agencies: Perform all Work in compliance with the requirements of the following regulatory agencies:
 - a) OSHA - Occupational Safety and Health Administration
 - b) EPA- Environmental Protection Agency
 - c) Owner's Building Department and Utilities Departments

1.3 DEFINITIONS / ACRONYMS

1. AMI - Advanced Metering Infrastructure
2. AMR - Automated Meter Reading
3. FCC - Federal Communications Commission
4. Installer - Manufacturer's authorized installation contractor
5. Manufacturer - Supplier of the materials, products and services for the AMI system
6. MIU or MTU - Meter Interface Unit or Transmitter
7. RSS - Remote Service Switching
8. OWNER – synonymous with Village of Hiram
9. Water Department - Water Utility Department
10. Contractor - synonymous with the term "Vendor."
11. Substantial Completion – Installation of all MTUs and AMI equipment provided under this Section with acceptable reading from meters achieved rate of 95% repeatable over 14 days.
12. Final Completion: Acceptable readings from meters achieved at rate of 100% repeatable over 14 days. **The completed system shall receive and use signal from 100% of all MTU and DCU devices within the Owner's service area for the length of the project, maintenance period, and the life of the warranty periods as specified in these documents. Reads compromised due to temporary obstructions, solar flares, Acts of God, or as otherwise approved by the Owner will be acceptable to the Owner for short periods of time as accepted by the Owner.**

1.4 SYSTEM DESCRIPTION

- A. The project includes a single Advance Metering Infrastructure (AMI) System. Manufacturer is to design and supply a fully functional fixed network system for the water meter replacement program. This work includes installation of a two-way Fixed Base Radio Meter Reading System that is a Fixed Network, Advance Metering Infrastructure (AMI) Service capable of satisfying the current and future meter reading needs.
- B. Product transition is the most important in moving forward from the existing handheld system to the new AMI Fixed RF system. The System Supplier shall provide a single meter reading platform that would allow all of the meter reading applications to move from the current Meter Reading Software and the new Fixed RF System under ONE system, allowing the billing office to view all readings with a single software system.
- C. Communications, Software and Fixed Base System - Provide a tower-based system that is upgradable and can define a twenty-year life cycle.
- D. The following features and capabilities:
 - 1. The system must provide automatic web updates.
 - 2. Multi-level security.
 - 3. Full integration with the Owner's existing billing software Fundbalance by Tyler Technologies.
 - 4. Hourly and daily readings.
 - 5. Graphing and consumption data.
 - 6. System health (view daily performance).
 - 7. Hourly and daily system-wide readings.
 - 8. Up-to-the-hour customer usage profile data.
 - 9. On-demand reads. Indicate how your system performs this function.
 - 10. Priority alarms.
 - 11. Mapping.
 - 12. District metered area reporting.
 - 13. Consumption analysis.
 - 14. Grouping functionality.
 - 15. Data back-up and disaster data retrieval ability. Please explain how this is accomplished as part of the Technical Proposal.
 - 16. Broadcast messaging and MTU/endpoint grouping capabilities.
 - 17. Utility meter specific feature/capabilities:
 - a. Leak detection.
 - b. Reverse flow detection.
 - c. Empty pipe alarm.
 - d. Tamper alarm.
 - e. Programmable data logging for peak flows and volumes within intervals.
 - f. Programmable data logging for minimum of 5,000 data points.

1.5 BID REVIEW AND AWARD BY OWNER

- A. Award will be to the lowest and best bid, based on evaluation of the Bid Forms including: Price Proposal; Technical Proposal including technical support, software hosting service, long-term accuracy and other criteria that the Owner deems relevant to not only life cycle costs, but efficiency of operation and maintenance; and Bid Proposal Questions Form. Lowest price will not be the sole factor for awarding this project.
- B. This is being bid as a turn-key project complete in furnishing and installing all equipment, materials, etc. It is the intention of the Owner to have all MIUs installed on the outside of the building receiving service.
- C. The specifications are minimum requirements. The Owner reserves the right to choose the Manufacturer which best meets the needs, requirements, budgetary, and delivery necessities of the Owner.

1.6 SUBMITTALS

- A. Submittal Procedures: Follow Section 013323.
- B. INFORMATION TO BE SUBMITTED WITH THE BID: TECHNICAL PROPOSAL
 - 1. Technical Proposal outline is included as part of the Bid Documents pages TP-1 thru TP-2.
 - 2. Propagation Study: Manufacturer must submit a complete propagation study identifying the ability to adequately send/receive data within the service area. Determine the locations best suited for installation of the collectors and to ensure proper communications with end point transmitters and the head end system. Include locations/addresses of each collector. 100% of the system must be read by the collectors.
 - 3. Provide Life Cycle Cost Analysis for the AMI system with MTUs including hosted software (software as a service – SAAS) and maintenance programs and technical support for a full 20 year period. Provide replacement and/or repair costs for all components of the AMI system as part of this life cycle cost analysis.
 - 4. Provide a full description of the AMR/AMI system and its individual components, including response to all questions included in the “Bid Proposal Questions Form.”
 - 5. Provide documentation regarding the full functionality of the software which Contractor will provide. Indicate the nearest location where the Owner can view a demonstration of the software functionality currently in use.
 - 6. Provide copies of all materials required to establish compliance with the specifications. Submittals shall include published documents detailing important details of construction, installation instructions including drawings and descriptive literature, bulletins and/or catalogs of equipment, operating and maintenance instructions, repair manuals, and parts manuals.
 - 7. Provide published terms and conditions of all warranties offered and, if warranty durations are different than specified in Paragraph 1.9, shall so note in the list of exceptions in the Technical Proposal. The Owner will not consider any third-party guarantees or warranties.

8. In addition to warranty periods, supply information regarding required or optional maintenance programs beyond the warranty period for both hardware and software. Features of those maintenance programs shall also be included. The Technical Proposal shall list any additional charges for the maintenance programs, such as hourly rate for on-site and/or remote support. The location of and procedures for obtaining such support shall be stated. A toll-free Help Desk number must be provided for system support.
9. Provide the Support and Maintenance Contract pricing for the Product and Software Support on Fixed Network System for the two years after the system is installed including:
 - a. Hardware Support – Fixed Collectors & other hardware
 - b. Software support, licensing, etc.
 - c. FCC primary use licensing
 - d. Hosting Charges – if necessary
 - e. If your system has monthly/per unit reading charges, please fully explain the reading and maintenance charges for using the system.
10. Manufacturers must submit any and all exceptions to this specification. Exceptions must be listed on a sheet as part of the Technical Proposal. Exceptions to other portions of this Project Manual are not acceptable and will not be considered valid. All exceptions will be considered with the Owner reserving the right to choose the meters, parts, and accessories which best meet the requirements of the Utility. Non-compliance in listing any exception may result in immediate rejection of the submitted bid.

C. SUBMITTALS AFTER AWARD OF CONTRACT

1. Submit, as provided in Section 013323 of these specifications, copies of all materials required to establish compliance with the specifications. Submittals shall include shop drawings showing important details of construction, installation instructions including drawing and descriptive literature, bulletins and/or catalogs of equipment, collector towers, operating and maintenance instructions, repair manuals, and parts manuals.
 2. Installation Plan: Submit detailed description of proposed installation. Indicate dimensions and tolerances, component connections and details, clearances required and installation requirements and details.
 3. Product Data: Submit data on MTUs and accessories and AMI data collectors. Submit manufacturer's literature and data indicating rated capacities, dimensions, weights and point loads. Indicate accessories, electrical characteristics and connection requirements, wiring diagrams, and location and sizes of field connections.
 4. Samples: Submit two sample MTUs one of each type representing a wall mount and a pit installation mount illustrating materials of construction and finishes.
 5. Design Data: Submit manufacturer's latest published literature; include illustrations, installation instructions, maintenance instructions, and spare parts lists.
 6. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.
- D. Manufacturer's Field Reports: Provide field reports for each site and include pre-install and post-install photographs, serial numbers for each component, coordinates, size, type, and other pertinent data, follow Paragraph 3.4.

1.7 QUALITY ASSURANCE

- A. All named manufacturer's Products must meet the applicable specifications in full, regardless of the appearance of the manufacturer's name.
- B. The meters and AMI manufacturer - must state where all the meters, RF and collection devices are made. It is preferred that the meters and AMI System are made in the United States, in ISO 9001 manufacturing facilities.
- C. The proposed system, including the MTUs, DCUs and repeaters (AMR/AMI hardware), and host software shall be the product of one manufacturer and provide a turnkey system offering to the utility, and shall be covered by the same manufacturer's warranty to avoid future problems with product compatibility, problems in determining which component caused the failure, and determining which company the Owner needs to pursue in the event of manufacturing defects. The AMR equipment vendor may be, but does not have to be, the meter manufacturer.
- D. Manufacturing: MTU's and AMI equipment supplied shall be from a single AMR equipment vendor, a company that has manufactured AMR/AMI equipment for at least ten (10) years and who manufacturers all type and size meters indicated in these specifications. The specific models being supplied must have been in successful and continuous municipal service for at least two (2) years.

1.8 QUALIFICATIONS

- A. Manufacturer: Must be a Company specializing in manufacturing Products and materials specified in this Section with minimum ten years documented experience in this type of manufacturing.
- B. Installer: Company specializing in performing Work with minimum five years documented experience or as approved by manufacturer.
- C. Contractor must be the factory authorized distributor for the AMI system proposed and be capable of processing the warranty claims for the Owner.
- D. Manufacturer must have an on-staff, factory, AMI support specialist whose sole responsibility is providing AMI system support and sales. Emails, phone numbers and all contact information must be provided.

1.9 WARRANTY

- A. In evaluating bid submittals, warranty coverage will be considered. The Manufacturer shall be required to state its warranty and/or guarantee policy with respect to each item of proposed equipment. The procedure for submitting warranty claims must also be provided. The procedure shall be outlined in detail with all applicable information including but not limited to addresses, phone numbers, shipping labels, forms, etc.

- B. Except as noted below, all products furnished under this Contract shall be warranted for at least one year from the date of delivery to the Owner, for defects in materials and workmanship. The warranty services shall include, at no additional cost to the Owner, all parts and labor needed for normal operation of the system and for any warranty repairs that may be needed. Coverage shall include MTUs, data collectors, repeaters and appurtenances. In the event of a non-functioning item, Contractor shall assist by telephone with troubleshooting, and shall promptly respond to emergency calls. For warranty-related problems, loaner equipment shall be provided to the Owner at no additional cost to the Owner, while the failed equipment is repaired or replaced by the Contractor.
- C. Warranty period shall restart at time = 0 for any replaced components and will commence on date of placing into service.
- D. General Warranty: The special warranty specified in this Article shall not deprive Buyer of other rights or remedies; buyer may otherwise have under the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Seller under the Contract Documents. The obligations of Seller under the Contract Documents shall not be limited in any way by the provisions of the specified special warranty.
- E. Special Warranty on Materials and Equipment: All warranties shall be extended to a full 10 years from substantial completion by including the cost for extending warranties within the appropriate Alternate Bid Items including extended service or maintenance programs/contracts in the Bid Schedule. Alternative Bid Prices for years 5-6, 7-8, and 9-10 of this program are included in the Bid Schedule, and may or may not be selected as part of this project.
 - 1. Provide manufacturer's written warranty, running to the benefit of Buyer, agreeing to correct, or at option of Buyer, remove or replace materials or equipment specified in this Section found to be defective during the standard manufacturer's warranty after the date of delivery unless modified below.
 - 2. MTUs shall be guaranteed for at least twenty (20) years from the date of delivery based on hourly reads with multiple data transmissions per day.
 - a) Battery shall be free of manufacture and design defects for a period of twenty (20) years.
 - 3. Data collector and repeaters shall be warranted for two (2) years from the date it is placed in service for defects in material and workmanship, extended to 10 years if selected as noted above.

1.10 MAINTENANCE SERVICE AND SUPPORT

- A. Furnish service and maintenance of Automatic Meter Reading System for 4 years with optional cost up to 10 years from Date of Substantial Completion.
- B. Minimum support for Fixed Base Collectors shall include:
 - 1. Include all upgrades for equipment manufacturers licensed software.
 - 2. Include securing primary-use fixed base license annually or as needed.
 - 3. Remote diagnostics provided by qualified technical personnel. The Owner will provide remote access to the collectors for this service.

4. Technical support - Monday - Friday 8:00am - 5:00pm
5. Two (2) business day response time. Manufacturer will dispatch personnel to Collector site to perform on-site analysis. Manufacturer's personnel will be dispatched after the customer has notified them of problem.
6. Repair or replacement of defective collector.
7. Must include labor and mounting of collector.
8. Does not include damage caused by "Act of God".
9. Loaner equipment within 48 hours after manufacturer technical personnel have been dispatched to the site and have determined that loaner equipment is required to resolve the problem.

1.11 ADDITIONAL MATERIALS

- A. Furnish two sets of any additional handheld programmers, interrogators, and/or any other equipment, all as needed to install and/or test a new MTU.

1.12 DELIVERY, STORAGE, AND HANDLING

- B. The Contractor shall protect meters, meter components, MTUs and all DCUs and AMI system components from weather, moisture, possible damage, and theft while under his control.
- C. Follow Section 331900.01 Part 1.11.

1.13 OWNER PROVIDED SERVICES/RESPONSIBILITIES

- A. The Owner will provide an area at the collector site(s) for installation, if the collector is installed at a site under the Owner's control/Ownership.
- B. The Owner will provide padlocks at collector location for security purposes.
- C. The Owner will provide network access (backhaul) at the site where the collector is located. The Owner will consult with Manufacturer representative regarding the available options for network connections between collector and the hosted system.
- D. The Owner will provide the installer with a master account document, indicating account number, site address, customer name, meter size, and location for each meter scheduled for addition or replacement of MTU, if known.
- E. The Owner will provide the installer with one meter reading system to collect final reads from meter and endpoint. Additional reading equipment shall be provided by installer and formatted with Owner database to permit multiple teams.
- F. Utility Data Integration - The Owner shall provide Installer with an Import/Export file format for its billing software, and ensure it makes any necessary upgrades to its billing system to enable it to accept data from and push necessary data to the proposed AMI and implementation system. The Owner's responsibility shall be to ensure that its billing

system has the necessary file Import/Export capability so that data collected in the field can be accepted by the billing software.

- G. The Owner will coordinate access to meter locations following the Contractor's required attempts per Section 331900.01.

PART 2 - PRODUCTS

2.1 AMI SYSTEM GENERAL REQUIREMENTS

A. General Requirements AMI Overview

1. The AMI system shall be a fully automated system that does not require the effort of any Owner staff to obtain a meter reading; and shall provide daily metering data at the network control computer at least once per day without having to interrogate the endpoint or data collector.
2. The system shall be capable of remotely collecting numeric meter identification, hourly readings, premise leaks and tamper information,
3. The meter reading data must interface with the Owner's billing system in a process whereby the Owner has the ability to produce meter bills at any given time interval or on any given day. The interface must be tested prior to replacing meters to ensure a smooth transition.
4. All hardware and software supplied by the Contractor must be on the market today – the Owner will not accept new products that do not yet have successful field applications. The system shall be comprised of all new equipment of current manufacture and most current models of each type of equipment. All equipment shall have been manufactured within one year of the date of installation, unless otherwise detailed in the Technical Proposal and as approved by the Owner prior to contract execution.
5. The Proposer must provide local service and provide documentation that vendor has been in business for more than 5 years.
6. The AMI system shall be true, two-way communication enabled for advanced metering infrastructure (AMI). The Fixed Base AMI System must provide communication from the Fixed Base Host Software/computer to the Data Collectors and to the MTUs to allow programming and software upgrades over-the-air. The communication from the Collectors to the MTUs/endpoints must utilize an approved FCC frequency.
7. The proposed system must provide for leak detection on the customer side, and help support leak detection capabilities on the distribution side.
8. Contractor shall coordinate development of, pay all costs of, and provide the transfer file to allow communications between the meter reading software and Owner's existing billing system. Transfer file use shall be validated before the training program specified elsewhere herein begins.
12. The System shall allow data collection (manual, probed, mobile RF and fixed Base) to operate together seamlessly in a hybrid system with a common interface with the Utility's current Billing Software.

13. AMI System shall be capable of collecting data from 100% of the area currently serviced by the Owner. The AMI System must provide system-wide readings from all MIUs. It must also provide hourly consumption data for each meter.
14. The software must have the capability to transmit all Owner meters at least 1 time daily, and enabled to read at a peak rate of four times per day. Software shall support operator-based security allowing the Owner to define operator users with varying authorization levels. The system shall log all operator changes and activities, so that a determination of specific operator responsibilities can be made.

B. FCC Requirements

1. AMI shall operate on a primary-use FCC licensed, frequency in the 450 MHz or 900 MHz narrowband PCS/or MAS radio spectrum. Minimum power output shall be 1 watt. Assist the Owner in obtaining said FCC license; Contractor shall bear all costs associated with the license, including application fees. Contractor's Life Cycle Cost Analysis submitted with the Technical Proposal shall state the estimated cost of said costs and fees on an annual or other basis. Cost of licensing fee shall be included in any annual Maintenance or Service Agreement included in this Project.
2. The AMI system must comply with all applicable Federal Communication Commission (FCC) Rules & Regulations. All AMI equipment and system components shall be labeled in accordance with the FCC. The output power of the AMI system will be governed by the relevant FCC standards for the operating frequencies used. Provide supporting documentation in the Technical Proposal to verify compliance.

C. Data Collection Units (DCUs) for Fixed-Network AMR Systems

1. The AMI system will employ a star structure without the use of signal hopping devices with data collectors mounted in a manner to provide redundancy in meter reading. In order to reduce the total number of collectors needed in the field, the Owner shall not allow the use of repeaters.
2. The fixed-base network AMR system shall utilize a series of DCUs/repeater antennas to convey the meter data from each MTU back to the Fixed Base Host Software. Equipment must be as unobtrusive as possible and nearly invisible to the community. The number of DCUs shall achieve reliable coverage of 100% of the meters in the Owner's system and provide such functionality as priority alarms and over-the-air updates. The Owner would prefer no DCUs to be mounted on utility poles, nor on private property or at any locations which would lead to rental fees being assessed to the Owner during long-term use of the AMR system. If Vendor intends to utilize such property, it must be clearly stated in the Technical Proposal and any associated costs included in the Life Cycle Cost Analysis. Transceivers shall be mounted in NEMA 4X enclosures.
3. **Contractor is responsible for providing as many DCUs as needed to attain 100% reads across the system at all times. No additional payment beyond the bid quantity will be provided if additional DCUs are required.**
4. Provide DCU in a NEMA 4X enclosure with battery back-up. Battery back-up must be capable of operating, for 8 hours during power failure. Enclosures shall be configured such that they can be secured with an Owner provided padlock.

5. The DCU/repeater units shall be powered by being hardwired into the structure's electrical system, to retrieve and relay meter readings to the base station. The DCU must be powered via 110 - 110V AC. Upon start-up after power failure, the DCU must restore databases, tables, and logs to the previous operational state. Upon power failure, the DCU shall retain the past three (3) days of meter data in a non-volatile memory. All costs associated with providing power to each unit are to be included in the Technical Proposal. If other arrangements for powering the DCUs/repeaters are being proposed, they must be listed in the Technical Proposal as an exception, and all costs associated with providing power to each unit are to be included in the Price Proposal.
6. DCUs shall be electrically isolated and protected against static discharge, electrical surges, and indirect lightning strikes. Antenna systems shall have electromagnetic pulse (EMP) protection. Data transmissions between MTUs and DCUs, and between DCUs and the Base Station, shall be in a proprietary format to reduce the risk of deciphering by outside entities.
7. The DCUs must have the capability of using Ethernet or GPRS modem to carry the data to the host server. The proposed method of backhaul communications from the DCUs to the base station shall be presented in the Technical Proposal, primary method desired to use Ethernet/IP if/where available.
8. The DCU must provide memory back-up, three (3) days minimum. It must be able to process up to 50,000 data packets per day.
9. Other Characteristics required, DCU must:
 - a. Have an operating temperature of -22°F to +140°F (-30°C to +60°C).
 - b. Have a storage temperature of -40°F to +185°F (-40°C to +70°C).
 - c. Have an operating humidity of 0 to 95% non-condensing.
 - d. Have a NEMA 4X enclosure and pass the UL50 (Underwriter's Laboratory) rain test.
 - e. Meet vibration requirement of MIL-810F.
10. DCU shall be UL, CSA and FCC Part 90 approved. Manufacturer shall be FlexNet M400B by Sensus, N-Sight R450 by Neptune, or approved equal.

2.2 AMI SYSTEM SOFTWARE SERVICES

A. VENDOR HOSTED

1. The AMI Host Software must provide all the control needed in the network and provide for the essential functions of network management, meter communications, reporting, database configuration and alarms monitoring. It shall comply with prevailing industry standards.
2. Follow Paragraph 2.4.

2.3 METER TRANSMISSION UNITS (MTUs)

- A. The Meter Transmission Units must be a compact electronic device connected to an absolute encoder registers of a meter. The MTU shall interrogate the encoder register and transmit the meter reading and other information to a tower-based Data Collector. The MTU shall be compatible with meter absolute encoder registers featuring 8-digit high resolution. The MTUs shall be manufactured in both wall and pit models. The wall MTU

shall have the ability to be mounted in a basement or on the outside of a house. The pit MTU shall have the ability to be mounted in a pit or an underground vault. The wall and pit MTUs shall be a fully potted waterproof design. The MTU shall support communication with the data collector and Fixed Base Host Software.

- B. The MTU shall utilize direct communications with the Data Collector to allow for over-the-air communications between the two devices. Power shall be supplied to the MTU by at least a C-cell lithium battery with capacitor. Battery warranty shall be as specified in Paragraph 1.9.E.
- C. Each MTU will be housed in a molded plastic housing that is resistant to rain, ice, moisture, and temperature changes from -22 to +140 degrees Fahrenheit. The enclosure must house the complete unit which includes electronics, battery compartment, and wire connections. The unit will also have an internal antenna. If the MTU has field-replaceable batteries, they must be made up of a chemistry and design which is readily available and appropriate for consumer use and be of low toxicity. The expended batteries must be currently disposable without special permits. Each unit shall provide a location for a tamper deterrent seal.
- D. The MTU shall have the capability of sending priority alarms for leak, tamper, and backflow when connected to an encoder register and leak alerts when connected to an monitoring detection device using sound waves (acoustical vibrations) such as an AMI leak sensing device.
- E. Reading from the meter register shall not be impacted by a battery failure with the MTU.
- F. MTUs shall be FlexNet Smart Point M2 by Sensus, Inc. or R450RF MIUs by Neptune, Inc. or approved equal.

2.4 MANUFACTURER HOSTED (SOFTWARE) SERVICES

- A. The Owner desires the Vendor to provide hosted service for the AMI Fixed Network System as an alternate. Include what off-site hosting services that shall be provided to host the reading data and reporting data.
- B. The Owner shall retain ownership rights of the meter reading data at all times.
- C. The proposed system must provide powerful analytics based software that informs the utility of utility defined exception conditions via email or through the systems interface.
- D. Host Software Specifications:
 - 1. The Fixed Base Host Software must provide all the control needed in the network and provide for the essential functions of network management, meter communications, reporting, database configuration and alarms monitoring. It shall comply with prevailing industry standards and should run on a Windows compatible PC.
 - 2. The software must support Fixed Base, Drive By, Hand Held- touch pad and manual readings under one software platform. The system must be able to operate as a hybrid, interfacing with the hand held meter reading system.

3. The software must be the latest analytical software package compatible with the AMI network and shall have a web-enable interface.
4. The System must allow for MTU message success rate and Data Collector performance to be monitored daily with system diagnostic information readily available on a "System Health" or Dashboard type screen. The Fixed Base Host Software must produce a DC download report for all DC units in the network. The report must list each DC unit by ID Number, Name and summary of the download statistics. The System must allow Utility personnel to configure key system critical alarms such as reverse flow, 24-hour continuous leak and distribution main leaks. The Software must be able to forward these alarms via email or text message to maintenance personnel that are assigned by the Utility.
5. In addition to obtaining the meter reading from an MTU the DC and Fixed Base Host Software, the System must also support the following information requirements:
 - a) The software shall show and retain a minimum of one year of hourly usage history.
 - b) The software shall be provided as a perpetual license to use the software with the supplied system, provided the annual maintenance agreement is upheld.
 - c) A minimum of 5 user licenses shall be included in the software pricing section. Cost for additional licenses shall be detailed in the Life Cycle Cost Analysis provided.
 - d) Ability to generate error reports identify which endpoints and data collectors have been inactive for a certain period of time. The software must support operator-based security allowing the Owner to define operator users with varying authorization levels and capabilities. Additionally, all aspects of that operator customization must be available (what screens they have access to, what data they can change, etc.).
 - e) The software should include the following standard reports for utility meters: Meter Reading History, Daily Leak Detection, Daily No-Use Meter, Daily Tamper Detection, and Backflow.
 - f) The software must provide for proactive exception alarms that can notify utility personnel via email or SMS text of desired exception conditions.
 - g) Storing additional meter readings and status flag information from other monitoring devices (such as distribution line leak noise loggers).
 - h) Must support single and dual register meters.
 - u) Must support meter readings (6-8 digits) and MTU ID numbers up to 10 digits.
 - j) Must support the encoder leak and backflow detection output information.
 - k) Must interface with mobile meter reading software to support hybrid system operation.
 - l) Must support GPS type data to identify locations of account graphically.
 - m) Must have the capability to store all meter data information obtained from the Data Collectors (DC) for a minimum of two (2) years, with immediate access to 12 months of hourly readings.
 - n) Must be able to retain the past three (3) rolling days of collected meter data in the case of a power outage or interruption in the communication link with the software.
 - o) Must be able to monitor the status of the WAN and alert the user in the event of a problem impacting communication between the DC(s) and Fixed Base Software (Server receiving alarm information about signal strength, etc.).

- p) The supplier must provide the service of remotely monitoring the system and have controls in place to ensure optimized system operation.
 - 1) Must have the capability to monitor status/performance of the DC units in the network.
 - 2) Must generate a report of DCs that have not downloaded information by day or date range. The report must list DC ID number.
- q) Diagnostics must be available such that operators can evaluate performance and send instructions over the air to optimize performance of the DC(s) and the network.

E. Customer Interface Portal Software

- 1. As an alternate, the Owner wants to consider a Logic Customer Portal, by Sensus or N-Sight IQ by Neptune, or approved equal, including web based, security protocols, graphical mapping, and other functions beneficial to provide transparency to customers.
- 2. Provide information including cost for this software as part of the Life Cycle Cost Analysis, including licensing fees, support, maintenance, etc. for Owner consideration. An Alternative Bid Price for the first two years of this program is included in the Bid Schedule, and may or may not be selected as part of this project.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION MEETINGS

- A. Pre-installation meeting to review project, worksites, storage, office, personnel, etc.
- B. Follow Sections 013119 and 331900.01, Part 3.1.

3.2 PREPARATION

- A. Follow Section 331900.01, Part 3.2.

3.3 SAFETY

- A. Follow Section 331900.01, Part 3.3.

3.4 COORDINATION

- A. Coordinate integration of AMI system with the Owner and billing software system's company.
- B. Follow Section 331900.01, Part 3.5.

3.5 SCHEDULING

- A. Although most of the meters are located inside homes and businesses, the MTUs will be installed on the outside wall of the house or in pits. If meters are being replaced as part of this project, all inside work, including running wires between meter and outside wall for the MTUs, will be performed per Specification Section 331900.01. If meters are to remain, but new wiring inside the home is required for the MTUs, it will be crucial to set up appointments for gaining access and permission to perform work inside the home/structure. It is most important to the Owner that proper care should be taken when entering resident's homes and businesses.
 - 1. Establish Work schedules that will minimize customer inconvenience and maximize gaining access to customer's premises.
 - 2. Installer Work schedules shall be subject to Owner's approval.
- B. Follow Section 331900.01, Part 3.4.

3.6 INSTALLATION-FIXED BASE AMI SYSTEM (COLLECTORS)

- A. Installer shall install DC Collectors as part of the contract. Installer shall be qualified to install the collector equipment and run all data and power cables between the antennae and the collector.
- B. The Contractor shall take a digital photo of the site before and after work is completed. These photos must be made available in a format easily accessed by the Owner's personnel.
- C. Install equipment on the Village's water tower. Additional sites as needed must be proposed by Contractor as part of the Technical Proposal and approved by Owner. Installer will be responsible for getting access/permission to any structure that is not owned by the Owner, bear all costs for same, and provide necessary access agreements, easements, etc. to the Owner.
 - a. The Village's water tower is located on State Route 82, parcels 20-029-00-007-000 and 20-029-00-005-001.
- C. Install equipment in accordance with manufacturer's instructions and Laws and Regulations, to provide a complete, functional AMI System. System shall be capable of reading all meters in the Utility that are equipped with appropriate transceiver equipment, and shall transmit the collected data to the Owner's billing department and to web hosted storage.
- D. Contractor shall install DCU/repeater devices per the manufacturer's installation instructions. All costs for such installation, including provision of power and communications, shall be included in the Contractor's Price Proposal. Contractor shall use the utmost caution with installation personnel and practices when working at elevated locations or near power lines.

- E. All necessary electric requirements including trenching, conduit, and cabling needed to supply power from the power source outlet to the base station cabinet will be the responsibility of the Installer. All electrical equipment shall be installed in accordance with local codes. It is the Installers responsibility to obtain easements (if necessary) approved by the Owner's Law Department.
- F. Install grounding material at the location of the collector installation. At a minimum, the material should consist of #4 or #2 stranded copper wire which will connect to the collector. Properly ground the collector and the antenna equipment.
- G. Provide sufficient foundation to secure the outdoor cabinet should an outdoor cabinet be required to house the collector. This foundation will consist of a concrete pad or steel structure that is designed to hold 600 lbs. per square inch.
- H. For installations requiring poles, the poles, installation, and related appurtenances shall be provided by the Manufacturer/Installer.
- I. Installer will make all data and power terminal, and antennae connections at the collector cabinet, this includes the connection from the power source, connection of the data line (supplied by the Owner) from the network access point at the site.
- J. Installer will provide all bracketing needed to mount the antennae at the site.
- K. Mount the collector cabinet (if needed) to the structure provided and identified by the Owner.
- L. Installer will provide all strapping hardware needed to run the data and power cables from the base of the collector site to the antennae if needed.
- M. Installer will provide the collector and antennae sufficient to receive meter data and provide the meter data to the head-end system via the wireless network connection provided by the Owner.
- N. Installer shall not weld on any water tanks for the purpose of mounting antennas. If water towers are used for antenna mounting, other means of mounting shall be utilized. Parties will mutually agree to the scope of work prior to the installation.

3.7 INSTALLATION OF MTUs

- A. The MTUs shall be installed in a neat and workman-like manner by technicians who have been trained and informed of the technical and procedural requirements of the Work.
- B. MTUs shall be installed in pits where required and on the outside of homes and businesses where meters are inside the structure. For homes or businesses where existing AMR endpoints have not been extended to the outside of the structure, new 3-wire extension kits shall be used to move the MIU to the outside of the structure. Extension kits shall either be new, unbroken 3-wire kits or spliced in a manner that is tamper proof for security of proper readings. Kits shall be as approved by the Owner. Connect all wires at both terminus ends.

- C. The Contractor shall provide on-site photos verifying the correct address as well as before and after pictures of the installation. These photos must be made available in a format easily accessed by the Owner's personnel.
- D. The following summary describes the general steps of the installation Work to be done. The actual Work may differ from this description, and will not be limited to these actions:
 - 1. Replace old meter with new meter with Meter Transmitter Unit (MTU)
 - 2. Attach meter wires as needed
 - 3. Test installation with Manufacturer's tester or equivalent
 - 4. Clean work area
 - 5. Complete paperwork
 - 6. Inform homeowner of actions

3.8 ADDITIONAL WORK AS AUTHORIZED

- A. Any additional Work requested by the Owner will be performed on a negotiated time and material basis.

3.9 PROTECTION OF FINISHED WORK

- A. Protect finished work until it is placed into service, inspected by, and turned over to, the Owner.

3.10 FIELD QUALITY CONTROL

- A. Field Tests:
 - 1. Upon completion of installation, perform field testing in presence of Owner to verify complete functionality of the system.
 - 2. Field testing shall include test readings of a minimum of 50 meters and MTUs to demonstrate to Owner the satisfactory operation of the system including all DCUs, Base Station, and software. MTU locations for the test shall be selected by the Owner, shall be distributed around the utility, and shall include expected areas of difficult radio transmission to the furthest point in the Owner's distribution system from each AMI station provided.
 - 3. Criteria for Acceptance: Satisfy Owner that system performs as intended.
 - 4. The MTU must be tested at the time of installation to ensure a reading is captured. The Contractor must provide each technician with the required equipment capable of reading the MTU at the time of installation. The Contractor must immediately correct at the time of installation any defects observed during the testing procedures. The radio meter interface unit assembly shall also be tested for continuity according to the Manufacturer's instructions. An installation is determined to have been successfully completed when a valid reading and ID is obtained through the radio meter interface assembly in a manner acceptable to the Owner. The Contractor shall correct immediately any defects observed during the foregoing testing procedures.

- B. Manufacturer's Services: Provide services for equipment manufacturer's factory-trained service representative to supervise installation of the equipment, field testing of the system, and training of Owner's personnel.
- C. Conditional acceptance shall not relieve Contractor of the responsibility to ensure that 100% of meters in the utility are read by the fixed-network AMR system at project completion.

3.11 DATABASE MANAGEMENT

- A. Provide a parallel test of existing system read and bills vs. new AMI system and bills produced to verify accuracy of bills produced. Over the course of this project, a total of 6 parallel tests at quarterly intervals will be required.
- B. Follow Section 331900.01, Part 3.10.

3.12 CLEANING AND DISPOSAL

- A. Follow Section 331900.01, Part 3.11.

3.13 TRAINING

- A. Complete installation and operating instructions will be included for all of the supplied hardware and software equipment. The training must be supplied by the system manufacturer or approved Distributor. Bid must include any additional costs for training and assistance to install and begin operation of the system. The Installer will also inform the customer of any pre-installation activities that are to be completed and the support material that will be needed for the initial installation.
- B. The Contractor shall provide no less than four (4) 8-hour training days to Owner field and office staff on all aspects of product installation, AMI system hardware and software operation, AMI system maintenance, and the interface with the Owner's billing system. This training will take place at an Owner-designated location and at times coordinated with the Owner. The Owner reserves the right to videotape the training sessions for use in training other Owner personnel.
- C. The manufacturer must support new and ongoing training sessions and material that relates to the operation and maintenance of the fixed base system. Manufacturer will provide a detailed schedule of training options and also perform on-site training sessions for various employees of the utility. The manufacturer must also include other remote training alternatives for new and existing employees. The manufacturer must also support a user's conference/forum in which users of the fixed base system have the ability to provide feedback for new products and best practices.

3.14 TECHNICAL SUPPORT AND SYSTEM MAINTENANCE

- A. Contractor shall supply toll-free telephone support to the Owner during Owner's normal business hours and after hours, for the purpose of answering Owner questions and troubleshooting operational issues with the meters and AMI system.

- B. Support Services: The manufacturer shall have a fully trained technical support department. The utility must have access to technical questions through a telephone based support desk. The trained technicians should be capable of answering and responding to various requests such as, but not limited to:
 - 1. Hardware, operational maintenance questions and problems.
 - 2. Software operational questions and problems.
 - 3. Assisting customer with configuring reports.
 - 4. Assisting with software updates.
 - 5. Troubleshooting hardware issues.
 - 6. Providing on-site training or evaluation as needed. The Help Desk must be available weekdays between 8:00 a.m. and 6:00 p.m. EST with after-hours numbers available as needed.
 - 7. The manufacturer will provide a complete set of installation and operating instructions for all the components of the fixed base system. Onsite training by authorized manufacturer personnel or their representatives must be provided.
 - 8. Identify the critical path items for installation and training needs.
 - 9. A Spanish-speaking interpreter may be needed in some instances.

END OF SECTION 330908.01

SECTION 331900.01 –UTILITY METERING EQUIPMENT

PART 1 – GENERAL

1.1 SCOPE OF WORK

- A. Furnish new consumer utility meters with encoder registers suitable for replacing existing consumer meters.
- B. This work includes installation of new utility meter and two-way MTU capable of meeting current and future meter reading needs as defined under this Project as a turn-key project. For MTUs follow Section 330908.01.
- C. All COVID-19 protocols shall be in accordance with the guidelines set forth by the Center for Disease Control (CDC) and the Ohio Department of Health.

1.2 REFERENCES

A. American Water Works Association:

- 1. AWWA C700-09 - Standard Specifications for Cold Utility Meter - Displacement Type, Bronze Main Case.
- 2. AWWA C702-10 - Standard for Cold Utility Meter - Compound Type.
- 3. AWWA C706 -10 Standard for Direct-Reading, Remote-Registration Systems for Cold Utility Meter.
- 4. AWWA C707 -10- Standard for Encoder-Type, Remote-Registration Systems for Cold Utility Meter.

B. International Organization for Standardization:

- 1. ISO 9001 - Standards of Quality Management Systems.

C. National Sanitation Foundation, NSF International:

- 1. NSF 61 - Standards for Drinking Water System Components.
- 2. NSF 372- American National Standard for Lead Content in Plumbing Products.

D. Materials and workmanship shall be in accordance with the following Standards:

- 1. ANSI - American National Standards Institute
- 2. AWS- American Welding Society
- 3. CSA- CSA International- Product Testing and Certification Services
- 4. FCC- Federal Communications Commission
- 5. MIL-STD-810- United States Military Standard for Environmental Engineering Considerations and Laboratory Test Standards Emphasizing Environmental Design and Test Limits.
- 6. NEC - National Electrical Code
- 7. NEMA - National Electrical Manufacturers Association

8. UL- Underwriters Laboratory
9. Regulatory Agencies: Perform all Work in compliance with the requirements of the following regulatory agencies:
 - a) OSHA - Occupational Safety and Health Administration
 - b) EPA- Environmental Protection Agency
 - c) OWNER's Building Department and Utilities Departments

1.3 DEFINITIONS/ACRONYMS

1. AMI - Advanced Metering Infrastructure
2. AMR - Automated Meter Reading
3. FCC - Federal Communications Commission
4. Installer - Manufacturer's authorized installation contractor
5. Manufacturer - Supplier of the materials, products and services under this Section.
6. MIU or MTU - Meter Interface Unit or Meter Transmitter Unit
7. OWNER – synonymous with Village of Hiram
8. Water Department - Water Utility Department
9. Contractor - synonymous with the term "Vendor".
10. Substantial Completion – Installation of all meters and equipment provided under this Section with acceptable reading from meters achieved rate of 98.5% repeatable over 14 days.
11. Final Completion – Acceptable readings from meters achieved at rate of 100% repeatable over 14 days.

1.4 SYSTEM DESCRIPTION

- A. This project includes providing utility meters, together with encoders and MIUs of the appropriate type and size, capable of being read by the Owner's meter reading system as specified in Section 330908.01
- B. The meters and AMI manufacturer - must state where all the meters, RF and collection devices are made. It is preferred that the meters and AMI System are made in the United States, in ISO 9001 manufacturing facilities. Comply with Section 330908.01.

1.5 BID REVIEW AND AWARD BY OWNER

- A. Award will be to the lowest and best bid, based on evaluation of the Bid Forms including: Price Proposal, Technical Proposal including meter simplicity, meter life, long-term accuracy and other criteria that the Owner deems relevant to not only life cycle costs, but efficiency of operation and maintenance; and, Bid Proposal Questions Form. Lowest price only will not be the sole factor for awarding this project.
- B. The specifications are minimum requirements. The Owner reserves the right to choose the Manufacturer which best meets the needs, requirements, budgetary, and delivery necessities of the Owner.

1.6 SUBMITTALS

A. Submittal Procedures: Requirements for submittals: Follow Section 013323.

B. INFORMATION TO BE SUBMITTED WITH THE BID: TECHNICAL PROPOSAL

1. Technical Proposal outline is included as part of the Bid Documents pages TP-1 thru TP-2.
2. Provide copies of all materials required to establish compliance with the specifications. Submittals shall include published documents detailing important details of construction, installation instructions including drawings and descriptive literature, bulletins and/or catalogs of equipment, operating and maintenance instructions, repair manuals, and parts manuals.
3. Provide published terms and conditions of all warranties offered and, if warranty durations are different than specified in Paragraph 1.9, shall so note in the list of exceptions in the Technical Proposal. The Owner will not consider any third-party guarantees or warranties.
4. Provide information on required or optional maintenance programs beyond the warranty period for both hardware and software.
5. Manufacturers must submit any and all exceptions to the specifications. Exceptions must be listed on a sheet as part of the Technical Proposal. All exceptions will be considered with the Owner reserving the right to choose the meters, parts, and accessories which best meet the requirements of the Utility. Non-compliance in listing any exception may result in immediate rejection of the submitted bid.

C. SUBMITTALS AFTER AWARD OF CONTRACT

1. Submit, as provided in Section 013323 of these specifications, copies of all materials required to establish compliance with the specifications. Submittals shall include shop drawings showing important details of construction, installation instructions including drawing and descriptive literature, bulletins and/or catalogs of equipment, operating and maintenance instructions, repair manuals, and parts manuals.
2. Installation Plan. Submit detailed description of proposed installation. Indicate dimensions and tolerances, component connections and details, clearances required and installation requirements and details.
3. Product Data: Submit data on meters and meter setting equipment and accessories. Submit manufacturer's literature and data indicating rated capacities, dimensions, weights and point loads. Indicate accessories, electrical characteristics and connection requirements, wiring diagrams, and location and sizes of field connections.
4. Samples: Submit two sample meters one of each size representing a small 5/8-inch meter and a 2-inch or larger size meter illustrating materials of construction and finishes.
5. Design Data: Submit manufacturer's latest published literature; include illustrations, installation instructions, maintenance instructions, and spare parts lists.
6. Submit an affidavit of compliance from the meter manufacturer or supplier that the meters provided; comply with all applicable requirements of AWWA C700 and AWWA C707, AWWA C710 and AWWA C707, or AWWA C713 and AWWA C707 (as appropriate) and these specifications.

7. Submit a Certificate of Testing for accuracy from the manufacturer for each meter furnished, stating that the meter has been tested for accuracy of registration and that it complies with the accuracy and capacity requirements of AWWA C700, AWWA C707, or AWWA C713.
8. Manufacturer's Certificates: Submit Statement of Compliance, supporting data, from material suppliers attesting that valves and accessories provided meet or exceed AWWA Standards and specification requirements.

D. Manufacturer's Field Reports: Provide field reports for each site and include pre-install and post-install photographs, serial numbers for each component, coordinates, size, type, and other pertinent data, follow Paragraph 3.6.

1.7 QUALITY ASSURANCE

- A. All named manufacturer's products must meet the applicable specifications in full, regardless of the appearance of the manufacturer's name.
- B. The proposed system, including the utility meter, register, and transmitter, shall be the product of one manufacturer and shall be covered by the same manufacturer's warranty to avoid future problems with product compatibility, problems in determining which component caused the failure, and determining which company the Owner needs to pursue in the event of manufacturing defects.
- C. Manufacturing: Meters supplied shall be from a company that has manufactured utility meter for at least ten (10) years and who manufactures all type and size meters indicated in these specifications. The specific models being supplied must have been in successful and continuous municipal service for at least two (2) years.
- D. Meters: Manufacturer's name, model number, and serial number shall be permanently marked on each meter body.

1.8 QUALIFICATIONS

- A. Manufacturer: Must be a Company specializing in manufacturing Products and materials specified in this Section with minimum ten (10) years documented experience in this type of manufacturing.
- B. Installer: Company specializing in performing Work with minimum five (5) years documented experience or as approved by manufacturer.

1.9 WARRANTY

- A. In evaluating bid submittals, warranty coverage will be considered. The Manufacturer shall be required to state its warranty and/or guarantee policy with respect to each item of proposed equipment. The procedure for submitting warranty claims must also be provided. The procedure shall be outlined in detail with all applicable information including but not limited to addresses, phone numbers, shipping labels, forms, etc.

- B. Follow Section 330908.01 Paragraph 1.9 except as noted below.
- C. Special Warranty on Materials and Equipment: **All warranties shall be extended to a full 4 years from substantial completion by including the cost for extending warranties within the appropriate Bid Items including extended service or maintenance programs/contracts in the Bid Schedule.** Alternative Bid Prices for years 5-10 of this program are included in the Bid Schedule, and may or may not be selected as part of this project.
1. Provide manufacturer's written warranty, running to the benefit of Owner, agreeing to correct, or at option of Owner, remove or replace materials or equipment specified in this Section found to be defective during the standard manufacturer's warranty after the date of delivery unless modified below.
 2. Meters shall be guaranteed to meet AWWA New Meter Accuracy Standards for a period of five (5) years from the date of delivery for meters smaller than 1-inch. Meter cases shall be guaranteed to be free from defects for twenty-five (25) years.
 3. Registers and transmitters shall be guaranteed for at least twenty (20) years from the date of delivery.
 4. Battery life shall be guaranteed for a minimum of ten (10) years, non-prorated, based on hourly reads with multiple data transmissions per day.

1.10 MAINTENANCE SERVICE AND SUPPORT

- A. In addition to warranty periods, Manufacturers are required to supply information on required or optional maintenance programs beyond the warranty period for both hardware and software. The location of and procedures for obtaining such support shall be stated. A toll-free Help Desk number must be provided for system support.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. The contractor shall protect meters and meter components, MIUs, DCUs and all AMI system components (appurtenances) from weather, moisture, possible damage, and theft by storing in a secure facility covered dry storage and staging location.
- B. The Contractor shall be responsible for storage of all meters, transmitters and other parts mentioned in this Section until installation, start-up, and acceptance.
- C. The Installer shall be responsible for unloading and loading of products and materials.
- D. The Owner reserves the right to inspect ALL and accept all meters, meter components, and AMI system components on site. They shall be in original sealed manufacturers shipping containers with labeling in place.
- E. The Contractor shall at his own expense replace all rejected meters and AMI system components. All meters and AMI system components shall be properly boxed to protect them against damage in shipment. Meters and AMI system components may be rejected by the Owner when damages to the container indicate the possibility of damage to the meter or AMI system components.

1.12 OWNER PROVIDED SERVICES/RESPONSIBILITIES

- A. The Owner will provide one existing meter reading device currently used to Contractor to get final reads. If Contractor desires more units, he shall provide as necessary at Contractor's cost.
- B. The Owner will provide the installer with a master account document, indicating account number, site address, customer name, meter size, and location for each meter scheduled for replacement, if known.
- C. The Owner will coordinate access to meter locations following Contractor's required attempts per Paragraph 3.4.D.

PART 2 – PRODUCTS

2.1 UTILITY METERS - GENERAL

A. General Requirements:

- 1. It is the intention of these specifications to obtain utility meter complete with electronic registers that meet the latest revision of the American Water Works Association (AWWA) standards C700 and C707; C710 and C707, or C713 and C707.
- 2. All meter assemblies shall be tested and in compliance with the requirements of the latest revision of the applicable AWWA Standard. The testing information should be shown on every meter and also should be able to be streamed to the utility for inventory.
- 3. All meters and registers will be forward and reverse engineered to guarantee future system compatibility.
- 4. All meters and registers provided under this Contract shall be from a single manufacturer. All meter bodies and registers will be made in an ISO 9001 facility. It is preferred that facility is owned and operated by the meter company, and located within the USA.

B. Meters:

- 1. All meters will meet the definition of Positive Displacement (PD), Solid State, Compound, and Turbine meters as defined by AWWA.
- 2. All meters must meet and/or exceed AWWA Specifications for Low and High flows throughout their meter line.
- 3. Meters must be No-lead Bronze meeting the requirements of NSF 61 and NSF 372, Safe Drinking Water Act (SDWA) Compliant, and all other federal, state and local requirements. Meter main cases shall have a lifetime warranty.
- 4. All meters will employ digital 8-digit encoder registers that have extended data capability; the register must also show rate of flow on the digital display. Resolution of capability of meter reading shall be down to 0.10 gpm.
- 5. Meters shall read in gallons for billing purposes.
- 6. Meters shall be of the sizes and quantities included in the schedule at the end of this section.

C. Registers:

1. Register must be permanent and hermetically sealed and firmly attached to meter case. A security seal must be provided to prevent easy removal and tampering.
2. The register must be an absolute encoder type and be readily adaptable to various AMR/AMI products without need for any on-site register programming.
3. The register shall be furnished with a test hand and/or a leak indicator and read in a manner consistent with the Owner's billing system. The size of the meter shall be marked permanently on the register dial face.

D. Miscellaneous:

1. Meters shall be supplied without coupling nuts, tailpieces and gaskets; however, bid items are in the proposal to supply same as directed by the Owner due to field conditions.
2. External Bolts and Washers: All external bolts and washers, etc. shall be of stainless steel or other corrosion resistant material as approved by the Owner and shall be easily removed from the main case.
3. Meters, couplings, tailpieces, fittings and all components in contact with drinking water shall conform fully to NSF 61 and NSF 372 requirements.
4. All meters must be serviceable and supported by a licensed factory distributor that services, installs, tests and sells meters from an office and warehouse preferably in Ohio.

E. EQUIPMENT VENDORS

1. All new meters must be provided from a single meter manufacturer.
2. The meter manufacturers acceptable to the Owner are as follows: Sensus, Neptune, Badger or as approved.

2.2 POSITIVE DISPLACEMENT (PD) METERS

- A. All utility meters (displacement type - magnetic drive 5/8" - 1") furnished shall conform to the "Standard Specifications for Cold Water Meters" AWWA C700 or C710, latest revision.
- B. Only magnetic driven, tamper-proof, sealed register, positive displacement oscillating piston or nutating disc type meters are acceptable. Sensus SR II, Sensus AcuStream, Neptune T10, and Badger Recordall disc meters are considered acceptable.
- C. Meters 5/8" - 1" must be bronze. Plastic main cases are not acceptable.
- D. All no-lead main cases shall be guaranteed free from manufacturing defects in workmanship and material for the life of the meter.
- E. Measuring Chamber:
 1. All PD meters will employ positive displacement measuring chambers.

2. The measuring chamber shall be of a 2-piece snap-joint type with no fasteners allowed. The chamber shall be made of a non-hydrolyzing synthetic polymer.
 3. The control block shall be the same material as the measuring chamber and be located on the top of the chamber. The control block shall be located after the strainer.
 4. The flat nutating disc shall be a single piece made from non-hydrolyzing synthetic polymer and shall contain a type 316 stainless steel spindle. The nutating disc shall be equipped with a synthetic polymer thrust roller located within the disc slot. The thrust roller head shall roll on the buttressed track provided by the diaphragm.
- F. Strainers: All meters shall contain a removable polypropylene plastic strainer screen. The strainer shall be located near the main case inlet port, before the measuring chamber. The strainer shall also function as the device that holds the measuring chamber in place within the main case. Straps or other types of fasteners shall not be accepted
- G. Performance: To ensure accuracy, each meter must be accompanied by a factory test tag certifying the accuracy at the flows required by AWWA C700.

2.3 TURBINE METERS - NOT USED FOR THIS PROJECT

- A. These specifications set forth the minimum acceptable design criteria and performance requirements for utility meters including the following potential service applications and general considerations:
1. Intended where a wide flow range is anticipated
 2. Measurement of water usage for critical billing applications
 3. Measurement intended for typical commercial and industrial applications requiring lower flow sensitivities
 4. Measurement of constant low to medium flows up to high flow usage
- B. Conformance to Standards
1. The meter package shall meet or exceed all requirements of ANSI/AWWA Standard C701. Each meter assembly shall be performance tested to ensure compliance.
 2. Sensus T2, Badger Recordall Turbo, and Neptune HP Turbo meters are considered acceptable.
- C. Main cases: The meter main case shall be of no-lead bronze composition or fusion-bonded, epoxy coated ductile iron.
- D. Performance: The meter assembly shall have performance capability of continuous operation up to the rated maximum flows as listed below without affecting long-term accuracy or causing any undue component wear. Maximum head loss through the meter/strainer assembly shall not exceed those listed in the following table per meter size

E. Minimum Operating Characteristics

Meter Size	Low Flow (95% Min.)	Operating Range (98.5-101.5%)	Intermittent Flows (98.5-101.5%)	Pressure Loss (Not to Exceed)
1 1/2"	.75 GPM	1.25 -160 GPM	200 GPM	6.9 PSI@ 160 GPM
2"	1.0 GPM	1.5 -200 GPM	250 GPM	7.0 PSI@ 200 GPM
3"	1.5 GPM	2.5-500 GPM	650 GPM	5.1 PSI@ 500 GPM
4"	2.0 GPM	3.0-1000 GPM	1250 GPM	8.7 PSI @ 1000 GPM
6"	2.5 GPM	4.0-2000 GPM	2500 GPM	8.2 PSI@ 2000 GPM

F. Measuring Chamber: The measuring chamber shall consist of a measuring element, removable housing, and all-electronic register. The measuring element shall be mounted on a horizontal, stationary stainless steel shaft with sleeve bearings and be essentially weightless in water. The measuring chamber shall be capable of operating within the above listed accuracy limits without calibration when transferred from one main case to another of the same size. Measuring shall be so configured to capture all flows as specified above, without the requirement of an automatic valve.

G. Direct Magnetic Drive System: The direct magnetic drive shall occur between the motion of the measuring element blade position and the electronic register. The direct drive system is designed to extend service life, enhance low flow sensitivity and provide extended flow capacity and overall accuracy of the meter assembly. Any and all additional intermediate, magnetic or mechanical, drive couplings are not acceptable.

H. Electronic Register:

1. The meter's register is all-electronic and does not contain any mechanical gearing for the display. The electronic register includes the following partial list of features:
 - a) AMR/AMI resolution units fully programmable
 - b) 8 digit Absolute encoder or pulsed output frequency fully programmable
 - c) Integral data logging capability
 - d) LCD display
 - e) If battery is used in the register, must have 20 year life minimum guarantee.

I. Maximum Operating Pressure: The meter assembly shall operate properly without leakage, damage or malfunction up to a maximum working pressure of 175 pounds per square inch (psi)

J. Connections: Flanges for the 1-1/2" and 2" size meter assemblies shall be of the 2-bolt oval flange configuration. The 3"-10" size meter assemblies shall have flanges of the Class 125 round type, flat faced and shall conform to ANSI B16.1 for specified diameter, drilling and oval flange configuration. The 3" - 10" size meter assemblies shall have flanges of the Class 125 round type, flat faced and shall conform to ANSI B16.1 for specified diameter, drilling and thickness.

2.4 COMPOUND METERS

A. These specifications set forth the minimum acceptable design criteria and performance requirements for utility meters including the following potential service applications and general considerations:

1. Intended where a wide flow range is anticipated
2. Measurement of water usage for critical billing applications
3. Measurement intended for typical commercial and industrial applications requiring lower flow sensitivities than turbine meters
4. Measurement of constant low to medium flows up to high flow usage
5. All specifications meet or exceed the latest revision of AWWA C701 and C702.

B. Type:

1. Compound meters shall consist of a combination of an AWWA Class II turbine meter for measuring high rates of flow and a nutating disc type positive displacement meter for measuring low rates of flow enclosed in a single main case.
2. An automatic valve shall direct flows through the disc meter at low flow rates and through the turbine meter at high flow rates. At high flow rates, the automatic valve shall also serve to restrict the flow through the disc meter to minimize wear.
3. Sensus C2, Badger Recordall Compound, and Neptune Tru-flo meters are considered acceptable.

C. Operating Characteristics:

1. The meters shall comply with the operating characteristics shown below (GPM):

Size	Normal Operating Range	Low Flow (95%)	Max Continuous Range	Head loss at max continuous flow
1-1/2"	0.5 – 160	0.25	200	6.9
2"	0.5- 160	0.25	200	4.3
3"	1-400	0.50	500	3.2
4"	1.5-800	0.75	1000	6.4
6"	3.0-1600	1.50	2000	5.5
8"	4-2700	2.50	3400	4.0

D. Size:

1. The size of meters shall be determined by the nominal size (in inches) of the opening in the inlet and outlet flanges unless otherwise directed by the Owner. Overall lengths of the meters shall be as follows:

Size	Laying Length (inch)
1.5"	13
2"	15 1/4
3"	17
4"	20
6"	24
8"	30 1/8

E. Case and Cover:

1. Meters must be made of bronze main cases or fusion-bonded, epoxy coated ductile iron and shall conform to the NSF 61 and NSF 372 SDWA Compliant.
2. The size, model, and arrows indicating direction of flow shall be cast in raised characters on the main case and cover. The covers shall contain a stainless steel calibration vane for the purpose of calibrating the turbine measuring element while the meter is in-line and under pressure.
3. A test plug shall be located in the main case or the cover for the purpose of field testing of the meter.

F. External Bolts: Casing bolts shall be made of AISI Type 316 stainless steel.

G. Connections:

1. Main cases shall be flanged.
2. Flanges for the 1-1/2" and 2" size meter assemblies shall be of the 2-bolt oval flange configuration. The 3"-10" size meter assemblies shall have flanges of the Class 125 round type, flat faced and shall conform to ANSI B16.1 for specified diameter, drilling and thickness.

H. Electronic Register:

1. The meter's register is all-electronic and does not contain any mechanical gearing to display flow and accurate totalization. The electronic register includes the following partial list of features:
 - a) AMR/AMI resolution units fully programmable
 - b) 8-digit Absolute encoder or pulse output frequency fully programmable
 - c) Integral data logging capability
 - d) Integral resettable accuracy testing feature
 - e) LCD display
 - f) If battery is used in the register, must have 10 year life minimum guarantee.

I. Register Boxes:

1. Register boxes and covers shall be of ruggedized composition.
2. The name of the manufacturer shall be clearly identifiable and located on the register box covers.

J. Register Box Sealing: Registers shall be affixed to the cover by means of a plastic tamper-proof seal pin that must be destroyed in order to remove the register.

K. Meter Serial Number: The meter serial number shall be imprinted on the meter flange or cover as well as the register box covers.

L. Measuring Chambers:

1. The turbine measuring chamber shall be a self-contained unit, attached to the cover for easy removal. The turbine shaft shall be tungsten carbide with tungsten carbide inserts and shall rotate in removable graphite bushings. Thrust bearings shall be tungsten carbide.
2. The nutating disc chamber shall be a self-contained unit mounted on the cover and easily removable from the cover. It shall conform to AWWA Standard C700 for the following sizes: 2" and 3"-5/8" disc, 4"-3/4" disc, 6"-1" disc.

- M. Unitized Measuring Element: A UME is a complete assembly, factory calibrated to AWWA standards, which includes the cover, registers, and both a turbine measuring element and a nutating disc chamber assembly. The UME shall be easily field-removable from the meter body without the requirement of unbolting flanges.
- N. Intermediate Gear Train- Turbine Section:
1. The intermediate gear train shall be directly coupled from the turbine rotor and magnetically coupled to the register through the meter cover. The gear train shall be housed in the turbine measuring chamber.
 2. All moving parts of the gear train shall be made of a self-lubricating polymer or stainless steel for operation in water.
- O. Automatic Valve:
1. The automatic valve shall be of the spring-loaded, poppet type.
 2. All valve parts shall be made of lead-free brass containing a minimum of 85% copper such as Envirobrass II, stainless steel, or a suitable polymer with a replaceable semi-hard EPDM rubber seat.
 3. Only the cover must be removed to gain access to the valve for inspection or service.
 4. The disc meter shall include a self-actuated valve that directs flow through the disc meter at low flow rates and through the turbine meter at high flow rates. At high flow rates, the self-actuated throttle valve shall restrict the flow through the disc meter to minimize wear.
- P. Strainer: A strainer shall be provided for the disc meter. It shall be easily removable and have an effective straining area of double the disc meter inlet.
- Q. Registration Accuracy:
1. Registration accuracy over the normal operating range shall be 98.5% to 101.5%.
 2. All meters shall be equipped with encoder remote registers per AWWA C707 shall meet all AWWA C702 performance standards. The AMI system must employ encoder "high resolution" style meter registers. The unit shall provide an 8-digit meter reading for transmission through the radio interface. The dial shall have a high resolution nine digit LCD display for meter testing. The register shall employ a visual LCD leak detection indicator as well as provide remote leak detection through an ASCII format to the RF AMI MIU. The manufacturer will guarantee that the reading obtained electronically matches the LCD odometer reading on the register and that the Manufacturer will pay the difference at the current rate whenever a discrepancy appears. The register should accumulate and register consumption without connecting to a receptacle or MIU. The register shall display flow rate information.

PART 3 – EXECUTION

3.1 PRE-INSTALLATION MEETINGS

- A. Pre-installation meeting to review project, worksites, storage, office, personnel, etc. Follow Section 013119.
- B. The meeting will take place one month prior to the start of this project.

3.2 PREPARATION

- A. Verify existing conditions at each site prior to commencing work at that site.
- B. Identify required lines, levels, contours and datum locations.
- C. Locate, identify and protect utilities to remain from damage.
- D. Do not interrupt existing utilities without permission and without making arrangements to provide temporary utility services.
 - 1. Notify the Owner not less than 2 days in advance of proposed utility interruption.
 - 2. Do not proceed without written permission from the Owner.
- E. The Owner support will be required during implementation of this Project to obtain access to meter boxes/pits and to coordinate utility interruptions. The Owner will provide notification in its billing to its customers that the Installer is performing the designated work and that possible service interruption may result.

3.3 SAFETY

- A. Background Checks - All Installer personnel that may potentially be involved in private property installations will be subject to a background check by the Owner's Police Department. Drug and alcohol testing will also be required. The Owner reserves the right to remove Installer personnel from the project if they are deemed to pose a risk to the customers on the water system.
- B. Identification - All Installer personnel shall wear shirts identifying the organization they are representing and shall have identification clearly visible on the exterior of their clothing. Identification shall list their first and last name, the name of the organization they represent and a contact number for the organization. Additionally, the vehicles shall have identification of the organization they represent. Should the Police Department determine that Owner issued identification is appropriate, this shall be clearly visible as well and worn at all times. Installer shall carry business cards with contact information to leave with residents and businesses.
- C. The Installer shall have the primary responsibility for the supervision, initiation, and maintaining all safety precautions and programs necessary to complete its Work associated with the Project. The Installer agrees to comply with all applicable regulations, ordinances, and laws relating to safety. It shall be the responsibility of the Owner, however, to assure that the sites controlled by the Owner at which the Installer is expected to do its Work are safe sites.
- D. The Installer shall be solely responsible for complying with all federal, state and local safety requirements, together with exercising precautions at all times for the protection of persons (including employees) and public and private property. It is also the sole responsibility of the Installer to initiate, maintain, and supervise all safety requirements, precautions and programs in connection with the Work. Submit Safety Plan prior to the Pre-Installation Meeting.

- E. Completion of a training program on safety, what to do in an emergency, customer complaints, and problems with meter installations.

3.4 SCHEDULING

- A. Since most of the meters are located inside home and businesses, it will be crucial to setup appointments for gaining access and permission to install new meters. It is most important to the Owner that proper care should be taken when entering resident's homes and businesses.
 - 1. Establish Work schedules that will minimize customer inconvenience and maximize gaining access to customer's premises.
 - 2. Installer Work schedules shall be subject to the Owner's approval.
- B. The Contractor must provide a fully staffed courteous and professional customer service department with flexible hours of operation from 7:00 AM to 7:00 PM Eastern Time, Monday through Friday. The Contractor must also provide a toll free number and offer customers flexible scheduling for weekends and evenings.
- C. Work hours for installation of the meters/transmitters shall be as arranged by the Installer with each homeowner by appointment in advance. Residents shall be contacted for appointments first by telephone and if unsuccessful after 3 attempts by telephone, then by "door knocking." Whether by telephone or "door knocking" no contact shall be made outside the specified working hours.
- D. If after making two (2) attempts by letter, three (3) attempts by phone, and one (1) attempt by leaving a pre-approved door hanger note, a resident is not responsive the Installer shall notify the Owner. Document all attempts. The Owner will make contact with the resident and arrange a mutually agreeable appointment. The Installer shall then complete the installation.
- E. If any meter and/or transmitter location is inaccessible, the Installer shall inform the resident verbally and in writing to make the location accessible. If after 14 days the location is still inaccessible, the Installer shall notify the Owner. Once the area is accessible, the Installer shall then complete the installation.

3.5 COORDINATION

- A. Coordinate Work with the Owner Meter operations within installation area. Verify with Owner if large meter types and/or sizes should be changed for any meters greater than or equal to 2-inch diameter.
- B. Provide a project manager to coordinate all installation activities with the customer and be the main contact point between the customer and Manufacturer/Installer during deployment. The project manager will also coordinate all installation activities with the meter company and contract installation crews hired by Manufacturer to install any equipment that is the responsibility of Manufacturer.

- C. In the event that locations exist where conditions prevail which require nonstandard work (i.e. move a service location etc., move fences for or other customer structures & items for access, install systems in heavy traffic locations alleys, parking lots, resize or services, etc.), the Installer and the Owner will discuss pricing and work may proceed from this point or the Owner may elect to exclude this work from the project.

3.6 INSTALLATION METERS/TRANSMITTERS

- A. For MIU installations, follow Section 330908.01 Part 3.7.

- B. Inaccessible equipment:

1. If any meter and/or MIU location is inaccessible, the Contractor shall inform the resident verbally and in writing to make the location accessible.
2. If after 14 days the location is still inaccessible, the Contractor shall notify the Owner. Once the area is accessible, the Contractor shall then complete the installation.
3. If the meter is not accessible within 60 days after Contractor's notice of inaccessibility to the Owner, the Contractor shall not be responsible for the installation. The materials shall be turned over to the Owner for later installation by the Owner or Owner's agent. Price to be paid will be for the materials only in this case.

- C. Photographic log:

1. The Contractor shall take and log pre and post digital photography of the installation.
2. One pre-construction photo shall document the serial number and final read of the old meter/register. Customer address shall also be photographed for each meter.
3. The final read and documentary photo shall be provided to the OWNER for billing purposes in an electronic format for ease of billing.
4. Format of the photos shall be acceptable by Owner in a format readily accessible.
5. The Contractor shall take and log latitude and longitude of each MTU location.

- D. Valve operations:

1. If no shut off exists before the meter inside the structure, the Contractor shall inform the Owner to arrange shut off by the Owner from the street/exterior of the building. Contractor shall allow a reasonable time for the Owner to schedule same.
2. If a shut off valve(s) inside the structure is utilized and leaks after use, the Contractor shall make reasonable attempt to stop the leak.
3. If unsuccessful, the Contractor will not be responsible to replace the valve unless authorized by Owner, but shall promptly notify the Owner. Contractor shall provide their own curb valve shutoff key and shall shut off the service to prevent damage.

- E. Work Site Orderliness:

1. Contractors shall wear protective coverings over shoes at all times while in residences.
2. Drop cloths and other preventative measures shall be utilized in carpeted or "finished" areas of work.
3. Contractors shall perform all required cleaning to maintain original condition of work areas.
4. Any damage to the construction site resulting from this work shall be repaired to its original condition by this contractor. Documentation (pictures and written) of this shall be provided to the Owner's representative.

- F. The following summary describes the general steps of the installation Work to be done. The actual Work may differ from this description, and will not be limited to these actions:
1. Installation Contractor will replace existing meters in accordance with the Manufacturer's instructions as well as Owner specifications.
 2. The meters shall be installed in a neat and workman-like manner by technicians who have been trained and informed of the technical and procedural requirements of the Work.
 3. Replace old meter with new meter with Meter Interface Unit (MIU).
 4. Attach meter wires.
 5. Program both the MTU and meter/transmitter as needed.
 6. Test installation with Manufacturer's tester or equivalent.
 7. Clean work area.
 8. Complete paperwork.
 9. Inform home Owner of actions.
- G. Water Shutoffs
1. The Installer, its agents and subcontractors, will be responsible for shutting off the water to each meter service as well as notifying each customer of the water shutoff. Some assistance may be required by Owner with the notification of its customers.
 2. The installation team will knock on the doors of residential customers as well as leave notifications on their doors.
 3. In the case of large commercial customers such as: schools, hospitals, nursing homes or any other commercial customer, special efforts will be made to ensure minimum disruption to their water needs. In order to prevent any damage from running flush valves or any other plumbing fixtures that are sensitive to water shutoffs, the Installer will schedule replacements with these commercial customers and will notify the maintenance personnel when turning the water back on at these facilities. Regardless of any effort of the Installer, ultimate responsibility of any and all fixtures inside buildings will remain the responsibility of the end user and/or Owner as detailed in the Utility's regulations.
- H. Meter Boxes, Vaults, and Roadways: The Installer is responsible for repairing any damage it causes to meter boxes, vaults that result from the installation of the Project. The Installer shall not be liable for pre-existing conditions or leaks. The Installer may install new meter boxes as part of the project as authorized by the Owner, if this work is requested it shall be billed per item at a rate established under the Contract.
- I. Disinfection: Adhere to state laws and AWWA guidelines in conjunction with the replacement of the utility meter.

3.7 ADDITIONAL WORK AS AUTHORIZED

- A. Any additional Work requested by the Water Department Utility will be performed on a negotiated time and material basis. The Owner reserves the right to review each situation and make final decision regarding whether the additional work is the responsibility of, and therefore at the expense of, the Installer, home Owner/water customer, or Owner.

B. Faulty Plumbing:

1. If, in the Installer's opinion, the condition of the customer's existing service piping is such that significant damage would result from attempting to remove and replace the existing utility meter, the Installer shall inform the Water Department and their project manager. The Owner shall authorize the installer to make repairs at the Contingent Bid Item pricing for "Faulty Plumbing Repairs, As Directed" included in the Bid, or as otherwise negotiated.
2. The Installer is responsible for any damages that occur within 6" on either side of the utility meter resulting from the Project installation. Any damages incurred within this 6" area will be promptly repaired at the expense of the Installer. The Installer is not liable for damages outside the 6" zone, either on the water distribution side or on the customer side incurred from the Project installation including shutoff, temporary outage, and restart of water service. The Installer is not liable for any pre-existing conditions including leaks, faulty workmanship and materials from previous projects or rust. Should such conditions occur (i.e. leaks) the Installer shall document them and at Owner's written request repair them at prices included in the Bid or as otherwise negotiated, if not included in the Bid.
 - a) Minor plumbing: Non-functioning, in-house shut-off valve replacement shall be authorized by the Owner for Installer to make repairs at the Contingent Bid Item pricing for "Replacing Non-Functioning Shut off valve inside building, As Directed" included in the Bid, or as otherwise negotiated.
 - b) Major plumbing: piping replacement for meter setting, at a negotiated price acceptable to both parties. Property Owner and/or water service customer shall be consulted and permitted first right to perform repairs within an acceptable time-frame. Cost for this repair shall be paid by the Owner up front, and then charged back to the property Owner by the Owner as appropriate.

C. Wiring: Provide 3 wire harness from meter/encoder to the MIU placed on the outside of the structure as directed by the Owner. Follow Section 330908.01.

D. Minor carpentry: Includes cutting out and replacing a small section of wall, size not to exceed 16" x 16". The Owner shall authorize the installer to make repairs at the Contingent Bid Item pricing for "Minor Carpentry Repairs, As Directed" included in the Bid, or as otherwise negotiated. Cost for this will be borne by the Owner.

E. Major carpentry: Includes opening a wall and replacing it. The Owner shall authorize the Installer to make major repairs at a negotiated price acceptable to both parties. Property Owner and/or water service customer shall be consulted and permitted first right to waive repairs or to perform them at their cost. Cost for this repair shall be paid by the Owner upfront, and then charged back to the property Owner by the Owner as appropriate.

3.8 PROTECTION OF FINISHED WORK

A. Protect finished work until it is placed into service, inspected by the Owner/Engineer, and turned over to the Owner

3.9 FIELD QUALITY CONTROL

- A. For MIU installations, follow Section 330908.01.

3.10 DATABASE MANAGEMENT

- A. The Installer or its agents shall be required to acquire certain data as it completes the aforementioned installation work. This data shall include: the previous meter reading, the current meter reading, the new meter serial number, the new register serial number, the transmitter serial number, GPS coordinates for the location of the work. This information will be acquired and delivered to the utility in an electronic form.
- B. The City requires that the Installer provides database management services to ensure the accuracy of the records in the system. The following items must be addressed in this service:
 - 1. Name and address verification and correction
 - 2. Telephone number verification and correction
 - 3. Owner identification number verification and correction
 - 4. Meter identification number verification and correction.

3.11 CLEANING AND DISPOSAL

- A. The Installer will be responsible for keeping the Project area free from the accumulation of waste materials or trash that result from the Project-related Work. Upon completion of the initial Project-related Work, the Installer will remove all waste materials, trash, tools, construction equipment and supplies, and shall remove all surplus materials associated with the Project.
- B. All meters removed from service shall be the property of the installer for purposes of scrapping. The price bid shall include credit to the OWNER for the scrap value of removed registers, meters and appurtenances. Proper paperwork shall be completed for each meter removed.

3.12 TRAINING

- A. Complete installation and operating instructions must be included for all supplied meters.
- B. The Contractor shall provide no less than two (2) 8-hour training days to Owner field and office staff on all aspects of product installation and maintenance. This training will take place at an Owner-designated location and at times coordinated with the Owner.

3.13 SCHEDULE OF METERS FOR REPLACEMENT

ITEM	SIZE	TYPE	QUANTITY	NOTES
1	5/8" PD Residential Utility meter w/ Fixed RF transmitter	Inside Pit	237 10	Eight meters at Alpha Drive are pit mounted. The college health center has pit and inside meters. Some pit mounted meters may be underwater.
2	1" PD utility meter w/ Fixed RF transmitter	Inside Pit	8 1	Cemetery pit meter is located near intersection.
3	1 1/2" PD utility meter w/ Fixed RF transmitter	Inside Pit	1 0	Replacing either positive displacement or turbine meters with compound meters.
4	2" Compound utility meter w/ Fixed RF transmitter	Inside Pit	22 0	Replacing either positive displacement or turbine meters with compound meters.
6	3" Compound utility meter w/ Fixed RF transmitter	Inside Pit	6 0	Replace all existing meters with compound meters.
7	4" Compound utility meter w/ Fixed RF transmitter	Inside Pit	1 0	Replace existing meter with compound meters.

END OF SECTION 331900.01