

**SUPPLEMENTAL SPECIFICATIONS  
TO THE  
CITY OF WICHITA, KANSAS  
STANDARD SPECIFICATIONS**

**PIKE ADDITION LIFT STATION  
15500 W. Maple**

**CITY PROJECT NO. 468-2019-005340  
OCA NO. 629320**

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## SPECIAL CONDITIONS

In addition to equipment indicated on the plans and called out in the specifications heretofore, the contractor shall furnish the following:

### PUMP STATION

1. Padlocks as needed for security of the entire system. Padlocks shall be approved by the City of Wichita Water and Sewer Department.
2. Three (3) copies of maintenance and operation manual for the Pump Station shall be furnished to the City of Wichita Water and Sewer Department.
3. The Contractor will be required to make a timely request to K.G.&E. and Peoples Natural Gas for extension of electrical power supply and gas supply to the pump station site.

All costs for connection of the pump station to the electrical power supply shall be included in the lump sum unit price bid for Pump Station and standby power module.

### BACKFILLING AND COMPACTION REQUIREMENTS.

Trench backfill compaction density shall be amended to require a “compacted density of equal to or greater than ninety-five percent (95%) of standard density.” This requirement is applicable to all trenches backfilled with fill material whether or not the trench is located under existing or proposed paving.

### PIPE CLASSIFICATION AND BEDDING REQUIREMENTS.

The following pipe and bedding requirements shall be utilized on this project. The bedding classifications as shown below for flexible, rigid, and semi-rigid pipes are outlined in the City of Wichita Standard Specifications, dated March 1998.

For trench widths up to 4 feet and depths up to 28 feet, the classes of pipe and bedding requirements shown below shall be used in lieu of those previously specified. All bedding shall be crushed rock material.

<u>Type of Pipe</u>	<u>Class of Pipe</u>	<u>Bedding Requirement</u>
Ductile Iron	Thickness Class 52	Improved bedding for Semi-Rigid Pipe
PVC Pipe	DR-35 (PS-46)	Improved bedding for Flexible Pipe

Vitrified Clay	As specified	Improved bedding for rigid pipe with a minimum of 4 inches of bedding material under the barrel of the pipe.
Reinforced Concrete	Class V	Improved bedding for rigid pipe with a minimum of 3 inches of bedding material under the barrel of the pipe.

Note: If a trench width greater than 4 feet is requested for use on this project, the contractor shall submit the trench width to the Engineer for approval. It should be noted that the installation of proposed pipe within a movable trench support system (i.e. trench box) where the trench support system will be removed and is below the top of the top of the proposed pipe will require extreme care in not displacing the compacted bedding material. If adequate compaction of the bedding material or displacement of the bedding material cannot be controlled, a higher bedding class (concrete cradle or concrete encasement) or higher class of pipe may be required.

CITY OF WICHITA  
SPECIFICATIONS

PUMP STATION WITH SUBMERSIBLE PUMPS AND FORCE MAIN PIPING

SUPPLEMENTAL CONDITIONS

Definitions

Wherever used in the CONTRACT DOCUMENTS, the following terms shall have the meanings indicated which shall be applicable to both the singular and plural thereof:

ADDENDA - Written or graphic instruments issued prior to the execution of the Contract which modify or interpret the CONTRACT DOCUMENTS, DRAWINGS and SPECIFICATIONS, by additions, deletions, clarifications or corrections.

BID - The offer or proposal of the BIDDER submitted on the prescribed form setting forth the prices for the WORK to be performed.

BONDS - Bid, Construction, and Statutory Payment Bonds and other instruments of security, furnished by the CONTRACTOR and his surety in accordance with the CONTRACT DOCUMENTS.

CONSULTANT - The Design Professional or firm having been responsible for the preparation of the CONTRACT DOCUMENTS when so noted in the "Information For Bidders". The CONSULTANT or a Consultant may assist the ENGINEER or act in his behalf during the construction phase, when so directed by the ENGINEER.

CONTRACT DOCUMENTS - The Advertisement For Bids, Information For Bidders, BID, Bid Bond, Contract, Statutory Bond, Construction Bond, NOTICE OF AWARD, NOTICE TO PROCEED, MODIFICATION ORDER, DRAWINGS, SPECIFICATIONS, and ADDENDA.

CONTRACT PRICE - The total monies payable to the CONTRACTOR under the terms and conditions of the CONTRACT DOCUMENTS.

CONTRACT TIME - The number of working days stated in the CONTRACT DOCUMENTS for the completion of the WORK.

DRAWINGS - The part of the CONTRACT DOCUMENTS which show the characteristics and scope of the WORK to be performed and which have been prepared or approved by the ENGINEER. The DRAWINGS consist of the sheet titles and drawings numbers as listed in the SUPPLEMENTAL GENERAL CONDITIONS.

FIELD ORDER - A written order effecting a change in the WORK not involving an adjustment in the CONTRACT PRICE or an extension of the CONTRACT TIME, issued by the ENGINEER to the CONTRACTOR during construction.

MODIFICATION ORDER - A written order to the CONTRACTOR authorizing an addition, deletion or revision in the WORK within the general scope of the CONTRACT DOCUMENTS, or authorizing an adjustment in the CONTRACT PRICE or contract time.

NOTICE OF AWARD - The written notice of the acceptance of the BID from the OWNER to the successful BIDDER.

NOTICE TO PROCEED - Written communication issued by the OWNER to the CONTRACTOR authorizing him to proceed with the WORK and establishing the date of commencement of the WORK.

OWNER - City of Wichita, Kansas.

PROJECT - The undertaking to be performed as provided in the CONTRACT DOCUMENTS.

RESIDENT PROJECT REPRESENTATIVE - The authorized representative of the ENGINEER who is assigned to the PROJECT site or any part thereof.

SHOP DRAWINGS - All drawings, diagrams, illustrations, brochures, schedules and other data which are prepared by the CONTRACTOR, a SUBCONTRACTOR, manufacturer, SUPPLIER or distributor, which illustrate how specific portions of the WORK shall be fabricated or installed.

SPECIFICATIONS - The SPECIFICATIONS consist of the pages numbered as shown on the "Table of Contents". The Specifications are a part of the CONTRACT DOCUMENTS and include written descriptions of a technical nature of materials, equipment, construction systems, standards and workmanship.

SUBCONTRACTOR - An individual, firm or corporation having a direct contract with the CONTRACTOR or with any other SUBCONTRACTOR for the performance of a part of the WORK at the site.

SUBSTANTIAL COMPLETION - That date as certified by the ENGINEER when the construction of the PROJECT or a specified part thereof is sufficiently completed, in accordance with the CONTRACT DOCUMENTS, so that the PROJECT or specified part can be utilized for the purposes for which it is intended.

**SUPPLIER** Any person or organization who supplies materials or equipment for the WORK, including that fabricated to a special design, but who does not perform labor at the site.

**WORK** - All labor necessary to produce the construction required by the CONTRACT DOCUMENTS, and all materials and equipment incorporated or to be incorporated in the PROJECT.

**WRITTEN NOTICE** - Any notice relative to any part of this Contract given, in writing, to a party of the Contract and considered delivered and the service thereof completed, when posted by certified or registered mail to the said party at his last given address, or delivered in person to said party or his authorized representative on the WORK.

#### Additional Instructions And Detail Drawings

The CONTRACTOR may be furnished additional instructions and detail drawings, by the ENGINEER, as necessary to carry out the WORK required by the CONTRACT DOCUMENTS.

The additional drawings and instruction thus supplied will become a part of the CONTRACT DOCUMENTS. The CONTRACTOR shall carry out the WORK in accordance with the additional detail drawings and instructions.

#### Schedules, Reports And Records

The CONTRACTOR shall submit to the ENGINEER such schedule of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data where applicable as are required by the CONTRACT DOCUMENTS for the WORK to be performed.

Prior to the first partial payment estimate the CONTRACTOR shall submit construction progress schedules showing the order in which he proposes to carry on the WORK, including dates at which he will start the various parts of the WORK, estimated date of completion of each part and, as applicable:

The dates at which special detail drawings will be required; and

Respective dates for submission of SHOP DRAWINGS, the beginning of manufacture, the testing and the installation of materials, supplies and equipment.

The CONTRACTOR shall also submit a schedule of payments that he anticipates he will earn during the course of the WORK.

## Drawings And Specifications

The intent of the DRAWINGS and SPECIFICATIONS is that the CONTRACTOR shall furnish all labor, materials, tools, equipment, and transportation necessary for the proper execution of the WORK in accordance with the CONTRACT DOCUMENTS and all incidental work necessary to complete the PROJECT in an acceptable manner, ready for use, occupancy or operation by the OWNER.

Within the Specifications the order of precedence shall be as follows: Addenda, Supplemental General Conditions, Information for Bidders, General Conditions, Technical Provisions. In case of conflict between the DRAWINGS and SPECIFICATIONS, the SPECIFICATIONS shall govern. Figure dimensions on DRAWINGS shall govern over scale dimensions, and detailed DRAWINGS shall govern over general DRAWINGS.

Any discrepancies found between the DRAWINGS and SPECIFICATIONS and site conditions or any inconsistencies or ambiguities in the DRAWINGS or SPECIFICATIONS shall be immediately reported to the ENGINEER, in writing, who will promptly correct such inconsistencies or ambiguities in writing. WORK done by the CONTRACTOR after his discovery of such discrepancies, inconsistencies or ambiguities shall be done at the CONTRACTOR'S risk.

## Shop Drawings

The CONTRACTOR shall provide SHOP DRAWINGS as may be necessary for the prosecution of the WORK as required by the CONTRACT DOCUMENTS. The ENGINEER will promptly review all SHOP DRAWINGS. The ENGINEER'S approval of any SHOP DRAWING shall not release the CONTRACTOR from responsibility for deviations from the CONTRACT DOCUMENTS. The approval of any SHOP DRAWING which substantially deviates from the requirement of the CONTRACT DOCUMENTS shall be evidenced by a MODIFICATION ORDER.

When submitted for the ENGINEER'S review, SHOP DRAWINGS shall bear the CONTRACTOR'S certification that he has reviewed, checked and approved the SHOP DRAWINGS and that they are in conformance with the requirements of the CONTRACT DOCUMENTS.

Portions of the WORK requiring a SHOP DRAWING or sample submission shall not begin until the SHOP DRAWING or submission has been approved by the ENGINEER. A copy of each approved SHOP DRAWING and each approved sample shall be kept in good order by the CONTRACTOR at the site and shall be available to the ENGINEER.

### Materials, Services And Facilities

It is understood that, except as otherwise specifically stated in the CONTRACT DOCUMENTS, the CONTRACTOR shall provide and pay for all materials, labor, tools, equipment, water, light, power, transportation, supervision, temporary construction of any nature, and all other services and facilities of any nature whatsoever necessary to execute, complete, and deliver the WORK within the specified time.

Materials and equipment shall be so stored as to insure the preservation of their quality and fitness for the WORK. Stored materials and equipment to be incorporated in the WORK shall be located so as to facilitate prompt inspection.

Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer.

Materials, supplies and equipment shall be in accordance with samples submitted by the CONTRACTOR and approved by the ENGINEER.

Materials, supplies or equipment to be incorporated into the WORK shall not be purchased by the CONTRACTOR or the SUBCONTRACTOR subject to a chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller.

### Inspection And Testing

All materials and equipment used in the construction of the PROJECT shall be subject to adequate inspection and testing in accordance with generally accepted standards, as required and defined in the CONTRACT DOCUMENTS.

"So long as the CONTRACTOR'S work progresses in an orderly and reasonable manner the costs of field sample preparation and testing of all specimens will be borne by the OWNER. Should the CONTRACTOR use methods of procedures that require unreasonable or excessive field testing to determine whether specification requirements are being met, or if field testing is performed with continued negative results that indicate the CONTRACTOR'S methods or procedures are not adequate to provide the specified results, the ENGINEER shall notify the CONTRACTOR in writing that the costs of all additional testing beyond specific limits, which shall be set out in the written notice for the particular area or material in question, shall be the responsibility of the CONTRACTOR. Such costs will then be deducted from the monies due the CONTRACTOR for the work performed."

The OWNER will provide all inspection and testing services not required of the CONTRACTOR by the CONTRACT DOCUMENTS, so long as the CONTRACTOR'S work progresses in an orderly and reasonable manner. Should the CONTRACTOR use methods or procedures that require unreasonable or excessive field testing to determine whether specification requirements are being met, or if field testing is performed with continued negative results relative to specification requirements, the ENGINEER shall notify the CONTRACTOR, in writing, that the costs of all additional testing beyond specific limits, which shall be set out in the WRITTEN NOTICE for the particular area(s) or material(s) in question, shall be the responsibility of the CONTRACTOR. Such costs will then be deducted from the monies due the CONTRACTOR for the testing performed.

If the CONTRACT DOCUMENTS, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any WORK to specifically be inspected, tested, or approved by someone other than the CONTRACTOR, the CONTRACTOR shall give the ENGINEER timely notice of readiness. The CONTRACTOR shall then furnish the ENGINEER the required certificates of inspection, testing or approval.

Inspections, tests or approvals by the ENGINEER or others shall not relieve the CONTRACTOR from his obligations to perform the WORK in accordance with the requirements of the CONTRACT DOCUMENTS.

The ENGINEER and his representatives will at all times have access to the WORK. In addition, authorized representatives and agents of any participating Federal or State agency shall be permitted to inspect all work, materials, payrolls, records of personnel, invoices of materials, and other relevant data and records. The CONTRACTOR shall provide proper facilities for such access and observation of the WORK and also for any inspection, or testing thereof.

If any WORK is covered contrary to the written instructions of the ENGINEER it must, if requested by the ENGINEER, be uncovered for his observation and replaced at the CONTRACTOR'S expense.

If the ENGINEER considers it necessary or advisable that covered WORK be inspected or tested by others, the CONTRACTOR, at the ENGINEER'S request, shall uncover, expose or otherwise make available for observation, inspection or testing as the ENGINEER may require, that portion of the WORK in question, furnishing all necessary labor, materials, tools, and equipment. If it is found that such WORK is defective, the CONTRACTOR shall bear all the expenses of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction. If, however, such WORK is

not found to be defective, the CONTRACTOR will be allowed an increase in the CONTRACT PRICE or an extension of the CONTRACT TIME, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction and an appropriate MODIFICATION ORDER shall be issued.

If the work is defective, or CONTRACTOR fails to supply sufficient skilled workmen or suitable materials or equipment or if CONTRACTOR fails to make prompt payments to Subcontractors or for labor, materials or equipment, OWNER may order CONTRACTOR to stop the work, or any portion thereof, until the cause for such order has been eliminated; however, this right of OWNER to stop the work shall not give rise to any duty on the part of OWNER to exercise this right for the benefit of CONTRACTOR or any other party.

The ENGINEER may provide one or more RESIDENT PROJECT REPRESENTATIVES to inspect materials to be used in the work and observe construction methods to determine compliance with the Contract Requirements. The ENGINEER and the RESIDENT PROJECT REPRESENTATIVES shall be provided free access to all parts of the work at the project site and to offsite locations where materials or equipment proposed for use in the work are to be produced or fabricated. RESIDENT PROJECT REPRESENTATIVES shall have the authority to reject defective materials; to delay specific construction operations while the acceptability of materials is being determined, or while equipment or machines are being adjusted or calibrated; and to suspend operations on any part of the work not meeting Contract Requirements. Project Representatives shall have no authority to deviate from or waive the requirements of the specifications without written permission of the ENGINEER. RESIDENT PROJECT REPRESENTATIVES will not perform as Superintendent or Foreman for the CONTRACTOR and neither the presence nor absence of the Project Representative on the work shall relieve the CONTRACTOR of his responsibility to perform all work in accordance with the Contract Requirements.

### Substitutions

Whenever a material, article, or piece of equipment is identified on the DRAWINGS or SPECIFICATIONS by reference to brand name or catalogue number, it shall be understood that this is referenced for the purpose of defining the performance or other salient requirements and that other products of equal capacities, quality and function will be considered. The CONTRACTOR may recommend the substitution of a material, article, or piece of equipment of equal substance and function for those referred to in the CONTRACT DOCUMENTS by reference to brand name or catalogue number and if, in the opinion of the ENGINEER, such material, article, or piece of equipment is of equal substance and function to that specified, the ENGINEER may approve its

substitution and use by the CONTRACTOR. Any cost differential shall be deductible from the CONTRACT PRICE and the CONTRACT DOCUMENTS shall be appropriately modified by a MODIFICATION ORDER. The CONTRACTOR warrants that if substitutes are approved, no major changes in the function or general design of the PROJECT will result. Incidental changes or extra component parts required to accommodate the substitute will be made by the CONTRACTOR without a change in the CONTRACT PRICE or CONTRACT TIME.

### Patents

The CONTRACTOR shall pay all applicable royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and save the OWNER harmless from loss on account thereof, except that the OWNER shall be responsible for any such loss when a particular process, design, or the product of a particular manufacturer or manufacturers is specified, however if the CONTRACTOR has reason to believe that the design, process or product specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the ENGINEER.

### Surveys, Permits, Regulations

The OWNER will furnish horizontal and vertical control points for locating the principal component parts of the WORK together with a suitable number of bench marks adjacent to the WORK as shown in the CONTRACT DOCUMENTS. From the information provided by the OWNER, unless otherwise specified in the CONTRACT DOCUMENTS, the CONTRACTOR shall develop and make all detail surveys needed for construction such as slope stakes, batter boards, stakes for pile locations and other working points, lines, elevations and cut sheets.

The CONTRACTOR shall carefully preserve bench marks, reference points and stakes and, in case of willful or careless destruction, he shall be charged with the resulting expense and shall be responsible for any mistakes that may be caused by their unnecessary loss or disturbance.

Permits and licenses of a temporary nature necessary for the prosecution of the WORK shall be secured and paid for by the CONTRACTOR unless otherwise stated in the SUPPLEMENTAL GENERAL CONDITIONS. Permits, licenses and easements for permanent structures or permanent changes in existing facilities shall be secured and paid for by the OWNER, unless otherwise specified. The CONTRACTOR shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the WORK as drawn and specified. If the CONTRACTOR observes that the CONTRACT DOCUMENTS are at variance therewith, he shall promptly notify the ENGINEER in writing, and any necessary changes shall be adjusted as provided in Section 13, CHANGES IN THE WORK.

## Protection Of Work, Property And Persons

The CONTRACTOR shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the WORK. He will take all necessary precautions for the safety of, and will provide the necessary protection to prevent damage, injury or loss to all employees on the WORK and other persons who may be affected thereby, all the WORK and all materials or equipment to be incorporated therein, whether in storage on or off the site, and other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

The CONTRACTOR shall comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction. He will erect and maintain, as required by the conditions and progress of the WORK, all necessary safeguards for safety and protection. He shall notify owners of adjacent utilities when prosecution of the WORK may affect them. The CONTRACTOR shall remedy all damage, injury or loss to any property caused, directly or indirectly, in whole or in part, by the CONTRACTOR, any SUBCONTRACTOR or anyone directly or indirectly employed by any of them or anyone for whose acts any of them be liable, except damage or loss attributable to the fault of the CONTRACT DOCUMENTS or to the acts or omissions of the OWNER or the ENGINEER or anyone employed by either of them or anyone for whose acts either of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of the CONTRACTOR.

In emergencies affecting the safety of persons or the WORK or property at the site or adjacent thereto, the CONTRACTOR, without special instruction or authorization from the ENGINEER or OWNER, shall act to prevent threatened damage, injury or loss. He shall give the ENGINEER prompt WRITTEN NOTICE of any significant changes in the WORK or deviations from the CONTRACT DOCUMENTS caused thereby, and a MODIFICATION ORDER changes and deviations involved.

### Supervision By Contractor

The CONTRACTOR shall supervise and direct the WORK. He shall be solely responsible for the means, methods, techniques, sequences and procedures of construction. The CONTRACTOR shall employ and maintain on the WORK a qualified supervisor or superintendent acceptable to the ENGINEER who shall have been designated in writing by the CONTRACTOR as the CONTRACTOR'S representative at the site. The supervisor shall have full authority to act on behalf of the CONTRACTOR and all communications given to the supervisor shall be as binding as if given to the CONTRACTOR. The supervisor shall be present on the site at all times as required to perform adequate supervision and coordination of the WORK.

### Changes In The Work

The OWNER may at any time, as the need arises, order changes within the scope of the WORK without invalidating the Contract. If such changes increase or decrease the amount due under the CONTRACT DOCUMENTS, or in the time required for performance of the WORK, an equitable adjustment shall be authorized by MODIFICATION ORDER.

The ENGINEER, also, may at any time, by issuing a FIELD ORDER, make changes in the details of the WORK. The CONTRACTOR shall proceed with the performance of any changes in the WORK so ordered by the ENGINEER unless the CONTRACTOR believes that such FIELD ORDER entitles him to a change in CONTRACT PRICE or TIME, or both, in which event he shall give the ENGINEER WRITTEN NOTICE thereof within seven (7) days after the receipt of the ordered change. Thereafter the CONTRACTOR shall document the basis for the change in CONTRACT PRICE or TIME within thirty (30) days. The CONTRACTOR shall not execute such changes pending the receipt of an executed MODIFICATION ORDER or further instruction from the OWNER.

### Changes In Contract Price

The CONTRACT PRICE may be changed only by a MODIFICATION ORDER. The value of the WORK covered by a MODIFICATION ORDER or of any claim for increase or decrease in the CONTRACT PRICE shall be determined by one or more of the following methods in the order of precedence listed below:

- (a) Unit prices previously approved.
- (b) An agreed lump sum.
- (c) The actual cost for labor, direct overhead, materials, supplies, equipment, and other services necessary to complete the work. In addition there shall be added an amount to be agreed upon but not to exceed fifteen (15) percent of the actual cost of the WORK to cover the cost of general overhead and profit.

When the Contract calls for stipulated unit prices for certain items of work, the Contract Price for each work item specified shall be determined as the product of the stipulated unit price and the completed units of acceptable work as measured and certified by the ENGINEER.

### Time For Completion And Liquidated Damages

The date of beginning and the time for completion of the WORK are essential conditions of the CONTRACT DOCUMENTS and the WORK embraced shall be commenced on a date specified in the NOTICE TO PROCEED.

The CONTRACTOR shall proceed with the WORK at such rate of progress to insure full completion within the CONTRACT TIME. It is expressly understood and agreed, by and between the CONTRACTOR and the OWNER, that the CONTRACT TIME for the completion of the WORK described herein is a reasonable time, taking into consideration the average climatic and economic conditions and other factors prevailing in the locality of the WORK. Refer to the "BID" for the CONTRACT TIME.

If the CONTRACTOR shall fail to complete the WORK within the CONTRACT TIME, or extension of time granted by the OWNER, then the CONTRACTOR shall pay to the OWNER the amount for liquidated damages as specified in the BID for each working day that the CONTRACTOR shall be in default after the time for completion stipulated in the CONTRACT DOCUMENTS. The stated amount of liquidated damages is fixed and agreed upon because of the extreme difficulty of ascertaining the actual damages the OWNER would sustain, and such amounts, if due, may be retained from money due the CONTRACTOR.

The CONTRACTOR shall not be charged with liquidated damages or any excess cost when the delay in completion of the WORK is due to the following, and the CONTRACTOR has promptly given WRITTEN NOTICE of such delay to the OWNER or ENGINEER.

To any preference, priority or allocation order duly issued by the OWNER.

To unforeseeable causes beyond the control and without the fault or negligence of the CONTRACTOR, including but not restricted to, acts of God, or of the public enemy, acts of the OWNER, acts of another CONTRACTOR in the performance of a contract with the OWNER, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and abnormal and unforeseeable weather; and

To any delays of SUBCONTRACTORS or delay in material deliveries occasioned by any of the causes specified in paragraphs 15.4.1 and 15.4.2 of this article.

#### Correction Of Work

The CONTRACTOR shall promptly remove from the premises all WORK rejected by the ENGINEER for failure to comply with the CONTRACT DOCUMENTS, whether incorporated in the construction or not, and the CONTRACTOR shall promptly replace and re-execute the WORK in accordance with the CONTRACT DOCUMENTS and without expense to the OWNER and shall bear the expense of making good all WORK of other CONTRACTORS destroyed or damaged by such removal or replacement.

All removal and replacement WORK shall be done at the CONTRACTOR'S expense. If the CONTRACTOR does not take action to remove such rejected WORK within ten (10) days after receipt of WRITTEN NOTICE, the OWNER may remove such WORK and store the materials at the expense of the CONTRACTOR.

Prior to SUBSTANTIAL COMPLETION, the OWNER, with the approval of the ENGINEER and with the concurrence of the CONTRACTOR, may use any completed or substantially completed portions of the WORK. Such use shall not constitute an acceptance of such portions of the WORK.

The OWNER shall have the right to enter the premises for the purpose of doing work not covered by the CONTRACT DOCUMENTS. This provision shall not be construed as relieving the CONTRACTOR of the sole responsibility for the care and protection of the WORK, or the restoration of any damaged WORK except such as may be caused by agents or employees of the OWNER.

Upon completion and acceptance of the WORK, the ENGINEER will issue a certificate attached to the final payment request that the WORK has been accepted by him under the conditions of the CONTRACT DOCUMENTS. The entire balance found to be due the CONTRACTOR, including the retained percentages, but except such sums as may be lawfully retained by the OWNER, shall be paid to the CONTRACTOR within thirty (30) days of completion and acceptance of the WORK.

The CONTRACTOR shall indemnify and save the OWNER or the OWNER'S agents harmless from all claims growing out of the lawful demands of SUBCONTRACTORS, laborers, workmen, mechanics, materialmen, and furnishers of machinery and parts thereof, equipment, tools, and all supplies, incurred in the furtherance of the performance of the WORK. The CONTRACTOR shall, at the OWNER'S request, furnish satisfactory evidence that all obligations of the nature designated above have been paid, discharged, or waived. If the CONTRACTOR fails to do so the OWNER may, after having notified the CONTRACTOR, either pay unpaid bills or withhold from the CONTRACTOR'S unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged whereupon payment to the CONTRACTOR shall be resumed, in accordance with the terms of the CONTRACT DOCUMENTS, but in no event shall the provisions of this sentence be construed to impose any obligations upon the OWNER to either the CONTRACTOR, his Surety, or any third party. In paying any unpaid bills of the CONTRACTOR, any payment so made by the OWNER shall be considered as a payment made under the CONTRACT DOCUMENTS by the OWNER to the CONTRACTOR and the OWNER shall not be liable to the CONTRACTOR for any such payments made in good faith.

### Guaranty

The CONTRACTOR shall guarantee all materials and equipment furnished and WORK performed for a period of two (2) years from the date of SUBSTANTIAL COMPLETION. The CONTRACTOR warrants and guarantees for a period of two (2) years from the date of SUBSTANTIAL COMPLETION of the system that the completed system is free from all defects due to faulty materials or workmanship and the CONTRACTOR shall promptly make such corrections as may be necessary by reason of such defects including the repairs of any damage to other parts of the system resulting from such

defects. The OWNER will give notice of observed defects with reasonable promptness. In the event that the CONTRACTOR should fail to make such repairs, adjustments, or other WORK that may be made necessary by such defects, the OWNER may do so and charge the CONTRACTOR the cost thereby incurred. The Construction BOND shall remain in full force and effect through the guarantee period.

### Governmental Immunity

All parties are on notice as to the existence or lack thereof of governmental immunity as set forth by the Kansas Tort Claims Act, K.S.A. 1979 Supp. 75-6101 et. seq., as amended.

### SUMMARY OF WORK

#### General

The work covered by these specifications and drawings shall consist of all materials, transportation costs, equipment, tools, and labor which are required and are related to, or are to be incorporated in this Contract and must be received, unloaded, stored, installed, erected, service connections provided, and coordinated with the construction by the Contractor under this Contract. Installation of equipment and materials shall mean furnishing of all labor and materials as required to place the Improvements in successful operation. The Contractor shall be responsible for all equipment and materials and shall replace at his own expense all such equipment and materials found defective in manufacture or damaged in handling after delivery by the manufacturer. This shall include the furnishing of all equipment, materials and labor required for the replacement of installed equipment and materials discovered defective prior to the final acceptance of the work. All equipment and materials shall be installed in strict accordance with manufacturer's instructions. The improvements are as listed:

Main 28, War Industries Sewer Force Main  
Sanitary Sewer Improvements to serve Rocky Ford Addition

This Contract shall include minor items not specifically mentioned herein but shown on the accompanying plans or obviously necessary to provide a complete job.

## SPECIAL PROJECT PROCEDURES

### Notification

It shall be the Contractor's Responsibility to notify the Owner a minimum of two weeks prior to all construction which requires interfacing with the existing water, sewer or electrical systems.

### Pump Station Startup And Operation

All equipment installed under this Contract, including that furnished by Owner or others under separate contract, shall be placed into successful operation according to the written instructions of the manufacturer's field representative. Startup, thus Substantial Completion of the Pump Station will not be attempted until after the approval and delivery to the Owner of a preliminary Operations and Maintenance Manual. All required adjustments, tests, lubricants, operation checks, and other startup activity shall be provided by the Contractor.

Acceptance of Work in connection with the installation of equipment furnished by others will be subject to approval of the manufacturers field representative. Contractor shall be responsible for planning, supervising, and executing the installation of Work, and the approval or acceptance of Engineer or the field representative will not relieve Contractor of responsibility for defective work.

The Contractor shall notify the Engineer two weeks prior to startup of all equipment.

### Disposal Of Waste Materials

The Contractor shall have full responsibility for proper disposal of waste materials. They shall be disposed of at the County Landfill or as otherwise approved in writing by the Engineer.

### Traffic Control

The Contractor shall protect traffic by the use of proper and necessary flags, lights, signals, barricades or other warning devices as needed, all in accordance with the latest edition of the Manual On Uniform Traffic Control Devices, U.S. Department of Transportation, Federal Highway Administration.

### Utilities

The Contractor will be required to obtain and pay for all utilities used for the project.

## COORDINATION

### Coordination

The Contractor shall cooperate with the Engineer, the Owner and other contractors in performing the work involved in the entire project. Fairness shall prevail as regards use of access roads, storage space, space for temporary office, utility services, and other facilities. In any arrangement as to the proportion of facilities between contractors, the decision of the Resident Engineer shall be final.

### Project Meetings

The Contractor shall coordinate and organize a monthly progress meeting on-site to review project progress with all subcontractors, the Owner and the Engineer. In attendance shall be the Engineer, the Owner, the Superintendent, one person representing the Contractor's Office management, and all subcontractors who are currently performing work. In addition the Contractor may wish to have subcontractors who will be coordinating work in the future. The Contractor shall be prepared to discuss pay requests, submittals, and change orders.

### ALTERNATIVES

#### Substitution Of Equipment

Whenever a material, article or piece of equipment is identified on the drawings or specifications by reference in brand name or catalog number, it shall be understood that this is referenced for the purpose of defining the performance or other salient requirements and that other products of equal capacities, quality and function shall be considered.

Prior to receiving bids the Contractor may recommend the substitution of a material, article, or piece of equipment of equal substance and function for those referred to in the Contract Documents by reference to brand name or catalog number, and if, in the opinion of the Engineer, such material, article, or piece of equipment is of equal substance and function to that specified, the Engineer may approve its substitution, and an addendum will be issued naming those additional manufacturer's which will be acceptable to the Engineer. The requests for substitutions must be received 10 days prior to bidding.

After execution of the contract, substitution of equipment of makes other than those specifically named in the contract documents will be approved by the Engineers only if the equipment named in the specifications cannot be delivered to the job in time to complete the work in proper sequence to work of other Contractors, due to conditions beyond control of the Contractor.

Requests for substitutions must be accompanied by documentary proof of equality and difference in price and delivery, if any, in form of certified quotations from suppliers of both specified and proposed equipment.

The City of Wichita shall receive all benefits of the difference in cost involved in any substitution, and the contract altered by change order to credit Owner with any savings so obtained.

## SUBMITTALS

### Construction Schedule

The Contractor shall submit his proposed construction schedule for the Engineer's approval within 10 days after the effective date of the Notice of Award. The Contractor's construction schedule, when approved by the Engineer, shall be used to establish major construction operations and to check on progress of the work. The Contractor shall provide sufficient materials, equipment and labor to assure completion of the work in accordance with the approved schedule.

The Contractor shall review the construction phasing or sequencing requirements noted on the plans when preparing the construction schedule. Any deviation from the phasing or sequencing requirements shall be noted and an alternative submitted in writing to the Engineer for approval.

If the Contractor's progress falls significantly behind the approved schedule, the Contractor shall, upon the Engineer's request, submit a revised schedule for completion of the work within the contract time and modify his operations to provide such additional materials, equipment and labor necessary to meet the revised schedule. Should the prosecution of the work be discontinued for any reason the Contractor shall notify the Engineer at least 24 hours in advance of resuming operations.

### Submittals

- a. The Contractor shall within 15 days after award of contract start sending submittals for approval. The Contractor shall prepare or have prepared in a neat and workmanlike manner, submittal drawings and shop details for all equipment and materials furnished under this Contract. The submittals shall contain the following:
  - (1) Six sets of identical submittal data separately stapled with Engineer's submittal form as a cover sheet.
  - (2) Where catalog cuts are used mark them to indicate equipment, capacities, controls, fittings, valves, sizes, etc.
  - (3) Reference each item to applicable specification paragraph number and plan sheet number. Reference items not appearing in base specification to applicable alternate numbers, change order numbers, letters of authorization, etc.

- (4) Shop drawings:
  - (a) All shop drawings shall be checked and signed by the contractor prior to submittal to the Engineer.
  - (b) Shop drawings submitted without contractor's signature or approval and verification will not be approved.
- (5) Submit wiring diagrams for all mechanical equipment and controls requiring field wiring clearly showing all required connections. This contractor will send one copy to the Electrical Contractor with a transmittal letter. Forward one copy of the transmittal letter to the Engineer's Office.
- (6) Bidders shall submit performance curves for the pumps offered. The curves shall show capacities (gpm) as abscissa and head (feet), required submergence (feet), brake horsepower and efficiency as ordinates. The curves shall be drawn for the specific pump offered and shall be extended to clearly show the point of maximum power requirement.

## TESTING, ADJUSTING AND BALANCING OF SYSTEMS

### Installation Check

An experienced, competent, and authorized representative of the manufacturer or supplier of each item of equipment indicated in the equipment schedule shall visit the site of the work and inspect, check, adjust if necessary, and approve the equipment installation. In each case, the equipment supplier's representative shall be present when the equipment is placed in operation. The equipment supplier's representative shall revisit the job site as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of the Engineer.

Each equipment supplier's representative shall furnish to the Owner, through the Engineer, a written report certifying that the equipment (1) has been properly installed and lubricated; (2) is in accurate alignment; (3) is free from any undue stress imposed by connecting piping or anchor bolts; and (4) has been operated under full load conditions and that it operated satisfactorily.

All costs for this work shall be included in the prices quoted by equipment suppliers.

## CONTRACT CLOSEOUT

### Cleaning

The Contractor shall remove all debris and thoroughly clean the project site prior to final inspection.

### Operation And Maintenance Manuals

For each type of equipment indicated in the equipment schedule or otherwise specified, the equipment supplier shall prepare an operation and maintenance manual covering:

- a. Equipment function, normal operation characteristics, and limiting conditions.
- b. Assembly, installation, alignment, adjustment, and checking instructions.
- c. Operating instructions for startup, routine and normal operation, regulation and control, shutdown, and emergency conditions.
- d. Lubrication and maintenance instructions.
- e. Guide to "troubleshooting".
- f. Parts lists, and predicted life of parts subject to wear.
- g. Outline, cross section, and assembly drawings; engineering data; and wiring diagrams.
- h. Test data and performance curves, where applicable.

The operation and maintenance manuals shall be in addition to any instructions or parts lists packed with or attached to the equipment when delivered.

Manuals shall be printed on heavy, first quality paper, 8-1/2 by 11 inch size with standard 3-hole punching. Drawings and diagrams shall be reduced to 8-1/2 by 11 inches or 11 by 17 inches. Where reduction is not practicable, larger drawings shall be folded separately and placed in envelopes which are bound into the manuals.

Three preliminary copies of each manual, temporarily bound in heavy paper covers bearing suitable identification, shall be submitted to the Engineer prior to the date of shipment of the equipment. After review by the Engineer, six final copies of each operation and maintenance manual shall be prepared and delivered to the Engineer not later than 30 days prior to placing the equipment in operation. The final manuals shall be bound in substantial permanent post binders such as the Boorum & Pease C619 Series, the McBee 858134 Series or approved equal. Each brochure shall have the following information clearly printed on its front cover.

- (a) Project name and address.
- (b) Section of work covered by brochure, i.e. "Electrical Work".
- (c) Name and address of Engineer.
- (d) Name and address of Contractor.
- (e) Telephone number of Contractor, including night or emergency number.

### Loose Equipment

All keys, wrenches, and special tools furnished with the equipment shall be kept in a safe place during construction and presented to the Owner at the completion of the project.

## GENERAL

The contractor shall furnish all labor, materials, equipment and incidentals required to complete the work as shown on the plans and included herein,

The principal items of equipment include 2 non-clog submersible pumps, valves, internal piping (to 5' outside of structures), controls, automatic pump level controls, wiring, generator, SCADA System, Utility Shelter and Force Main Piping.

## SUBMERSIBLE WET PIT SEWAGE PUMPS

### **PART 1 - GENERAL SYSTEM DESCRIPTION PERFORMANCE REQUIREMENTS**

Operating Conditions - Design: 413 GPM @ 71.6 FT TDH @ 49.0%  
Minimum Shutoff head:89 FT  
Minimum Motor HP: 20 HP  
Minimum Hydraulic Efficiency (at design): 49.0%  
Maximum Motor RPM: 1750 RPM

### **QUALITY ASSURANCE - REFERENCED STANDARDS:**

American Iron & Steel Institute (AISI)  
American Society for Testing and Materials (ASTM)  
Factory Mutual (FM)  
Hydraulic Institute Standards for Centrifugal, Rotary, and Recip Pumps (HI)  
National Fire Protection Agency (NFPA)  
National Electric Code(NEC)  
National Electrical Manufacturers Association(NEMA)  
Anti-Friction Bearing Manufacturers Association(AFBMA)  
International Standards Organization (ISO) - ISO9001

### **WARRANTY**

The pump manufacturer shall warrant the pump and motor to the Owner against defects in workmanship and materials for a period of seven (7) years (pro-rated) under normal use and service. Pump manufacturer warranties shall be in published form, and shall apply to all similar units. A copy of each warranty shall be provided to the Owner at startup.

### **PART 2 - PRODUCTS ACCEPTABLE MANUFACTURERS**

Subject to compliance with the Contract Documents, the following are acceptable:

## **KSB**

Equal as approved by the engineer 15 business days prior to bid  
All products, whether named as "acceptable" or proposed as "equal" must fully comply with these specifications. Standard product must be modified, if required, for compliance. The contractor shall base his bid price on product offered by KSB, Inc. for purposes of determining the successful bidder on this project. The contractor may submit, with the bid, an alternate proposal with applicable deduct if any for supplying product other than KSB. Alternate proposals must include a clear statement of each point of difference between the proposed alternate product and these specifications. The Owner and Engineer reserve the right to reject any bid not based on KSB product.

## **MATERIALS**

### **SUBMERSIBLE SEWAGE PUMPS**

Pump Case: Cast Iron, ASTM A48, Class 35B

Motor Housing: Cast Iron, ASTM A48, Class 35B

Impeller: Cast Iron, ASTM A48, Class 35B

Intermediate Housing (Backplate): Cast Iron, ASTM A48, Class 35B

Discharge Base Elbow: Cast Iron, ASTM A48, Class 35B

Pump/Motor Shaft: Carbon Steel, ASTM A576, Gr.1045 with replaceable ASTM A276 Type 420 shaft protection sleeve.

Wear Ring, case: Cast Iron, ASTM A48, minimum 200 Brinell

O-Rings: Nitrile Rubber (NBR)

Fasteners (including impeller fastener): Stainless Steel, ASTM A276 Type 316Ti.

Lower Seal Faces: Silicon Carbide/Silicon Carbide

Upper Seal Faces: Silicon Carbide stationary/Carbon rotating

Guide rails and mounting brackets: Stainless Steel, ASTM A276 Type 316

Lifting Chain or cable: Stainless Steel, ASTM A276 Type 316

Oil-all uses (seal lubrication, etc): Ecologically safe, parifin or mineral base

Power/Control Cable Jacket: Chloroprene with non-wicking fillers

## **ACCESSORIES**

### **POWER CABLE**

Provide 50 ft of power/control cable with each pump, suitable for submersible wastewater application, sized in accordance with NEC requirements. Provide cable terminal box on side of motor housing, with cable entry sealed to insure that no entry of moisture is possible into the high-voltage motor/ terminal area even if the cable is damaged or severed below water level. Cable seal shall include a compressed rubber grommet to seal the cable exterior and epoxy fill to seal the interior passages. A strain relief device, in direct contact with both the cable and the cast iron entry housing, shall be provided. The cable entry shall be rated by Factory Mutual (or UL) for submerged operating depths to 85 feet.

### **TEMPERATURE PROTECTION**

Furnish temperature monitoring devices in motor windings for use in conjunction with and supplemental to external motor overload protection. Arrange controls to shut down pump should any of the monitors detect high temperature and automatically reset once motor temperature returns to normal. Set temperature monitors at levels recommended by pump manufacturer

### **SEAL LEAK DETECTION**

Provide a detector in the motor's stator cavity which allows a control panel mounted relay to indicate leakage into the motor.

#### **"PumpSafe" MOTOR SENSOR MONITORING RELAY**

The pump supplier shall furnish all relays required for monitoring all motor sensors. The relays shall be installed by others in the motor control panel and properly wired in accordance with pump manufacturer's instructions. Relays shall mount in standard 12-pin socket bases (provided) and shall operate on available control voltage of 24-240 VAC. If relays require an input voltage that is not available in the motor control panel an adequate transformer (with fused input) shall be provided by the pump supplier. Relays shall have a power consumption of no more than 2.8 watt, and shall be UL approved. Relays shall be modular in design, with each relay monitoring no more than two motor sensor functions.

Each relay module shall include a dual color (red/green) LED to indicate the status of each monitored sensor. Green will indicate "status OK"; red will indicate a failure or alarm condition. A self-corrected fault will allow the relay output contacts to reset, and cause the LED to change from a steady alarm indication to a flashing signal. The LED shall continue to flash until locally cleared, providing the operator an indication of a potential intermittent fault. Each relay shall also include a power-on LED and both "test" and "reset" pushbuttons.

An independent fail-safe (switch on power loss) form-C output contact shall be included for each monitored sensor to provide a normally-open / normally-closed dry contact to initiate a remote alarm device or shut down the motor. Contacts shall be rated for 5 amps at 120 volt.

### **FABRICATION**

#### **GENERAL**

Provide pumps capable of handling raw unscreened wastewater. Design pumps to allow for removal and reinstallation without the need to enter the wet well and without removal of bolts, nuts or other fasteners.

Provide a pump which connects to a permanently mounted discharge connection by simple downward motion, without rotation, guided by at least two non-load-bearing guides. For guide pipe systems the pipe shall be supplied and warranted by the installing contractor. Intermediate guide supports (between upper bracket and discharge elbow connections) shall be supplied for wet wells deeper than 20'. Final connection shall insure zero leakage between pump and discharge connection flange.

Provide a discharge connection/ guide system so that no part of the pump bears directly on the floor of the wet well. Provide Type 316 stainless steel chain of sufficient length to properly and safely lift pumps from the wet well. All exposed cast iron and ferrous surfaces shall be cleaned of dirt and grease, sandblasted to near white finish, and coated with an anti-corrosion reaction primer. The pump shall then be coated with two-component thick coat paint, with an epoxy resin base, having at minimum 83% solids by volume. This coating shall be non-toxic and approved for both wastewater and water applications.

## **MAJOR COMPONENTS**

Furnish major components (pump case, impeller, intermediate housing, motor housing) of cast material as specified with smooth surfaces devoid of blow holes and other irregularities. Pump case design shall incorporate a centerline discharge for stability when mounted on the base elbow.

## **IMPELLER**

The impeller(s) shall be of gray cast iron, Class 35B, dynamically balanced, semi-open, non-clogging design capable of handling soils, fibrous materials, heavy sludge and other matter found in wastewater. The impeller(s) shall have a back shroud only with back pump-out vanes to equalize axial thrust, and curved blades which protrude into the pump casing for maximum efficiency. The impeller will create a vortex which carries solids through the pump casing without passing through the blades. Impeller(s) shall be capable of passing a minimum 3 15/16" diameter solid..

## **SHAFT**

Provide common pump/motor shaft of sufficient size to transmit full driver output with a maximum deflection of 0.002 inches measured at the lower mechanical seal. Machine the shaft of carbon steel (for maximum strength and motor efficiency) and isolate the shaft from the pumped media with a replaceable Type 420 stainless steel shaft sleeve under the lower mechanical seal. Do not use carbon steel as shaft material without a stainless steel sleeve. If a sleeve is not used, machine the entire pump/motor shaft of ASTM A276 Type 420 stainless steel

## **SHAFT SEAL**

Provide two totally independent mechanical shaft seals, installed in tandem, each with its own independent single spring system acting in a common direction. Install the upper seal in an oil-filled chamber with drain and inspection plug (with positive anti-leak seal) for easy access from external to the pump. Provide seals requiring neither routine maintenance nor adjustment, but capable of being easily inspected and replaced. Provide seals which are non-proprietary in design, with replacements available from a source other than the pump manufacturer or its distributors. Do not provide seals with the following characteristics: conventional double mechanical seals with single or multiple springs acting in opposed direction; cartridge-type mechanical seals; seals

incorporating coolant circulating impellers, seals with face materials other than those specified

## **BEARINGS**

Furnish upper and lower bearings, single row (preferred) or double row as needed to provide a B10 life of, at minimum, 100,000 hours at all anticipated axial and radial loadings. Provide sealed/shielded (permanently lubricated) bearings .If open-type (non-shielded) bearings are used, provide re-lubrication ports with positive anti-leak plugs for periodic addition of lubrication from external to the pump

## **MOTOR**

Provide a motor which is squirrel cage, induction in design, housed in a completely watertight and air filled chamber, with a min 1.15 service factor. The motor shall be adequately sized and rated for continuous operation at a maximum fluid temperature of 104° F (40° C) [**optional:** 140°F (60° C)]. Allowable maximum submergence shall not be less than 100ft (30 m). The motor stator shall be wound using Class H monomer-free polyester resin insulation resulting in an overall motor rating of 311 Degrees F (155 degrees C), Class F insulation. The stator windings shall be trickle impregnated resulting in a winding fill factor of at least 95%. The use of a multiple step “dip and bake” type stator insulation method shall not be acceptable. The rotor bars and short circuit rings shall be made of aluminum. The motor and pump set complete shall be designed and manufactured by the same company. Provide temperature protection and seal leak detection as described in section above. Provide adequately rated motor with sufficient surface area for ambient only cooling suited for the intermittent mode of operation in wet well wastewater applications, submerged or partially submerged, without damage. Motors containing di-electric oils used for motor cooling and/or bearing lubrication or motors where the pumped media or externally provided fresh water is directed through the motor shell for cooling are not acceptable.

Provide motors which are FM listed for use in Class I Division 1 Groups C&D hazardous locations as defined by the National Electric Code

## **SOURCE QUALITY CONTROL**

### **EQUIPMENT TESTS**

Tests shall be performed in accordance with the Test Code for Centrifugal Pumps per the Standards of the Hydraulic Institute. Tests shall be performed on the actual assembled pumps to be supplied. Tests shall cover a range from shut-off to at minimum 20% beyond specified design capacity. Conduct test per above specification on all supplied pumps, generating a curve showing actual flow, head, BHP and hydraulic efficiency.

## GUIDE RAIL

The guide rails used to direct the pump in proper alignment with the stationary discharge piping shall be of a double rail design. The rail shall be sized as required by the pump being used. The guide rails shall be of stainless steel pipe. Single rail or cable guide systems will not be considered.

The pump shall be automatically connected to the discharge connection elbow when lowered into place, and shall be easily removed for inspection or service. There shall be no need for personnel to enter the wet well. Sealing of the pumping unit to the discharge connection elbows shall be accomplished by a single down motion of the pump.

## GUIDE BRACKET

A sliding guide connector shall be an integral part of the pump unit. No other carrier shall be required. The downward sliding action of the pump shall align the sealing flange.

An upper stainless steel guide bracket shall be furnished to attach the guide rails to the concrete deck. Intermediate stainless steel guide rail brackets shall be furnished for an installation where the pump depth exceeds twenty (20) feet.

## DISCHARGE BASE ELBOW

A discharge base elbow shall be furnished for each pump. The discharge base elbow shall rest squarely on the floor of the pump well and be securely anchored to the floor. Units which require a separate concrete or fabricated structure in order to elevate the base elbow above the pump well floor shall not be acceptable.

The base elbow shall be equivalent to 4" piping in size. The elbow shall be at 90° with a standard 125-lb. flange faced and drilled on the outlet side and an inlet flanged faced only. The inlet side shall have a flange face adapted for the pump discharge. The mating surface between the pump and the discharge elbow will be metal to metal contact. No bellows, O-ring or other connections will be considered.

## LIFTING CHAIN

Each pumping unit shall be provided with a stainless steel lifting chain. The lifting chain shall be of sufficient length to extend from the pumping unit at one end to 4' beyond the top of the wet well at the other end. The access frame shall provide a hook to attach the lifting chain when not in use. The chain will be sized for the pump being lifted.

## ACCESS FRAME AND DOOR

Approved access frame and door supplier is Halliday Products or approved equal.

An access frame assembly shall be supplied with hinged doors for removal of each pump. Access frame and covers shall have a one-piece, mill finish, extended aluminum frame incorporating a continuous concrete anchor. Door panel shall be aluminum diamond plate, reinforced to withstand a live load of 300 psf. Frame opening dimensions shall be AS SHOWN ON DRAWING (Verify with pump manufacturer). The slide rail brackets shall attach to the access frame assembly with 300 Series stainless steel fasteners. A recessed, stainless steel handle shall be provided with each door. A safety latch to hold door in open position shall be provided. The door shall be provided with a locking device. Hinges shall be stainless steel with tamperproof fasteners. Door shall close flush with the frame and rest on a built-in neoprene cushion/gasket. Hooks shall be provided on the frame to attach lifting chains for each pump.

## WARRANTY

In addition to the Contractors standard warranty, he shall obtain a five-year warranty, from the date of shipment, from the manufacturer in the owners name for the pumps and provide it to the owner.

Operation and Maintenance Manuals shall be furnished to the owner, which will include parts lists of components and complete service and trouble shooting guide.

## PUMP STATION CONTROL PANELS

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. This section includes all elements required to furnish and install a complete electrical control system to control, operate, and display information as indicated in the plans and specifications. The control system shall include all equipment, devices, wiring, and incidental materials to operate the system and display or relay information in accordance with these specifications. The intention of this section is to secure a complete control system that will operate equipment in accordance with narratives and requirements indicated in the plans, specifications, and manufacturer's literature for the equipment installed. All circuits and devices for protection of installed equipment shall be included in the lump sum bid.

#### **1.02 SCOPE OF WORK**

- A. The contractor shall furnish and install with each pump station, one EcoSmart Station® control panel. The pump station control panel shall house the complete electrical system to operate the pump station. The control panel shall be manufactured by a UL certified panel facility and shall meet all UL698A

standards (Industrial control equipment with circuit extensions into hazardous locations). All components shall be UL recognized or listed including those supplied by the pump manufacturer and the control panel shall house all necessary controls including circuit breakers, RVSS's, and other equipment specified herein. The panel shall be built to meet NEMA Type 4X ratings (Controls compartment), NEMA Type 3R ratings (Service and MCC compartments), and shall in all respects conform to the National Electric Code and all other state and local codes which may apply.

### 1.03 DEFINITIONS

- A. AIC – Amps Interrupting Current is the maximum current that is produced upon a fault to ground or a fault between phases.
- B. Arc Flash – An electrical explosion that can occur when there is an uncontrolled conduction of electrical current to ground or to another phase. An Arc Flash occurs very rapidly and produces intense heat and energy that can harm personnel and destroy equipment.
- C. Control Compartment – A compartment in the EcoSmart Station® that contains all control components of the pump station including the EnergyView® controller, communications and other devices.
- D. ECO Mode – An operation mode that operates the pumps at a speed determined by auto efficiency tuning of the EnergyView® controller.
- E. FLA – Full Load Amps
- F. GFCI – Ground Fault Circuit Interrupter
- G. GPM – Gallons Per Minute
- H. HMI – Human Machine Interface
- I. HOA – Hand-Off-Auto operator switch
- J. kW – Kilowatts (power)
- K. MCC – Motor Control Center
- L. MCC Compartment – A compartment in the EcoSmart Station® that contains components related to motor starting. Some components include variable frequency drives, pump breakers, the control power transformer, and the voltage monitor.
- M. Service Compartment – A compartment in the EcoSmart Station® that contains service entrance equipment for the station. Some components include main incoming terminal blocks, main service circuit breaker, phase monitor and other protective devices, and a transfer switch with generator receptacle (if required).
- N. PID – Proportional Integral and Derivative
- O. PID Mode – A mode in the EnergyView® controller that keeps a constant wet well level by varying the pump speed.
- P. PLC – Program Logic Controller
- Q. Skirt Compartment – A vented compartment under the EcoSmart Station® that is reserved for routing of cables into various compartments.
- R. UPS – Uninterruptable Power Supply
- S. RVSS – Reduced Voltage Soft Starters

## **1.04 REFERENCES**

- A. ANSI®/NFPA® 70 – National Electrical Code® (NEC®)
- B. IEC 61000 – Electromagnetic Compatibility
- C. NEMA 250 – Enclosures for Electrical Equipment
- D. NEMA ICS7 – Industrial Control and Systems Adjustable Speed Drives
- E. UL® 50 – Enclosures for Electrical Equipment
- F. UL 98 – Disconnect Switches
- G. UL 507 – Electric Fans
- H. UL 508 – Industrial Control Equipment
- I. UL 508C – Power Conversion Equipment
- J. UL 698A – Circuit extension into hazardous locations
- K. UL 991 – Safety Tests
- L. IEEE-519 – Harmonic levels
- M. NFPA 70E – National Fire Protection Association

## **1.05 SUBMITTALS**

- A. The Engineer reserves the right to approve or disapprove any and all equipment based upon evaluation. Approval for fabrication and installation will be made only after submittal and review of all shop contract documents. The information required for approval shall include the following items and be provided to the engineer prior to the bid date.
  - 1. Electrical schematics
  - 2. Enclosure dimensional drawings
  - 3. Complete layout drawing with dimensions
  - 4. Heat loss calculation in MCC compartment
  - 5. Manufacturer data sheet for all components
  - 6. Complete bill of material
  - 7. User operating manual
  - 8. Installation instructions
  - 9. 2 year warranty certificate

## **1.06 SUBSTITUTIONS**

- A. The Engineer will consider proposals for substitution of materials, equipment, methods and services only when proposals are accompanied by full and technical data and all other information required by the Engineer for the proposed substitution. Substitution of materials, equipment, methods and/or services is not allowed unless such substitution has been specifically approved by the Engineer 15 business days before the bid date.

## **1.07 QUALITY ASSURANCE**

A. Enclosure

1. The enclosure shall be fabricated under the regulations of ISO 9001 certification for the manufacturing of enclosures.
2. The enclosure shall be a UL508 listed enclosure.

B. Control panel

1. Control panel shall be manufactured in a UL508A facility and be UL certified to manufacture panels with UL698A intrinsically safe components.
2. Factory shall conduct full operational tests with appropriate voltage applied to the panel.

### **1.08 DELIVERY, HANDLING, STORAGE**

- A. All materials relating to this section individually and as completed panels shall be handled as fragile equipment and stored only inside closed buildings and protected from moisture entry. All openings shall be continuously sealed until the moment that connections thereto are actually made.

### **1.09 WARRANTY**

- A. Warranty: 24 Months from date of manufacture. The warranty shall apply to being free to defects in material and workmanship.

## **PART 2 PRODUCTS**

### **2.01 ENCLOSURE**

- A. The enclosure shall be one freestanding enclosure consisting of four different compartments within one footprint. Approved Enclosure shall be Arc Armor® by Primex Inc.

### **2.02 COMPARTMENT REQUIREMENTS**

#### **Signature**

- A. The Service compartment shall be a NEMA Type 3R rated compartment that houses the main service power components.
- B. The MCC compartment shall be NEMA Type 3R rated compartment that houses the motor starter components.
- C. The Control compartment shall be NEMA Type 4X rated compartment the houses all controls associated with the panel. The maximum voltage within this compartment is to be 120vac.
- D. The Skirt compartment is a nonrated vented compartment that provides an area for the entry of well conduits. All conduits with the exception of line power will come through the Skirt compartment.
- E. Conduit and mounting template – A drawing shall be provided with each enclosure to provide anchoring locations and conduit locations entering the

enclosure. This drawing shall be available at the time of conduit and foundation layout.

## 2.03 ENCLOSURE CONSTRUCTION

- A. All compartments are fabricated as one complete unit with singular common separation walls resulting in one complete enclosure. The NEMA Type rating integrity of each compartment shall be maintained at all times from the factory manufactured enclosure through final installation.
- B. The entire panel enclosure shall be fabricated with stainless steel type 304 (18-8 stainless 18% chromium, 8% nickel)
- C. Welding requirements: stainless steel shall be welded using type "L" (low carbon) type welding rods during fabrication.
- D. Interior wall construction: all common walls shall consist of one sheet of type 304L (18-8) stainless steel with a minimum 14-gauge thickness (0.075 inches). Backs to back or double walls are not acceptable.
- E. Interior mounting: all mounting plates, hinges and other components mounted onto the enclosure walls shall be held in place by welded in place stainless studs. There shall be no penetrations for through bolts or other means of anchoring into the compartments from the exterior of the cabinet.
- F. Threaded studs: all studs shall be stainless flanged weld stud, with AISI Grade 304/305 standard steel, tensile strength = 85,000 psi, yield strength = 40,000 psi (of the stud, not the welded interface), un-plated surface. Sizing = 10 x 32, ¼ x 20. All nuts shall be of the same quality.
- G. The exterior and interior finish of the panel shall be powder coat 3-4 mil minimum polyester power coat finish. The enclosure shall be prepped by an acid wash prior to an electro-statically precipitated applied paint that should be baked at a high temperature to bond paint to enclosure surface. Powder coating shall be performed after final enclosure assembly and prior to mounting electrical devices and components. All surfaces shall be painted on both sides and on edges.
- H. Exterior door handles to be die-cast aluminum alloy powder coated black. Door handles to be fully lockable and able to accommodate a #21 Master padlock. Each door handle must be NEMA Type rated to maintain the rating of the associated compartment.
- I. Exterior door hinges shall be continuous 304L stainless steel piano type hinges. All hinges are finished with white powder coating.
- J. Mechanical door stops to be mounted on the Control and MCC compartment doors to secure the door in the open position at 110 degrees. Door may be closed by manually lifting up on the door stop arm. They shall be located at the bottom of each cabinet door.
- K. A grey thermoplastic data pocket is to be mounted on the door of the MCC compartment.
- L. Two lifting eyebolt rings shall be installed on the top center of the panel and penetrate through the top of the panel. The lifting eyebolt rings shall enter into the MCC compartment, not the Control compartment. Each individual lifting

eyebolt ring shall be rated the entire weight of the panel. The top drip cap shall be structurally reinforced for the lifting load at the point of attachment of the eyebolt rings. The lifting eyebolt ring shall have a gasket to prevent water entry into the MCC compartment. Lifting eyebolt ring shall be oriented in parallel to the width of the enclosure. They shall be constructed from high tensile strength steel, powder coated white.

- M. A drip cap shall be installed as one continuous sheet of stainless steel covering the entire top of the Arc Armor® enclosure. The drip cap shall have rolled edge with a 1" trough continuous to each end. It shall be constructed of a minimum 14 gauge stainless steel with a white powder coat finish.
- N. Back panels shall be constructed of polished aluminum, .125" thick minimum. Back panels to have ¾" rolled edge flange with ½" mounting hole at a minimum at each corner. Back panels are to be mounted to the enclosure with a minimum of 3/8" studs and nuts. Back panels that are larger than 1200 square inches shall be constructed of white painted steel.
- O. The Control compartment shall have a dead front inner door for mounting the controller, indicators, and switches. The inner door shall be constructed out of .125" aluminum. The door shall be mounted to the enclosure via a continuous piano hinge. Two twist lock latches are to be used to secure the inner door in the closed position. The latches are to be T-handle type constructed from polyamide-6 nylon plastic 30% glass reinforced material. They shall be mountable through square holes to prevent rotation of the entire mechanism.

## **2.04 GENERAL ENCLOSURE REQUIREMENTS**

- A. The reduction of the Arc Flash potential shall be reduced by isolating high voltage into specific compartments.
- B. The Service and MCC compartments may contain components that operate at a voltage that is capable of creating an Arc Flash condition. Personnel Protection Equipment (PPE) is required. Accessibility should be limited to qualified electricians only.
- C. The Control compartment only contains control voltage (maximum of 120vac). Minimal Personnel Protection Equipment (PPE) is required for operators and maintenance personnel. See NFPA 70E for proper PPE requirements.
- D. All penetrations through compartments shall be performed to maintain the NEMA Type ratings of each individual compartment.
- E. The enclosure shall be constructed so that no screws or bolt heads are visible when viewed from any external portion of the enclosure.
- F. Punch cutouts for instruments and other devices shall be cut, punched, or drilled and smoothly finished with rounded edges.
- G. No holes shall be drilled in the top (rain cap) of the cabinet (with the exception of the lifting eyebolts).
- H. Electrical schematic shall be permanently affixed to inside of the outer door of the Control and MCC compartments. The schematic shall resist water to prevent removal and discoloration from heat, gasses, and ultraviolet light.

## **2.05 SERVICE COMPARTMENT COMPONENT AND REQUIREMENTS**

- A. Main service entrance termination
  - 1. The main service entrance conductors shall be terminated onto lugs mounted at the bottom center of the Service compartment. The lugs shall be aluminum compression type and shall be rated for both aluminum and copper wire terminations. The lugs shall be sized to accommodate the wire size of service entrance conductors.
  - 2. Component shall be Square D, 9080 series.
- B. Main Circuit Breaker
  - 1. The main circuit breaker shall be a thermal-magnetic molded case circuit breaker rated to 600V and sized according to the NEC and the load requirements of the control panel. It shall be mounted in the compartment with a lockable handle mechanism mounted on the Service compartment door.
  - 2. Component shall be Square D, HDL Type. For 400A use type LAL
- C. Surge Arrestor
  - 1. A surge arrestor shall be connected to the load side of the main service circuit breaker. It shall be mounted behind a protective cover on which the main service entrance termination lugs are mounted.
  - 2. Components shall be Delta, Model LA603
- D. Surge Capacitor
  - 1. A surge capacitor shall be connected to the load side of the main service circuit breaker. It shall be mounted behind a protective cover on which the main service entrance termination lugs are mounted.
  - 2. Component shall be Delta, Model CA603R
- E. Phase Monitor
  - 1. The phase loss monitor shall be supplied from the load side of the main disconnect. It shall monitor the voltage of each phase and provide a dry contact closure upon phase loss, phase reversal, overvoltage or under voltage condition. Monitor shall have an adjustable reset delay.
  - 2. Component shall be SYMCOM, 460

## **2.06 MCC COMPARTMENT COMPONENT AND REQUIREMENTS**

- A. 3-Phase voltage indicator
  - 1. A voltage indicator shall be mounted on the door of the MCC compartment to provide a warning that high energy circuits are energized and voltage is present on each phase. The voltage indicator warns against the potential danger of electric shock, Arc Flash and/or Arc Blast conditions inside the cabinet.
  - 2. Component shall be Diversified Electronics, Model UPA-10
- B. Door interlock
  - 1. An electromechanical door interlock shall prevent access into the MCC compartment unless the main power is disconnected. The MCC

compartment door interlock mechanism is powered through a two-pole circuit breaker in the MCC compartment.

2. Component shall be Hoffman, Model AEK460NDH-460
- C. Pump circuit breakers
1. Pump circuit breakers to be a thermal-magnetic molded case breaker. Individual pump circuit breaker shall be sized according to the RVSS manufacturer, NEC and the FLA of the pump.
  2. Components shall be Schneider Electric, HDL type
- D. Control transformer primary circuit breaker
1. The control power circuit breaker shall be sized according to the rating of the primary windings of the control power transformer. The line side of the circuit breaker shall be supplied from a tap from the load side of the main circuit breaker. It shall be DIN rail mounted and adjacent to the MCC Compartment door interlock circuit breaker.
  2. Component shall be Schneider Electric, MGN series.
- E. Door interlock circuit breaker
1. MCC compartment door interlock circuit breaker shall be a two-pole 10-amp circuit breaker and supplied from a tap from the load side of the main circuit breaker. It shall be DIN rail mounted and adjacent to the control power circuit breaker.
  2. Component shall be Schneider Electric, MGN series
- F. Control power transformer
1. A control power transformer is only required on stations that do not provide 120 volts to a service neutral.
  2. Component shall be Schneider Electric, Model 9070T1500D1
- G. Reduced Voltage Soft Starter
1. RVSS's shall be located in the MCC compartment and connected to the load side of a dedicated line reactor.
  2. RVSS's Requirement are to follow specification as stated in this Section 2.10.
- H. Cooling fans
1. The MCC compartment shall have two ventilation fans. One fan shall be located at the air intake shroud in the bottom right side of the compartment, supplying air into the compartment. A second fan shall be located at the exhaust shroud, located in the upper left side of the compartment and exhausting air outside. Both fans shall 120VAC supplied from 3-amp circuit breaker and be thermostatically controlled. Each fan shall have filter and finger guards.
  2. Components shall be Sunon, P/N-SP100A
- I. Thermostat
1. A thermostat shall be mounted in the MCC compartment and operate the fans on rising internal temperature. The thermostat shall be mounted in the lower half of the MCC compartment in order to avoid short cycling. The thermostat shall control the operation of both fans in parallel.
  2. Component shall be Pfannenbergl, P/N-17121000010
- J. Compartment Service Light

1. The MCC compartment shall have an LED service light installed in the upper front portion of the compartment. The service light shall be operated by an ON/OFF switch located on the inner door of the controls compartment. It shall operate at 24VDC and be supplied from the battery backup in order for the light to operate during a power loss.
  2. Component shall be Super Bright LEDs, LF-CW30SMD
- K. Pump Terminal Blocks
1. The terminal blocks for motor lead terminations shall be mounted on an angled and raised bracket to provide easy access for field wiring terminations.
  2. Components shall be by Square D, (size will vary on pump size)
- L. MCC/Control compartment interconnecting seal barrier
1. A cable barrier shall be installed that provides isolation between the MCC compartment and the Control compartment. The barrier shall be used to maintain a NEMA Type 3R rating in the MCC compartment and a NEMA Type 4X rating in the Control compartment. All control cables shall pass through the barrier.
  2. Component shall be ROXTEC, P/N- EZ00000001010

## **2.07 CONTROLS COMPARTMENT COMPONENT AND REQUIREMENTS**

### **A. PLC controller**

1. The LevelView® controller shall be comprised of two components. A display unit mounted on the inner door and an I/O module mounted on the back plate. The two are connected via a single communication cable.
2. The display unit shall have the following features:
  - a. 5.7 inch color touch screen (320x240 pixels)
  - b. 256 color TFT LCD display
  - c. LED backlight - Sunlight readable
  - d. Modbus communications
  - e. 2 serial RS 232/RS485 isolated ports
  - f. Supports GPRS & SMS cellular communication
  - g. Optional Ethernet communication card
  - h. SD card reader for data logging or program backup (32 GB max)
3. The I/O module shall have the following features:
  - a. 16 digital Inputs
  - b. 8 relay outputs
  - c. 3 analog inputs
4. PLC/HMI shall be Tamarack Engineering, Model Energy View®

### **B. DC Power Supply/UPS**

1. The power supply shall convert 120 Vac to 24 Vdc power for control circuits and supply an uninterrupted 24Vdc power via a battery if 120Vac is lost. The power supply shall have dual output: One 24Vdc output for the control circuitry, the other for charging the battery.
2. The power supply shall have the following characteristics:
  - a. Output 155 watts

- b. Over current protection
- c. Over voltage protection
- d. DC voltage adjustment
- e. Short circuit protection

3. Component shall be Astrodyne, Model AD155-B/DRL

#### C. Battery

- 1. The battery backup power shall consist of two 12 VDC batteries configured in series to provide an output voltage of 24 VDC. A fuse link shall be installed in the circuit between each battery to provide overload protection. The batteries shall have a minimum rating of 7 amp hours.
- 2. Component shall be Square D, P/N-ABL8BPK24A07

#### D. Over Temperature and Seal Fail Monitoring Relay

- 1. The relay shall be compatible with the pump that is installed in the wet well.
- 2. There shall be one relay per pump that is present in the system.
- 3. The relay shall have the following requirements:
  - a. Molded relay bezel to allow for door mounting.
  - b. Power on light.
  - c. Over temperature and Seal Leak fault light. Color: Red.
  - d. Selector switch for Auto or Manual mode. This switch shall allow the user to select between automatic or manual reset of the heat sensor fault.
  - e. Provide an over temperature reset pushbutton for Manual reset mode.
  - f. Seal fail sensibility to be adjustable between 4.7K ohm to 100K ohm via an adjustable potentiometer.
- 4. Default component shall be Tamarack Engineering, Model PMR-1

#### E. Intrinsically safe barrier

- 1. The intrinsic safety barriers shall be DIN rail mounted and located in a UL approved isolated Safety Barrier location. The intrinsic safety barriers shall be used to limit the amount of energy available to all level sensing circuits in the wet well in order to prevent sparking.
  - a. Analog IS barrier
    - i. Pepperl+Fuchs, Model Z787
  - b. Back up float switches IS barrier
    - i. Ingram, Model ISR2-24-10K

#### F. Control circuit breakers

- 1. The control circuit breakers shall be located in the Control compartment and used to protect all 120 volt and 24 volt circuits. The 120 volt circuit breakers shall be supplied by the secondary side of the control transformer (unless 120 volts is available from the main electrical service).
- 2. There shall be six single pole control circuit breakers as follows:
  - a. Main control power
  - b. Fan
  - c. GFI Receptacle
  - d. Heater

- e. Control wiring
  - f. 24vdc Power supply
- 3. Components shall be Square D, C60N series
- G. Control Relays
  1. Control relays shall have the following characteristics:
    - a. 4 pole, 8 A, 1/3 hp (IEC rating = 6 A)
    - b. Coil: 120 VAC or 24 VAC
    - c. DIN rail mounting
    - d. Terminal screw type socket
    - e. Voltage rating: 300 volts
    - f. Mechanical status flag
    - g. Pilot light indicating status
    - h. Manual operator
    - i. Protection module mounted in base (diode, RC circuit or varistor)
    - j. Metal hold down clip
  2. Components shall be Square D, Zelio Relays P/N-RXM4B1F7, Hold down clips P/N-RXZ400, Relay socket P/N-RXZE2M114M
- H. Anti-condensation heater
  1. A compartment heater shall be supplied and mounted at the bottom portion of the Control compartment. The heater shall be positioned away from any heat sensitive components directly above the heater. Construction should be vulcanized fiberglass-reinforced silicone rubber encapsulating a nickel alloy heating element with an integrated thermostat.
  2. Component shall be ElectroFlex, Model EN2-125
- I. Compartment Service Light
  1. The controls compartment shall have an LED service light installed in the upper front portion of the compartment. The service light shall be operated by an ON/OFF switch located on the inner door of the controls compartment. It shall operate at 24VDC and be supplied from the battery backup in order for the light to operate during a power loss.
  2. Component shall be Super Bright LEDs, LF-CW30SMD
- J. Utility receptacle
  1. A GFCI receptacle shall be mounted on the Control compartment inner door. The receptacle shall be rated at 15 amps, but restricted to 7 amp service by a dedicated 10 amp 120 VAC circuit breaker. The circuit breaker shall be supplied from the secondary of the control transformer.
  2. Component shall be Leviton, Model 75991
- K. Selector Switches
  1. Switches shall be mounted on the Control compartment inner door. The switches shall have extended operator handles.
    - a. HOA Switches



- c. Flush Kynar diaphragm
  - d. Abrasion resistant
  - e. Built in lightning arrestor
  - f. Lifetime warranty
- 2. Component shall be Keller America, Model Level Rat
- P. Complete fully functional float system / Back up
  - 1. Four mechanical control float switches shall be supplied with the control panel in order to operate the fully functional float circuitry.
  - 2. Rotary Dial for Float / Transducer operation
  - 3. Component shall be SJE-Rhombus, MilliampMaster™

## 2.08 SEQUENCE OF OPERATION

- A. Level Monitoring and Control
  - 1. The wet well level shall be monitored on the main screen in feet and tenths of feet. A setup screen shall enable the user to set the span and offset of the level transducer. A level setup screen shall be available for the user to set the five level set points required for a duplex lift station: Low level alarm, Stop all pumps level, Start lead pump, start lag pump & high level alarm. A level simulation function shall also be available for the operator to manually raise and drop the level of the wet well from the touch screen without handling the level transducer. The simulation function shall be self terminating after 5 seconds on inactivity to prevent the user from leaving the station in the level simulation mode.
- B. Pump Operation
  - 1. Only pumps in the AUTO mode shall be called to run in automatic pump operation. In HAND mode the pump shall run irrespective of the status of the controller and the wet well level. In the HAND position the selection switch shall directly control the RVSS run command and speed control. In AUTO mode, the pump operation shall be based on the level of the wet well and the level set points. As the level of the wet well rises above the "Start lead pump level" the lead pump shall start and run continuously until the level drops below the "stop all pump level". When the level is below the "stop all pumps level" no pump shall run in AUTO mode. As the level rises above the "Start lead pump level" again, the next available pump shall start and run continuously until the level drops below the "Stop all pumps level". Should the level continue to rise after the lead pump has started and reach the "start lag pump" level, the second available pump shall start and run simultaneously with the lead pump until the level drops below the "Stop all pumps level" and both pumps shall stop. Should the level rise above the "high level alarm" setpoint, the alarm will sound and the strobe will turn on. If the level drops below the "high level alarm" setpoint, the horn and strobe will stop, but alarm shall remain in the alarm log.
- C. Flow Monitoring

1. The discharge flow rate of each pump shall be monitored by level changes in the wet well. The controller shall be able to compute the flow rate based on fill time, discharge time, level changes and tank dimension. The flow rate shall be updated at the end of each pump cycle and displayed on the main screen in GPM. Flow monitoring shall be achieved without the use of a flow meter for cylindrical and rectangular tanks. Should a flow meter be made available, an analog input on the controller shall be enabled and the analog input shall be calibrated on the screen to display the correct GPM values.
- D. Sequence of Operation
1. The system software shall run on the Level View™ color touch screen controller. The Level View™ controller does not require any tools or laptop computer to configure. All configuration and setup shall be achievable from the menus on the touch screen display. The LED backlight of the controller shall be switched off on a timed basis to save energy and to maximize the battery autonomy during power failure
- E. Dry Run Protection
1. If enabled, the controller shall provide monitoring of a dry run condition. When a pump is called to run and the monitored amperage drops below the 'Dry Run Amps' set point value for a user-adjustable time period an alarm condition shall be noted in the alarm log.
- F. Back Up Float System
1. Should the level transducer fail, the float switch backup system shall take over. An alarm shall be issued.
  2. Should the controller fail, the pump operation shall be based on the back up float switches. Should the High Level float switch alarm activate, both pumps shall run until the low level float switch is reached. An alarm shall be issued.
  3. Backup float operation shall be independent of the controller for added protection against level overflow conditions.
- G. Communications
1. The controller shall be able to communicate via the following methods:
    - a. Dial up modem (RS 232 or Ethernet) Radio modem (RS 232 or Ethernet)
    - b. Cellular modem (RS 232 –to modem to GPRS to TCP/IP)
    - c. Cellular modem (SMS - text messaging)
  2. The default protocol shall be Modbus RTU, however other communication protocols shall be made available via an optional protocol converter.

## **2.09 LEVEL VIEW™ CONTROLLER**

### **A. Main Screen Description**

1. The main screen shall display the most commonly required information regarding the operation of the pump station. The following items are displayed:
  - a. Pump run status
  - b. Pump current (Amps)
  - c. Pump discharge flow (GPM)
  - d. Wet well level (feet)
  - e. Pump Cycle counter
  - f. Pump total hours run
  - g. Station status bar
  - h. Level set point indicators
  - i. High Float alarm at top of display
  - j. Lead pump selection

#### B. Alarm Screen Description

1. The Alarm Menu display shall indicate the most commonly required information regarding the alarms at the pump station. The Alarm Menu shall have the following features:
  - a. View current alarms
  - b. Sort by alarm date and time
  - c. Zoom into alarm providing more details
  - d. Alarm history (256 previous alarms)

#### C. Menu Display Description

1. The Navigation menu shall not be password protected. It shall allow navigation to the following displays:
  - a. Alarm Menu Display
  - b. Data Log Display (7 day running log)
    - i. Pump cycles
    - ii. Pump minutes
    - iii. Pump gallons

#### D. Setup Menu Description

1. The setup menu displays shall require a password. The setup displays are as follows:
  - a. Level
  - b. Flow
  - c. Amps
  - d. Sensor
  - e. System

#### E. Level Setup Display Description

1. The wet well level display shall have the following characteristics:
  - a. Level set point setup (individual on/off settings for each point)
    - i. Low-level elevation
    - ii. Lead pump call elevation
    - iii. Lag pump call elevation

- iv. High-level elevation
  - b. Current Level indication
    - i. Input Status
  - c. Simulation Buttons
    - i. Simulation, Push and Hold
    - ii. Automatically return to actual level after 5 seconds of inactivity.
  - d. Set to Default Button
    - i. Push and hold to automatically set tank level set points based on a percentage of the full range of the level sensor.
- F. Flow Setup
  1. The flow setup display shall enable the operator to set the following functions:
    - a. Flow calculation based on a cylindrical tank
    - b. Flow calculation based on a rectangular tank
- G. Amp Setup
  1. The Amp setup display shall enable the operator to set the following functions:
    - a. Pump current monitoring
      - i. Enable or disable monitoring
      - ii. Set high current alarm time delay
      - iii. Set Pump 1 high current alarm
      - iv. Set Pump 2 high current alarm
    - b. Dry Run Protection
      - i. Enable or disable dry run protection
      - ii. Set dry run time delay
      - iii. Set Pump 1 dry run amps
      - iv. Set Pump 2 dry run amps
- H. Sensor Setup
  1. The sensor setup display shall enable the operator to set the following functions:
    - a. Level transducer setup
      - i. Set transducer range (20mA value in feet)
      - ii. Set transducer offset value
    - b. Current transducer setup
      - i. Set Pump 1 current transducer range
      - ii. Set Pump 2 current transducer range
- I. System Setup Display
  1. The system setup display shall enable the operator to set the following functions:
    - a. System operation
    - b. Pumping mode (tank fill or tank empty)
    - c. Alternation selection (automatic, pump 1 lead, pump 2 lead, pump 3 lead)

- d. System time (real time clock)
- e. System date (real time clock)
- f. Password (setup access control only)
- g. Access the I/O status visualization screen
- h. Access the ETM/Cycle Counter reset screen

J. ETM/CC Reset

1. The ETM/CC reset display shall enable the operator to set the following functions:

- a. View elapsed time meters (in hours) for each pump
- b. View cycle counters for each pump
- c. Individually reset elapsed time meter for each pump
- d. Individually reset cycle counter for each pump

K. I/O Status and Programmable outputs

1. The I/O Status display shall enable the operator to set the following functions:

- a. View on/off status for each digital input to the controller
- b. View on/off status for each relay output from the controller
- c. View analog value (in milliamps) for each analog input and output
- d. View scaled value (in engineering units) for each analog input and output
- e. Access the Programmable Outputs set screen

L. Programmable Outputs

1. The Programmable Outputs display shall enable operator to set the following functions:

- a. Configure the programmable relay outputs (7 total available) for any of the following conditions:
  - i. Pump 1 Running
  - ii. Pump 2 Running
  - iii. Transducer Low Level
  - iv. Transducer High Level
  - v. Float switch Low Level
  - vi. Float switch High Level
  - vii. Pump 1 Failure
  - viii. Pump 2 Failure
  - ix. Pump 1 Seal Failure
  - x. Pump 2 Seal Failure
  - xi. Backup Float Mode Active
  - xii. Power/Phase Failure
  - xiii. Transducer Open (failure) alarm
  - xiv. General Alarm
- b. Set to Default button

- i. Press and hold to automatically set programmable output relays to the default state

## **2.10 Reduced Voltage Soft Starters**

### **A. Motor Starter**

1. NEMA rated bypass motor starting contactors shall be located in the Control panel and connected to the soft starters as required.
2. Solid-state, reduced voltage motor starters shall be provided for each pump motor. The soft starter shall provide soft start/ramp up and soft stop/ramp down control.

## **2.11 Lift Station SCADA System**

A. Contractor shall contact Mr. Ed McGrath at R.E. Pedrotti (913-677-3366 or [edm@pedrotti.com](mailto:edm@pedrotti.com)) for scope and list of required equipment. SCADA system is to be installed and wired by the Contractor, cost is to be included in cost of Lift Station.

## **PART 3 EXECUTION**

### **3.01 GENERAL**

A. All work shall be done in accordance with appropriate Divisions and Section and shall be performed in a workmanship manner.

### **3.02 FABRICATION**

A. All control panels shall be shop assembled and factory tested prior to delivery to the site. Final as-built drawing shall be made to reflect all adjustments and modifications made to the system after start-up has been completed satisfactorily. All equipment and devices shall be mounted, adjusted, calibrated, and operated exactly as recommended by the manufacturer of each component.

B. Control switches, indicator lights, and other devices shall be grouped as stated in this section and in submittal package.

### **3.03 EQUIPMENT INSTALLATION**

A. All equipment shall be installed in accordance with approved drawings and the manufacturer's written instructions.

### **3.04 WIRING AND TERMINATIONS**

A. All wiring shall follow NEC color coding scheme.

- B. All wiring shall be run parallel to side walls of panels and/or in covered wiring troughs. Wires passing across hinged areas shall be protected by abrasion resistant cabling materials.

### **3.05 IDENTIFICATION**

- A. All conductors shall be labeled at each end with numbers matching submittals data sheets and all wire terminations shall be identified by the component terminal numbers as shown on appropriate panel drawings.

### **1.06 START UP**

- A. Start up shall be done in accordance with manufacturer's written instructions and be completed by qualified electrician or Control Works, Inc.
- B. A completed start up report shall be returned to Control Works, Inc. in order to maintain full warranty coverage.

### UTILITY SHELTER

The Contractor shall furnish a one piece molded fiberglass reinforced polyester insulated building as manufactured by Jacobs Manufacturing Corp. Building shall have the following overall exterior dimensions (8' ) wide X (10' ) deep X a side wall clearance of (8') at eave height. Building shall contain one (36" x 78") single door.

Shelter shall withstand 125 miles per hour wind load and a 35 pound per square foot snow load. Fiberglass reinforced plastic buildings shall be of one piece molded construction with composite walls and roof. Exterior surface shall be gel-coat (white or tan) with a smooth finish and free from fiber patterns, roughness or other irregularities. Exterior laminate which is chemically bonded to the gel-coat shall be a minimum of 1/8" thick. The Laminate consisting of polyester resin and chopped strand fiberglass shall have a minimum glass content of 30%.

A minimum of 1" thick insulation shall be used for the core material and shall have an R-6.06 value. The core material shall be rigid closed cell, self extinguishing polyisocyanurate foam with a density of 2 pounds per cubic foot. The molding shall be continuous forming a one-piece molded composite shelter with an integral 4" wide internal mounting flange around the perimeter. The flange shall be pre-drilled on 12" centers with a 5/8" diameter hole for bolting to a structural fiberglass floor or a concrete pad. A one piece molded fiberglass composite door shall be 1-3/4" thick and typical to materials of construction of the walls.

The door shall be mounted using a continuous stainless steel hinge. The door shall be provided with a one point keyed stainless steel latch. The door gasket shall be extruded closed cell neoprene rubber bulb and provide a weather tight seal. A minimum of two

cadmium plated lifting eyes shall be provided for lifting the building. Lifting eyes may be removable after installation. Wood shall not be permitted for use in reinforcement or structural support. FRP building shall be a wood free structure.

PLUG VALVES

General: All plug valves shall be located in the valve vault as shown on the plans. The Plug valves shall be eccentric plug or tapered plug and shall be rated for 175 PSI. Valves inside buildings or vaults shall be provided with 125# flanges. The valves shall be provided with nut operators.

Manufacturers: The plug valves shall be Dezurik, Kennedy, Pratt or approved equal.

Materials:

Item	Material
Body and Plug	Semi-steel, ASTM A126, Class B
Plug Facing hardness	Neoprene or Buna-N, 70 durometer
Body Seat upper and lower Trunnion	Welded nickel overlay or bronze replaceable seat rings. Sleeve Type, 18-8 stainless steel, bronze, or rigidly backed TFE.
Upper Thrust Bearing	TFE or Delrin
Stem Seal	V-type packing, Buna or TFE; or double O-ring, Buna.

Design: The valve port area shall be at least 80 percent of the cross section of the connecting piping. Valves shall provide tight shutoff with rated pressure from either the upstream or the downstream direction. Valve ends shall be as required to match connecting piping.

Valves shall be rated for working pressure of at least 150 psi. The opening motion shall be eccentric and shall lift the plug away from the body seat. Fully adjustable plug position stops shall be provided.

The valve shaft shall be sealed with two O-rings or four packing rings. Stuffing boxes and packing glands shall be designed to allow adjustment or replacement without disassembly of valve or operator.

The valve body shall be plainly marked to indicate the seat end.

Operators: Totally enclosed operators shall be provided on all valves.

Operators shall be adequate to seat, unseat, and maintain valve position under all operating conditions. Operators shall produce the required torque with a maximum pull of 80 pounds on the lever or handwheel. Manual operator components shall withstand, without damage, a pull of 200 pounds on the handwheel or an input of 300 ft-lb on the operating nut.

Position indicator shall be provided on each exposed operator and on each operation nut on an extension.

Testing: Except as modified herein, eccentric plug valves shall be tested in accordance with AWWA C504, Rubber-Seated Butterfly Valves, Section 12. Each valve shall be performance tested in accordance with paragraph 12.1 and shall be given a leakage test and a hydrostatic test as described in paragraphs 12.2 and 12.3.

The leakage test shall be applied to the face of the plug (tending to unseat the valve) at the rated pressure of the valve, or the service rating of the operator, whichever is less.

The manufacturer shall furnish certified copies of reports covering proof of design testing as described in Paragraph 12.4. Upon completion of cycle testing, the valve shall be droptight with pressure applied to the face of the plug and also the back of the plug.

Installation: Valves in sewage or sludge lines shall be installed with the seat on the upstream end.

Valve Operators: Each valve operator shall be designed to unseat, open or close, and seat the valve under the most adverse operating condition to which the valve shall be subjected. Each valve operator shall be capable of closing the valve starting from wide open with the extreme closing flow specified and ending with a differential equal to the specified shutoff pressure. All gearing shall be totally enclosed and permanently lubricated.

## GATE VALVE (RESILIENT SEAT)

### Manufacturers

Mueller, Kennedy or approved equal.

### General

Gate valve shall be designed for a working pressure of not less than 150 pounds per square inch. Valves shall have joints as required for the piping in which they are installed. Valves shall have a smooth unobstructed waterway as large as the inside pipe diameter it is intended for. Valves shall have a non-rising stem, be equipped with an operating nut and be opened by turning counter clockwise. Valve shall be iron bodied with epoxy coating and be equipped with a bubble tight synthetic coated cast

iron disc. Valve shall operate in full compression seating and must meet or exceed all the requirements of the latest revision of AWWA C-509.

### CHECK VALVES

All check valves shall be located in the valve vault as shown on the plans. Each check valve shall be a non-clog swing check valve with external lever and spring, Check valve shall conform to AWWA C-508 Standard, latest revision. Check valve shall be designed for 175 psig working pressure and factory shell tested at 350 psig. The valve shall have flanged connections conforming to ANSI B16.1 Class 125 specifications. The valve body and disc shall be construction of cast iron ASTM A 126 Grade B. The disc shall be faced with cast bronze ASTM B584 Alloy C84400. Valve shaft pin shall be of large diameter 18-8 stainless steel. The bushing shall be securely held in the valve body by cap screws not screwed directly into the body in order to prevent the possibility of backing out. Where the valve shaft passes through the bushing for connection to the outside lever, a shaft seal of the O-ring type shall be provided. The valve shall be internally and externally coated with standard primer, in conformance with AWWA Standard C508.

### SLEEVE COUPLINGS

Sleeve couplings shall be Dresser Style 38 or Rockwell Style 411 or approved equal.

Couplings shall be installed at the locations as shown in the plans and shall be manufactured for joining the type of pipe shown.

Materials of construction: Sleeve - ASTM A53, ASTM A512, Followers - Malleable Iron ASTM A47 Grade 32510 or Ductile Iron ASTM A536 for 12" and smaller AISI 1018 steel for 14" and larger, and Bolts and Nuts - High strength low alloy steel with semi-finished hex nuts to AWWA C-111 (ANSI A21.1 1).

### PRESSURE GAGES

#### Manufacturers

Red Valve, Ronningen-Petter or approved equal.

#### Capacity

Anticipated pressure to be 50% of full scale unless otherwise indicated on the plans.

#### Features

Phosphor bronze bourdon tube, 4 1/2" diameter dial of white laminated phenol with black figures and graduation lines, nylon movement in rotary gear design, adjustable micrometer type pointer readily accessible from front of gage, black enameled cast,

glass face window tightly constructed to be dust and moisture resistant, accuracy within 1/2 of 1% of scale range and shutoff cock.

#### Flange Wafer

The flange wafer shall be provided with a flexible sleeve and a sensing liquid. The unit shall be equal to the Red Valve Series 40.

#### Pressure Switches

Where indicated on the plans pressure switches shall be provided on the units.

#### Pulsation Damper

Pulsation dampers shall be provided on the pressure gauges and pressure switches.

### START UP AND OPERATION

All equipment installed under this contract shall be placed into successful operation according to the written instructions of the manufacturer. All required adjustments, tests, lubricants, operation checks, and other startup activities shall be provided by the contractor.

Acceptance of work in connection with the installation of equipment furnished by others will be subject to approval of the Engineer. Contractor shall be responsible for planning, supervising, and executing the installation of work, and the approval or acceptance of the engineer or the field representative will not relieve contractor of responsibility for defective work.

The contractor shall furnish to the owner within two weeks after startup a written report, with documentation from the equipment manufacturers, concerning all required testing, operation checks, and performance characteristics at startup.