

## **ADDENDUM NO. 4**

### **Friars Branch Pump Station Improvements Contract No. W-12-027-201**

#### **City of Chattanooga, Tennessee**

The following revisions shall apply to the Contract Documents and Specifications for the Friars Branch Pump Station Improvements project as prepared by Arcadis.

1. The attached Responses to Requests for Information shall become a part of the Contract Documents.
2. In note 3 on sheet M-1 and note 2 on sheet M-5, clarify "STAINLESS STEEL SHEET METAL" to specify "16 gauge 304-SS SHEET METAL".
3. On sheet M-1, provide aluminum grate in place of the manhole lid at top of effluent trough (referenced to detail 3 on sheet C-4 and called out on sheet S-5). The aluminum grating, banding and fastening is to be in accordance with specification 05 53 16.
4. On sheets M-4 and M-5, remove all references to rehabilitation of the hoist and trolley. Rehabilitation of the hoist and trolley is removed from the project scope.
5. On sheet M-2, delete note 6, regarding sump pump spare parts.
6. On sheet M-5, amend callout at future discharge elbow to read "30" Ø KNIFE GATE VALVE WITH 30" BLIND FLANGE"
7. On sheets M-1, M-2, M-3, M-4, M-5, S-1, S-2, and S-3, remove all references to sandblasting of existing handrails. Sandblasting of existing handrails is not required. Existing handrails need only be cleaned and prepped prior to being repainted in accordance with Section 09 91 00.
8. In detail 4 shown on sheet S-8, clarify note "2" Ø DRAIN (WELDED) WITH BALL VALVE" to read "2" Ø DRAIN (WELDED) WITH BALL VALVE, ALL MATERIAL 304-SS, TYPICAL 3 PLACES"
9. REPLACE Section 00 80 00-14, Wage Rate General Decision with attached Heavy wage rates.
10. REPLACE Section 43 21 13 Centrifugal End Suction Pumps Dry Pit in its entirety with attached.
11. DELETE Section 01 45 28, 1.03.A.1. This project does not require an onsite testing lab.
12. In Specification Section 40 05 23 – DELETE paragraph 2.02 A. 1. d. 3) and REPLACE with the following: 3) Stainless steel pipe greater than eight-inch diameter shall be Schedule 10S, minimum.

#### **End of Addendum No. 4**

September 15, 2016

\_\_\_\_\_  
Date:

\_\_\_\_\_  
/s/ Justin C. Holland  
Deputy Administrator, Public Works  
City of Chattanooga

**Project:** Friars Branch Pump Station Improvements

**Contract Number:** W-09-011-201

**Request for Information Number:** 1

**Date:** September 15, 2016

Following are responses to the comments and questions received:

1. In Division 000000, re: 04213 - Bid Schedule: page 4 is missing. Please clarify if it is indeed missing or if it is a mistake in page numbering?

**Response:** *Page was inadvertently omitted from hard copy. Revision was provided with Addendum No. 2.*

2. Will you please provide the manufacturer and model of the existing cable hoist so that we can properly price the rehab work?

**Response:** *The rehabilitation of existing hoist and trolley has been removed from the project per Addendum No. 4.*

3. On the bid form, the Extra Work as Ordered by Engineer; item 8. Can we get a better description of the type of repairs that are required for the 3,000 SF of Concrete Restoration. Spec Section 03.01.30 describes several types of repairs.... SF is not necessarily the best unit of measure. Can this scope of work be included as an allowance?

**Response:** *The work is as defined in Section 03 01 30 of the specifications.*

4. Please confirm that the industry standard definition of rehabilitation will be used for this project? I.E. note 4 drawing M-2, shall be to remove rust, paint, and coordinate old embedded material with new mating equipment?

**Response:** *Use industrial standard definition of rehabilitation.*

5. Spec section 01.45.28 calls for an onsite facility for the testing lab, which is a 10x10x7 heated structure for the concrete testing cylinders..... will this structure be included in the \$10,000 testing lab allowance on the bid form?

**Response:** *The requirement for onsite testing lab has been removed per Addendum No. 4.*

6. On sheet M-11, the Elevator rehab, is everything on this sheet part of the bid form allowance, even the HVAC modifications on this sheet?

**Response:** *Elevator rehabilitation is to be covered in the allowance. All HVAC modifications are in the base bid.*

7. On sheet M-5, there is a note to "Rehab existing hoist & trolley." What is required for this rehab?

**Response:** *The rehabilitation of existing hoist and trolley has been removed from the project per Addendum No. 4.*

**Responses to Requests  
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8. Has the owner/engineer talked to the local power company to coordinate the power for this bypass along with having power for the new pump station, both power systems will have to be installed until the new pump station is started up.

**Response: Coordination with local power company has not been performed and will be the responsibility of the contractor.**

9. 01.75.16 – the Operational test period is listed as 30 days. Do we need to keep the bypass pumping system in place during this whole 30 day period?

**Response: Yes**

10. Will substantial completion be granted at the beginning or end of the operational test period?

**Response: Substantial completion will be granted at the end of the operational test period accordance with GC-1.01 item 44.**

11. Spec section 01.45.28 calls for an onsite facility for the testing lab, which is a 10x10x7 heated structure for the concrete testing cylinders..... will this structure be included in the \$10,000 testing lab allowance on the bid form? Or can it be deleted from project?

**Response: The requirement for onsite testing lab has been removed per Addendum No. 4**

12. Is there any Geotechnical data of soil boring information available for this project?

**Response: Existing geotechnical information is provided in Addendum No. 3.**

13. Specification 31 23 05 pages 20-21 specifies percent compaction per ASTM D698. Drawing S-5 Section A and B indicates "STRUCTURAL FILL COMPACTED TO 98% ASTM D1557". Which is correct?

**Response: 98% ASTM D1557 is correct.**

14. Spec section 01 51 43, 3.01B – please define what is required to "inspect the bypass pumping system every two hours." Can we utilize system telemetry, flow monitoring instrumentation, etc. to accomplish this, or are you dictating that we have a person watching the bypassing pumping system 24 hrs per day?

**Response: Inspections shall be performed on site, not remotely. The Contractor shall ensure that the temporary pumping system is properly maintained and that a responsible operator shall be on site at all times when pumps are operating.**

15. The gate stem guide supports shown on drawing G-8 and G-9 are not marked for demolition, please advise if these items need any action on this contract (demolition or rehabilitation)

**Response: The gate stem guide supports shall be replaced.**

16. On drawing M-4, there are multiple notes that indicate (4) pipes should be installed from the pump discharge pipe into the effluent trough. Please confirm the pipe quantity and if four new wall pipes are

needed?

**Response: Confirmed. Four new wall pipes are required. Revise note on sheet M-5 to read "30" diameter knife gate valve with 30" diameter blind flange."**

17. Drawing S-6 calls for the 36" SS pipe fitting in the effluent trough to have a flared end, the M drawings don't call for this, please clarify what is needed?

**Response: The flared end is not required.**

18. On drawing M-3, how much piping needs to be replaced on the sump pipe?

**Response: All of the pipe from sump pump to the discharge point at the effluent trough structure shall be replaced.**

19. Specification section 015143-2.01.G – indicates standby power (generator) shall be provided in the event of a power loss. Please clarify if the bypass system provider needs a standby generator onsite when the bypass is active. The current pump station does not have a generator onsite. Specification 2.02.D states no portable generators are allowed onsite – please clarify.

**Response: The contractor shall provide standby generator onsite for the entire duration that bypass pumping is active. The prohibition of portable generators in 202.D relates to primary power, rather than standby power generation.**

20. In the question above, if for some reason you want a standby generator on site, please clarify the size of generator needed based on the pumping rate. In other words, do you want a generator on site to pump the maximum 80 MGD? This would be an extremely expensive option to have this size generator sitting on site.

**Response: Yes. The standby generator must allow the pump station to operate at up to 80 MGD.**

21. For this bypass system one or more temporary manholes will need to be installed on or connected to the existing sewers. If these manholes are installed per city/county rules and regulations, can they be left in place once the bypass operation is complete? At least can we leave the temporary structures below existing grade in place?

**Response: For bidding purposes, include provisions for removal of all temporary structures.**

22. It appears this project is the result of a Consent Order against the City of Chattanooga. Please provide a copy of the Consent Order to allow evaluation of its impact on the contract.

**Response: The consent order can be found at [http://www.chattanooga.gov/public-works-files/ConsentDecree/ChattanoogaCD\\_FINAL\\_EFFECTIVE\\_BOOKMARKED.pdf](http://www.chattanooga.gov/public-works-files/ConsentDecree/ChattanoogaCD_FINAL_EFFECTIVE_BOOKMARKED.pdf)**

23. General Conditions 3.2.1. states "Tentative specifications shall be constructed as current unless otherwise noted". Please define "Tentative specifications".

**Response: Tentative specifications are defined as any specification not published as a final specification of any technical society, organization, or association that may be published but**

***not as a final specification.”***

24. General Conditions 3.2.2. states “Where obsolete Federal Specifications have been referenced, they shall be superseded by the Federal Specification in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids)”. Please identify the obsolete Federal specifications used in this project.

***Response: No additional information will be provided to Bidders related to Federal Specifications.***

25. Why was the Standard language in EJCDC C-700, Article 4.3.C. changed from “The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor’s cost of, or time required for, performance of the Work; subject, however, to the following:” to “The Contract Price or the Contract Times, or both, may be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor’s cost of, or time required for, performance of the Work; subject, however, to the following:”?

***Response: No additional information will be provided to Bidders related to the modifications the Owner has chosen to make to the Standard language in EJCDC C-700.***

26. Why was the Standard language in EJCDC C-700, Article 4.4.C.2. changed from “If Engineer concludes that a change in the Contract Documents is required, a Field Order, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that caused a change as described in Paragraph A.9 of this Article 4.04.” to “If Engineer concludes that a change in the Contract Documents is required, a Field Order, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment may be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that caused a change as described in Paragraph A.9 of this Article 4.04.”?

***Response: No additional information will be provided to Bidders related to the modifications the Owner has chosen to make to the Standard language in EJCDC C-700.***

27. Why were all Owner insurance requirements, as specified in the Standard EJCDC C-700 deleted (General Conditions 5.3.B.) and all insurance responsibilities transferred to the Contractor?

***Response: No additional information will be provided to Bidders related to the modifications the Owner has chosen to make to the Standard language in EJCDC C-700.***

28. Why was the following language deleted from the Standard C-700, Article 5.7, Waiver of Rights; “Owner and Contractor waive all rights against each other and their respective officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners,

employees, agents, consultants, and subcontractors of each and any of them) under such policies for losses and damages so caused.”?

**Response: No additional information will be provided to Bidders related to the modifications the Owner has chosen to make to the Standard language in EJCDC C-700.**

29. General Conditions, 6.1. states “Any method of work suggested by the City or Engineer, but not specified, shall be used at the risk and responsibility of the Contractor; and the City and Engineer will assume no responsibility therefore.” Means and methods belong solely to the Contractor; under what conditions can the City or Engineer suggest a work method?

**Response: No additional information will be provided to Bidders related to the modifications the Owner has chosen to make to the Standard language in EJCDC C-700.**

30. It appears that General Conditions 6.20. requires the Contractor to indemnify the Owner and/or Engineer for their acts of omission and negligence. Please clarify.

**Response: No additional information will be provided to Bidders related to the modifications the Owner has chosen to make to the Standard language in EJCDC C-700.**

31. Why was the Standard language in EJCDC C-700 concerning Claims and Disputes modified shortening the days to submit a claim from 30 days to 10 days; and submission of supporting claims documentation shortened from 60 days to 20 days?

**Response: Refer to GC-10.5 Claims and Disputes and GC-17.5 Controlling Law which state the terms and conditions related to Claims and Disputes. GC-17.5 states “Each party hereby consents to the Hamilton Superior Court’s sole jurisdiction over any dispute which arises as a result of the execution or performance of the Agreement, and each party hereby waives any and all objections to venue in the Hamilton Superior Court.**

32. Why was the maximum aggregate fee reduced from 27 percent to 26.8 percent in General Conditions 12.1. according to the Standard language in EJCDC C-700?

**Response: No additional information will be provided to Bidders related to the modifications the Owner has chosen to make to the Standard language in EJCDC C-700.**

33. The Standard language in EJCDC C-700, Article 14 states that payment is due to the Contractor 10 days after presentation of the Application for Payment to then Owner. Why was this changed to 30 days?

**Response: In addition to GC-14.02, refer to SC-14.02 for terms and conditions related to when payments are due to the contractor after Applications for Payment are presented to the Owner.**

34. Article 15.3, Owner Termination for Convenience, states “Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate or discontinue, in whole or in part, the Contract.” This is a deviation from the EJCDC Standard C-700. Please explain the procedures for terminating “part” of a contract. Furthermore, it appears the General Conditions deleted all references to “fair and reasonable overhead and profit” due to the Contractor upon termination, and replaced “fair and reasonable” with “ten percent” overhead and

profit. Please explain why this standard language was deleted from the Contract, and how ten percent was determined to be equitable.

**Response: No additional information will be provided to Bidders related to the modifications the Owner has chosen to make to the Standard language in EJCDC C-700.**

35. It appears that all standard language concerning Dispute Resolution was deleted from the General Conditions (Article 16). Please explain the dispute resolution procedures for the project.

**Response: Refer to GC-10.5 Claims and Disputes and GC-17.5 Controlling Law which state the terms and conditions related to Claims and Disputes. GC-17.5 states "Each party hereby consents to the Hamilton Superior Court's sole jurisdiction over any dispute which arises as a result of the execution or performance of the Agreement, and each party hereby waives any and all objections to venue in the Hamilton Superior Court."**

36. It appears that General Conditions 17.13, Losses from Natural Causes, conflicts with General Conditions 12.3., Delays, concerning delays beyond the control of the Contractor (Force Majeure). Why is the Contractor not entitled to time extensions for "action of the elements" beyond his control?

**Response: No additional information will be provided to Bidders related to the modifications the Owner has chosen to make to the Standard language in EJCDC C-700.**

37. Please advise on the max surcharge elevation of the Influent line to the pump station for bypassing purposes.

**Response: Elevation 641.0**

38. Can you please confirm that all infiltration flows have been incorporated into the flow rate calculation and the basis of design will be the maximum flows seen.

**Response: Yes**

39. What is the peak hourly flow that we need to anticipate in the bypass?

**Response: A peak event of 78.6 MGD has been recorded at the pump station.**

40. Please advise are the bidders to use the Davis Bacon Rates for Heavy Highway or Building construction? Please provide a Heavy Highway rate for a carpenter.

**Response: Heavy wage rates are to be used for this project and are provided in Addendum No. 4. Bid carpenter's based on the general laborer rate of \$18.75.**

41. 32. 42 21 13 Section 1.04.A.2.b: Allowable suction lift is a theoretical calculation of lift based upon atmospheric conditions. Since it is a theoretical value, most manufactures do not place this on their performance curves. NPSH is more tangible and is the value that is required by HI on manufacturer's performance curves. Allowable suction lift calculation is typically used to ensure a centrifugal pump can theoretically lift the liquid to a prescribed height based upon atmospheric conditions (sea level being the max) during the preliminary design phase of a project. Recommend that this value be removed from curve requirement.



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**Response: Comment noted.**

42. 33 42 21 13 Section 1.04.B.1.a: Per HI standards, efficiency shall be guaranteed based on factory testing at the prescribed design flow rate and TDH. If field conditions are accurately represented by the design parameters in the specifications/drawings, the pump will perform well within the allocated parameters once installed at the site

**Response: Comment noted.**

43. 34. 42 21 13 Section 1.06.A: Request that it be clarified that warranty for the pumps shall commence after manufacturer's pump startup.

**Response: No. The warranty shall begin as per specification 01 78 36 1.01.B.**

44. 42 21 13 Section 2.01.B.4: The performance table lists maximum speed as 800 RPM. All previous design review sets indicated 600 RPM. Please clarify.

**Response: The maximum pump speed is 600 RPM. Refer to updated specification 43 21 13 in Addendum No. 4.**

45. 42 21 13 Section 2.03.A.2: Flowserve utilizes a 3-vane or 3-port impeller. Request the wording be revised to "multiport impeller".

**Response: The specification 43 21 13 Section 2.03.A.2: does allow for a 3-port impeller.**

46. 42 21 13 Section 2.03.A.8: The volute shield is proprietary to one manufacturer and eliminates named suppliers. Request the first sentence be removed.

**Response: Refer to updated specification 43 21 13 in Addendum No. 4.**

47. 42 21 13 Section 2.03.A.13: Pumps are not close coupled. There is shafting between pump and motor.

**Response: Refer to updated specification 43 21 13 in Addendum No. 4.**

48. 42 21 13 Section 2.04.D H.S.: Watson Company is no longer in business and Thomas Division of Rexnord does not make universal joint shafting. We would recommend Johnson Power to be listed. They are the leading shaft supplier to the industry, very user friendly and are utilized by every pump manufacturer.

**Response: Product approvals will not be reviewed/approved until after contract is awarded. Johnson Power shafting may be submitted as an "or equal" product for review during the shop drawing review process.**

49. 42 21 39.13 First of all is a vibration & temperature monitoring system required for the size of pumps on this project &/or why so much redundancy, it is a very costly system for this size of pumps, and if required can an alternate control system to the Bentley Nevada be offered?

**Response: Bid this item as shown and as specified.**



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50. Due to the fast pace of this project what is the owner's intent on inspection over 40 hour work week? Have they anticipated additional work hours may be required over 40? If they have not is it the cities intent to charge additional costs of the inspector to the contractor?

**Response: No**

51. There appeared to be confusion on whether the pre-bid was, or was not, mandatory for bidding purposes, will you please confirm if the pre-bid was mandatory?

**Response: Bidder attendance at the pre-bid conference was encouraged, but not mandatory.**

52. In the matter of the contractor performing soil borings on site or performing a test excavation, will the City of Chattanooga allow this due to insurance requirements or liability? Are there any special liabilities or other administrative requirements that need to be taken to perform these activities?

**Response: Coordinate directly with City staff as indicated at the pre-bid conference.**

53. In the matter of the flow data, will the City please confirm that the one flow monitor has been calibrated and if the data is accurate along with being "consistent".

**Response: The temporary by-pass pumping system is to be provided to meet the requirements of specification 01 51 43 2.01.**

54. Has the City or any other party bypassed this station in the last five (5) years or other time of note? If so, is there any data or information that may be beneficial for utilization on this contract?

**Response: No**

55. If flows are determined to be relevantly different than the flow from the information provided and the bypass system must be upgraded, improved or altered from the approved design (as solely per the bypassing specification), will this be considered a change of condition? Has the flow data from the one flow monitor been cross checked with the pump performance curves or against any other known measurable?

**Response: The temporary by-pass pumping system is to be provided to meet the requirements of specification 01 51 43 2.01.**

56. Please provide all known as-builts for the relevant portions of this project. Also, if the approved submittals for the buried materials are available, please provide the approved or transmitted documents to confirm existing materials.

**Response: Record drawings of the sanitary sewer lines were provided in Addendum No. 3.**

57. Does the City have a, or any, piezometer('s) at that station that are not identified on the drawings? Or any within a mile of this site?

**Response: No**

58. Given that we are soon approaching winter and they bypass is an extremely significant portion of this

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project, would the Owner consider an extension to the construction schedule given the fact that optimal bypassing time is likely being missed (i.e. heat, dry soils, saturation and similar)?

**Response: Bid the project as shown and as specified.**

59. The effluent trough was not able to be viewed, will the City confirm the method used to inspect the trough. Specifically was this CCTV, visual, soundings, scanner, GPR, X-ray or other? Will the City also make those results available?

**Response: The effluent trough is to be replaced in total. Bid this item as shown and as specified.**

60. Please confirm if it is a contract requirement for the Superintendent to be full time on the project. For the full 483 days?

**Response: Refer to GC-6.1.B, which states that "At all times during the progress of the Work, Contractor shall assign a competent superintendent..." Contractor is responsible for determining when the superintendent is to be full time on the project during the progress of the Work as necessary to comply with the Contract Documents including, but not limited to, CG-6.1 A. which states "Contractor shall supervise, provide quality control, inspect and direct the Work competently and efficiently...."**

61. Please confirm if it is a contract requirement for the Project Manager to be full time on the project. For the full 483 days? If it is a requirement, does this mean that the Project Manager must be on site, or just assigned full time?

**Response: Refer to GC-6.1 B., which states "Contractor shall also designate, in writing, a representative hereinafter referred to as Project Manager, assigned to the Project on a full time basis during execution of the Work..." Contractor is responsible for determining when the Project Manager must be on-site during the execution of the Work to comply with the Contract Documents including but not limited to GC – 6.1 B. which states "... Project Manager... who shall the authority to act on behalf of Contractor, including executing the orders or directions of the Engineer without delay...shall have the full authority to promptly supply products, tools, plant equipment, and labor as may be required to diligently prosecute the Work."**

62. Does the Owner anticipate that the project will be awarded in the time frame allotted for this bid?

**Response: Yes.**

63. Is there any foreseeable reason that the "bid hold" will be extended beyond the specified time frame? Assuming that the bid is awarded, what would be the anticipated date of the notice to proceed?

**Response: We expect awarding of the contract within 60-days of receipt of bids subject to the provisions of GC-19.**

64. For "extra work as ordered by the engineer", please define "changes ordered by the Engineer". Specially, when are these allowable given that the GC's are seemingly clear that the contractor is responsible for any deviations (i.e. rock excavation).

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**Response: Minor changes and additional work ordered by the Engineer are defined in various places in the Contract Documents, including by not limited to GC-1.1. A.20. Field Order and Section 01 22 00 – Measurement and Payment. Refer to GC-4.4.A.9. for a description of when work revised by the Engineer will be paid for as extra work.**

65. Please define the scope, method, choice product or any other information such as details for bid items #7 and #8 in "Schedule III". Should reinforcing replacement be assumed? What areas could this work be assumed, in as this could affect the bypass?

**Response: Refer to drawing S-3 note 4 and specification 03 01 30. No reinforcement replacement is assumed.**

66. Please confirm or clarify the statement that "salaried employees must be paid an overtime rate for work over 40 hours in a nonsupervisory position.

**Response: Contractor staff performing supervisory functions are not required to be paid overtime. Contractor staff performing work in a non-supervisory capacity shall be paid overtime.**

67. Based on the previous bids received and the indication that the project was over the engineers estimate, is it the City's intent to award the project even though no significant changes or scope was removed from the project for this bid.

**Response: We expect awarding of the contract within 60-days of receipt of bids subject to the provisions of GC-19.**

68. Is the Engineer of Record the sole reviewer of submittals, RFI's, changes orders or similar on this project?

**Response: No.**

69. Is the only "Inspector" on the project a single "authorized representative of the Engineer"?

**Response: No.**

70. Has there been any type of hazardous soils studies on site? If hazardous materials are found on site, is the discovery considered a changed condition?

**Response: No. Prepare bid as specified.**

71. On contract drawing M-4 and M-5, dismantling joints are called out, however in specification section 400506, no mention of a dismantling joint is mentioned. Please provide a standard specification for the material.

**Response: Provide Romac dismantling joints, or equal.**

72. Spill prevention is listed in the specifications, however there appears to be no need for it, please clarify why this was included in the specifications.

**Response: Refer to Section 01 35 44 1.01.D**

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73. Specification 017923 details Instruction of Operations and Maintenance Personnel, is this to occur after successful startup, or can it be accomplished while the manufacturer is on site during the startup period specified?

***Response: Refer to Section 01 79 23 1.01.B***

74. Are two project signs required? Section 015800 details a project sign and the Supplementary Conditions with the documents for the Clean Water State Revolving Fund detail a Clean Water for Tennessee sign. Please confirm the number of signs required for the project.

***Response: Bid the project as specified.***

General Decision Number: TN160146 01/08/2016 TN146

Superseded General Decision Number: TN20150146

State: Tennessee

Construction Type: Heavy  
Including Water and Sewer Line Construction

Counties: Hamilton and Sequatchie Counties in Tennessee.

HEAVY CONSTRUCTION PROJECTS (including sewer/water construction).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.15 for calendar year 2016 applies to all contracts subject to the Davis-Bacon Act for which the solicitation was issued on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.15 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2016. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts).

Modification Number	Publication Date
0	01/08/2016

ELEC0175-012 06/01/2015

Hamilton County

	Rates	Fringes
ELECTRICIAN.....	\$ 29.93	14.5%+6.40

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ELEC0429-008 09/01/2015

Sequatchie County

	Rates	Fringes
Electrician.....	\$ 24.84	11.90

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\* ENGI0917-022 05/01/2015

	Rates	Fringes
Operating Engineers:		
Bulldozer and Crane.....	\$ 26.72	9.90
Forklift.....	\$ 24.53	9.90

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LABO0846-001 05/01/2013

	Rates	Fringes
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LABORER: Common or General.....\$ 13.85 4.90

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SUTN2009-144 12/02/2009

	Rates	Fringes
LABORER: Flagger.....	\$ 8.73	0.00
LABORER: Pipelayer.....	\$ 11.68	0.00
OPERATOR: Backhoe/Excavator/Trackhoe.....	\$ 16.82	0.00
OPERATOR: Loader.....	\$ 13.50	0.00
TRUCK DRIVER: Dump Truck.....	\$ 10.76	0.00

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WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

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The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

#### Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate

changes in the collective bargaining agreement (CBA) governing this classification and rate.

#### Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

#### Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

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#### WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial



contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations  
Wage and Hour Division  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

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## Part 1 General

### 1.01 Description

#### A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified, and required to furnish and install vertical, dry-pit, solids handling end suction centrifugal pumps complete and operational with motors, motor supports, local control stations, drivers, shafting and guards, suction elbows, motor high ring base guards, seal water systems, vibration and temperature monitoring systems, control equipment, and accessories as shown and specified. Anchor bolts are included in this Section.
2. This shall include coordination of the pumps and motors with the sensors installation, as well as the monitoring system interfacing with electrical work and instrumentation and control functions. Overall system responsibility of the vibration system shall include contract documentation preparation, onsite installation inspection and coordination, equipment configuration and verification, field testing, start-up, training, calibration and overall successful operation of the equipment. The CONTRACTOR, through the Supplier, shall guarantee and be the source of information for the complete system, including each piece of equipment furnished under this Section and other Sections, regardless of the manufacturing source of that equipment.

#### B. Coordination:

1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before the vertical centrifugal end suction pumps-dry pit Work.

#### C. Related Sections:

1. Section 03 60 00, Grout.
2. Section 05 05 33, Anchor Systems.
3. Section 09 91 00, Painting.
4. Section 40 05 93, Common Motor Requirements for Process Equipment.
5. Section 40 60 05, Instrumentation and Controls.
6. Applicable Sections of Division 26, Electrical.

### 1.02 References

#### A. Standards referenced in this Section are listed below:

1. American Bearing Manufacturers' Association, (ABMA).
2. American National Standards Institute, (ANSI).
3. American Society for Testing Materials, (ASTM).
4. Standards of American Water Works Association, (AWWA).
5. Institute of Electrical and Electronic Engineers, (IEEE).
6. Standards of the Hydraulic Institute, (HI).
7. National Electrical Code, (NEC).
8. Standards of the National Electrical Manufacturers Association, (NEMA).

### 1.03 Quality Assurance

- A. Manufacturer's Qualifications:
  - 1. Manufacturer shall have a minimum of five years of experience producing substantially similar equipment, and shall be able to show evidence of at least five installations in satisfactory operation for at least five years.
- B. Component Supply and Compatibility:
  - 1. Obtain all equipment included in this Section regardless of the component manufacturer from a single vertical centrifugal end suction pumps-dry pit manufacturer.
  - 2. The vertical centrifugal end suction pumps-dry pit equipment manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
  - 3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the vertical centrifugal end suction pumps-dry pit equipment manufacturer.

### 1.04 Submittals

- A. Action Submittals: Submit the following:
  - 1. Shop Drawings:
    - a. Fabrication, assembly, installation and wiring diagrams for pumps, motors, and ancillary components.
    - b. Vibration and Temperature Monitoring System shop drawings including point-to-point interconnection wiring diagrams of field wiring associated with the system.
  - 2. Product Data:
    - a. Manufacturer's literature, illustrations, specifications and engineering data including: dimensions, materials, size, weight, performance data for pumps, suction elbows, motors, pedestals, shafting, seal water systems, vibration and temperature monitoring systems, and ancillary components.
    - b. Curves showing overall pump efficiencies, required net positive suction head, flow rate, head, brake horsepower, motor horsepower, speed and shut-off head. Curves shall indicate continuously acceptable operating ranges. Curves shall have at least five speeds plotted between maximum and minimum rpm.
    - c. Motor tests and data, as described in Part 2.
- B. Informational Submittals: Submit the following:
  - 1. Source Quality Control:
    - a. Guarantee with proof of ability to maintain efficiency.
    - b. Certified pump tests.
- C. Closeout Submittals: Submit the following:
  - 1. Operations and Maintenance Data:
    - a. Submit complete installation, operation and maintenance manuals including test reports, maintenance data and schedules, description of operation and spare parts information.

- b. Furnish Operation and Maintenance Manuals in conformance with the requirements of Section 01 78 23, Operations and Maintenance Data.

## 1.05 Delivery Storage and Handling

- A. Packing, Shipping, Handling and Unloading:
  - 1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to prevent delay of the Work.
  - 2. Product delivery, storage, and handling shall comply with the requirements of Sections 01 65 00, Transportation and Handling.
- B. Storage and Protection:
  - 1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
  - 2. Product delivery, storage, and handling shall comply with the requirements of Sections 01 65 00, Transportation and Handling.
- C. Acceptance at Site:
  - 1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

## 1.06 Warranty

- A. Provide manufacturer's written warranty, running to the benefit of OWNER, agreeing to, at OWNER's option, correct, remove, or replace materials or equipment specified in this Section and found to be defective. The warranty shall be for a period of five years after date of Substantial Completion. Replacement value of items regularly subject to wear in normal use, such as seals, bearings, impellers, rotors, and stator, may be prorated.

## Part 2 Products

### 2.01 Equipment Performance

- A. Description:
  - 1. Pumps shall be vertical, dry-pit, solids handling, end suction centrifugal type with extended shaft.
- B. Performance Criteria:
  - 1. Pumps, motors, drives, shafting, and supports shall be designed and installed for continuous service for all points within the specified range of operation, without overheating, damaging cavitation, and without excessive vibration or noise.

## Centrifugal End Suction Pumps Dry Pit

2. Pump volutes shall be able to pass through the existing 5-foot – 6-inch by 5-foot – 6-inch floor openings without pump modification or disassembly.
3. Pumps shall comply with the requirements of HI Standards for the conditions specified herein and as shown.
4. Pumps shall comply with the minimum design conditions specified below and shall be specially designed, constructed, and installed for the service intended:

DESIGN CONDITIONS	Pump Nos. 1, 2, and 4
Location:	Pump Station, Dry Pit
Fluid Pumped:	Raw Sewage
Fluid Temperature (°F)	Ambient, max. 80°F
Fluid pH:	Neutral
Solids Content of Pumped Fluid (%):	< 0.5
Number of Pumps Required:	3
Pump Design Flow – First Design Point (gpm):	25,000
Total Dynamic Head @ Design Flow (feet):	34
Minimum Efficiency @ Design Flow (%):	74
Maximum Pump Speed (rpm) <sup>1</sup> :	600
Head at Zero Flow & Full Speed (ft) <sup>2</sup> :	65
Maximum Motor Horsepower (Hp) <sup>3</sup> :	300
Drive Type:	Variable speed - VFD
Minimum Continuous Stable Flow (gpm):	< 6,950
Suction Condition:	Flooded
NPSHa @ Design Flow (ft) <sup>4</sup> :	29.8
Maximum NPSHr @ Design Flow (ft):	27
Pump Solids Handling Capability (Min. spherical diameter, in):	5.0
Minimum Suction Size (in):	30
Minimum Discharge Size (in):	24
Reduced Speed Flow at 2nd Design Point (gpm):	13,200
Total Developed Head at 2nd Design Point (ft):	26
Reduced Speed Flow at 3rd Design Point (gpm):	6,950
Total Developed Head at 3rd Design Point (ft):	23
Motor Voltage/Phase/Hertz	460 / 3 / 60
<b>Notes:</b> <ol style="list-style-type: none"> <li>1. This is the maximum pump speed to meet the specified operating conditions and the speed that the pump is to be tested at in the factory to demonstrate compliance with these specifications.</li> <li>2. Plus or minus 5 feet.</li> <li>3. Maximum motor horsepower is 300; however, the required pump brake horsepower on any point of the pump characteristic curve at the specified operating speed is not to exceed the rated motor horsepower. Motor service factors are not to be used to meet any operating condition along the full length of the pump characteristic curve.</li> <li>4. The listed NPSHa is the maximum available at the noted flow rate. The tabulated value does not include any sort of margin/buffer or safety factor.</li> </ol>	

## 2.02 Manufacturers

- A. Products and Manufacturers: Provide one of the following:
  1. Flowserve, Model MNV.
  2. Fairbanks Morse, Model 5711.
  3. Patterson Pumps, Model F24B.

4. Or approved equal.

## 2.03 Details of Construction

### A. Pump Materials and Construction:

1. Casing: Cast-iron with handhole and cover. Volute shall be designed to allow removal of rotating assembly without disturbing the suction or discharge connections.
2. Impeller Type: Enclosed, multiple port, non-clog, dynamically balanced.
3. Impeller Material: Cast-iron.
4. Impeller Wear Ring: Hardened chrome steel, removable.
5. Suction Head Wear Ring: Hardened chrome steel, removable.
6. Shaft Sleeve: Hardened chrome steel.
7. Shaft: Stainless Steel.
8. Wear Ring: Wear ring shall be heat treated to a Brinell hardness of 600, minimum.
9. Seals: Split-type mechanical seal, silicon carbide face, Model 442, as manufactured by Chesterton, or equal. Provide SpiralTrac bushings, as manufactured by EnviroSeal, or equal.
10. Bearings: Anti-friction, grease or oil lubricated with a minimum B-10 life of 100,000 hours.
11. Pump Pedestal: Provide support pedestals for anchoring onto concrete supports as shown.
12. Provide cylindrical steel motor supports with welded base and end cap. Support shall allow for access to coupling and facilitate inspection.
13. Furnish with 125 pound ANSI connection flanges and handhole.
14. Anchor bolts and inserts shall be sized per the pump manufacturer's requirements. CONTRACTOR shall provide anchor bolts per the pump manufacturer's requirements and that comply with Section 05 05 33, Anchor Systems. Anchor bolts shall be installed in accordance with the manufacturer's recommendations and per 05 05 33.
15. All bolts, nuts and cap screws shall be constructed of Type 316 stainless steel and shall have hexagon heads.
16. Brass or stainless steel nameplates giving the manufacturer's model and serial number, rated capacity, head, speed and all other pertinent data shall be attached to the pump.

### B. Suction Elbow

1. Manufacturer shall provide an elbow directly connected to the suction connection of each pump.
2. The suction elbow shall provide a smooth laminar flow transition to the impeller eye such that suction flow will meet Hydraulic Institute acceptance criteria listed in HI 9.8.5.6 with respect to swirl angle and time averaged velocity at the impeller eye over the full range of specified flow conditions for the intended service and suction pipe configuration shown.
3. The suction elbow shall be configured such that the dimensions are compatible with the required elevations and dimensions of the dry pit in which the pumps are to be installed.
4. Flange connections on the elbow shall be ANSI 125 lb drilling and compatible with the pump suction connection.

5. The suction elbow shall contain a contoured hand hole cover to permit inspection and clean out of the impeller and suction passage.

C. Motors:

1. Motors shall conform to the requirements of Section 40 05 93, Common Motor Requirements for Process Equipment.
2. Vertical, drip-proof, TEFC, solid shaft, ball bearing type, rated for 480V, 60 Hz, 3 phase service, with maximum horsepower listed in 2.01.B, above.
3. Motors shall be in accordance with all current applicable standards of NEMA, IEEE, AFBMA, NEC, and ANSI.
4. Motors shall be normal starting torque, normal slip, squirrel cage induction type. Electric motors shall be driven by VFDs and shall be premium efficient and inverter duty type.
5. Motors shall be capable of carrying full load current continuously without injurious temperature rise in an ambient temperature of 40°C.
6. Motors shall be provided with a service factor of 1.15.
7. Motors shall be of sufficient size so that there will be no overload on the motor above rated nameplate horsepower under any condition of operation from shut-off to zero head, unless otherwise specifically permitted in this Section.
8. Motor thrust bearings shall be adequate to carry continuous thrust loads under all conditions of pump operation from zero head to shut-off.
9. Locked rotor currents shall be as specified in NEMA standards.
10. Provide thermistor type winding thermal protection for motors.
  - a. Thermistors embedded in each stator phase winding shall be in direct contact with the winding conductors. Each thermistor circuit shall be factory-wired to 120-volt solid-state control module provided by pump manufacturer and installed in the VFD enclosure. Control module contacts shall be automatic-reset type, rated 120 vac, five amps minimum, opening on excessive temperature. Provide normally-closed isolated contact for motor shutdown.
11. Lubrication may be grease or oil type.
12. Motor Tests and Data:
  - a. For each motor larger than ten horsepower, furnish a certified motor data sheet for the actual motor or for a previously manufactured electrically duplicate motor which was tested. Provide the following minimum data:
    - 1) Starting torque.
    - 2) Efficiency at 1/2, 3/4 and full load.
    - 3) Power factor at 1/2, 3/4 and full load.
    - 4) Percent slip.
    - 5) Running light, full load and locked rotor current.
    - 6) Current balance check.
    - 7) Vibration check.
    - 8) Temperature rises and results of dielectric tests.
    - 9) Motor type and frame size.
    - 10) Bearing type and lubrication medium.
    - 11) Insulation and enclosure type.
13. Job Motor Shop Tests:
  - a. Each motor shall be given a complete initial shop test. After receipt and approval of the initial shop test data at least one of each of the different motors of the various ratings and types shall be witness shop tested at the motor manufacturer's facility. The witness shop tests shall be performed in the presence of the OWNER, the ENGINEER, or both. If the tests indicate



unsatisfactory or questionable results, the ENGINEER may require that additional witness shop tests be performed on the other motor or motors of the same rating and type. The additional tests shall be performed at no additional cost to the OWNER. OWNER, ENGINEER, or both shall be permitted to witness them.

- b. Prior to scheduling witness shop tests, CONTRACTOR shall submit to the ENGINEER ten certified copies of the initial shop tests data for approval. Witness tests shall not be scheduled until receipt of this approval.
- c. Tests shall provide the following minimum information:
  - 1) Starting torque.
  - 2) Efficiency at 1/2, 3/4 and full load.
  - 3) Power factor at 1/2, 3/4 and full load.
  - 4) Percent slip.
  - 5) No load, running light, full load and locked rotor current.
  - 6) Current balance check.
  - 7) Test curves for current, voltage, brake horsepower and power factor.
  - 8) Full load heat run.
  - 9) Vibration check.
  - 10) No load sound pressure level in dB on the A weighted scale at five feet for motors with totally enclosed air to water cooled enclosures. Sound pressure levels shall be determined in accordance with the procedures of IEEE 85.
  - 11) Temperature rises and results of dielectric tests.
  - 12) Motor type and frame size.
  - 13) Bearing type and lubrication medium.
  - 14) Insulation and enclosure type.
- d. If the shop tests results indicate that a motor does not conform to specified or guaranteed performance, the motor shall be modified and retested, at no additional cost to the OWNER, until full compliance with specified and guaranteed performance can be demonstrated. OWNER and ENGINEER shall be permitted to witness the retest.
- e. The witness shop test shall be scheduled at the convenience of the OWNER. The date for the witness shop test shall be agreed upon in writing at least ten calendar days prior to the actual test date. The cost of lodging, meals and travel for the OWNER shall not be the CONTRACTOR'S responsibility. However, if the witness shop tests are not run on the date agreed upon because of the CONTRACTOR'S or his supplier's fault, the cost of the excess travel, lodging, meals, and time for the OWNER may be deducted from the money due the CONTRACTOR.
- f. Ten copies of certified test data covering each witness shop test shall be submitted to the ENGINEER for approval.
- g. No motor shall be shipped from the motor manufacturer's plant until all test data have been approved by the ENGINEER.

- D. Soleplate: Pump manufacturer shall design sole plates for the pump and the motor to:
  1. Span the openings shown on the Drawings;
  2. Anchor the pump to the supporting piers and anchor the motor and shafting assembly to the supporting structure;
  3. Support the static and dynamic loads of the pump, motor and attached appurtenances.
  4. Provide the motor sole plate with a central opening large enough to remove the

- coupling and any u-joints and shafting.
- 5. Drill and tap the motor sole plate for bolts to secure the pump motor stand to the sole plate.
- 6. Sole plate anchor bolts are to be sized and furnished by the pump manufacturer.
- 7. Material requirement: Painted steel.

## 2.04 Vertical Drive Shafting

- A. Vertical open drive steel shafting shall be provided between the motor and the pump. The required number of sections and the location of supports shall be as designed and recommended by shafting manufacturer, unless otherwise approved by the ENGINEER.
- B. Shafting shall be universal joint, suitably sized to transmit required driving torque, and shall conform to the following requirements:
  - 1. Suitable for 24-hour continuous duty at any speed within the range specified.
  - 2. Shafting shall not operate at or close to its critical speeds, and harmonics shall be avoided.
  - 3. Shafting shall be designed to transmit the full rated driver horsepower with a service factor of 1.5.
  - 4. Bearings shall have a minimum B-10 rating of 100,000 hours.
  - 5. Shafting shall be dynamically balanced.
  - 6. Intermediate support bearings shall be fastened to extra heavy structural steel members, or reinforced concrete, and as recommended by the manufacturer.
  - 7. Shaft system shall provide for the removal of the pump rotating element without disturbing connected equipment or the alignment of intermediate support bearings.
  - 8. CONTRACTOR shall furnish intermediate bearing supports where multiple shaft sections are required. Intermediate bearing supports shall be designed by a Professional Structural Engineer, licensed in the State of Tennessee. The structure shall be rigid in all planes, and the natural frequency of the bearing support shall be a minimum of four times the running speed forcing frequency.
- C. Rotating shafting shall be completely enclosed by OSHA approved guards where it is within 7 feet-6 inches of a floor or landing.
- D. Manufacturers: Provide products of one of the following:
  - 1. H.S. Watson Company.
  - 2. Thomas Division of Rexnord, Incorporated.
  - 3. Or equal.

## 2.05 Seal Water Station

- A. A seal water station shall be furnished for each pump, complete with all fittings, valves, gauges, switches, piping, and other accessories specified and required. Seal water stations shall be wall-mounted at each pump:
  - 1. Each seal water feeder line serving an individual pump shall contain the following components:
    - a. Seal Water Control and Monitoring Unit specifically designed for seal water control including the following features, Safematic Safeunit, manufactured by

John Crane Company, or approved equal. Select units in coordination with pump supplier's recommendation for water supply required and as appropriate for double mechanical seals provided with pump.

1. Flow rate indicator
2. Flow Regulating Valve
3. Pressure gauge
4. Push – to – clean feature
5. Maximum temperature range to be 170 F
6. Maximum Pressure Range to be 360 psi
7. Inductive Low flow alarm sensor with 120 volt output
8. Mounting bracket and all related hardware from manufacturer.
- b. Seal water Control and Monitoring Unit by pass with isolation and needle throttling valve.
- c. Pressure reducing valve with downstream pressure gauge.
- d. Provide a Solenoid Valve for each seal water station: ASCO 8210 Series, 1/2-inch npt, normally open, NBR seals, 120 volt, NEMA 4x rated, suitable for Class 1, Division 2, Group D area.
- e. Flow and pressure capacity for double mechanical seal: 0.25 gpm @ 15 psi above pump discharge.
3. Pipe shall be 1/2-inch Type 304 stainless steel tubing with soldered fittings. Unions and adapters as needed for npt connections.
4. Strainer: 1/2-inch npt with stainless steel screen 100 mesh with 1/2-inch npt cleanout ball valve with Teflon seats, seals, and washers.
5. Isolation Ball Valves: 1-inch npt cleanout ball valve with Teflon seats, seals, and washers.

## 2.06 Vibration and Temperature Monitoring System

- A. A vibration and temperature monitoring system shall be furnished for each pump supplied:
  1. Provide a vibration and temperature monitoring system for the pumps which shall utilize temperature and vibration monitoring and share a common enclosure for housing the electronics and touchscreen interface. The Vibration and Temperature Monitoring System enclosure shall be wall mounted, NEMA 12, with front access only.
  2. For each pump, furnish the temperature probes and vibration probes (both piezo-velocity sensors and proximity transducers), installed at the factory by the pump supplier. The complete listing of sensors is shown on Sheet I-04.
  3. Provide and install rack-configuration license and software on OWNER's computer. Use the OWNER's Configuration computer for training to operators.
  4. All tests of pumps shall be performed with Vibration and temperature System attached and online.
  5. The pump manufacturer shall mount the probes on the pumps and pull the leads to a terminal box located at the pump base. Contractor shall make the wiring connection at the terminal box.
- B. System Instrumentation:
  1. Temperature elements shall be 3-wire 100-Ohm Platinum RTDs. The cables for the RTDs shall be brought to terminal boxes outside of the motor windings/bearings and pump bearings. For each pump, provide the following RTDs:

- a. Motor Winding: Three (3) RTDs, one per phase winding
    - b. Motor Bearings: Two (2) RTDs, one per bearing
    - c. Pump Bearings: Two (2) RTDs, one per bearing
  - 2. Velomitor XA Piezo-velocity sensors use solid state accelerometers to detect horizontal vibration in the motor bearings. There shall be eight (8) installed per pump, two for each motor bearing and two each at the top and bottom bearings of the pump. Waterproof housing provided for the bottom bearing sensor to prevent from water, if submerged. The cables for the accelerometers shall be brought to terminal boxes. The accelerometers shall meet the following requirements:
    - a. Velocity Range: 50 in/s peak.
    - b. Sensitivity: 100 mV/in/s.
    - c. Operating Temperature Range: - 67 degrees F to 250 degrees F.
    - d. Material: 316L Stainless Steel.
    - e. Connector: 2-pin Mill-C-26482 hermetically sealed, 316 stainless steel shell.
  - 3. 3300 XL Proximity transducers consist of an 8mm probe, extension cable, and sensor module. Provide proximity transducers for for the pump axial position. Cables for the probes shall be brought to a terminal box housing the sensors and kept at a distance not to exceed a 5-meter length of matching probe and extension cable. The proximity transducers shall meet the following requirements:
    - a. Linear Range: 80 mil.
    - b. Incremental Scale Factor: 200 mV/mil.
    - c. Deviation: 1 mil when components 32 degrees F to 113 degrees F.
    - d. Probe Materials: Polyphenylene sulfide tip and 304 stainless steel case.
    - e. Probe Cable: 75 Ohm triaxial FEP insulated cable.
    - f. Extension Cable: 75 Ohm triaxial FEP insulated cable.
    - g. Sensor Material: A308 Aluminum.
- C. Enclosure:
- 1. The Vibration and Temperature Monitoring System enclosure shall be sized to house the following devices:
    - a. Enclosure shall accept a 120 Vac power feed and DIN-mounted double-pole circuit breakers shall be provided for each rack power supply.
    - b. Heating and air conditioning units for temperature control during extreme weather.
    - c. Three-point latches and key locks.
    - d. Fluorescent lamp with motion detector.
    - e. PVC wireway for routing cable.
    - f. DIN-mount terminal blocks for power, signals, and relays.
    - g. Print pocket.
    - h. Duplex power outlet.
    - i. Copper bus bars for earth and signal common.
  - 2. The rack-mounted electronics within the enclosure shall consist of a processor, power supplies, relay output module, communications module, RTD temperature input modules, accelerometer input modules, and proximity transducer input modules:
    - a. The rack mount of the system shall be a full size 19-inch rack and shall provide power and backplane communications to the remainder of the inserted modules. Rack shall be bulkhead mounted.
    - b. A dual power supply shall provide redundant power to the machinery protection system electronics. Each power supply shall be powered by 120 VAC. Individual power supplies can be removed and inserted as long as the

- other power supply is installed.
  - c. One Rack Interface Module provides the connections for programming and troubleshooting the modules connected to the rack. It can support 10/100 BaseT and continuously collects monitored data.
  - d. One 16-channel relay module shall be used to interlock with the pump VFDs. Each pump shall use 3 relays, and a voting system programmed into the module shall determine when the relay is tripped. Each pump shall have a high vibration, high bearing temperature, and high winding temperature relay output.
  - e. Six 4-channel proximity/seismic modules shall accept field inputs from proximity transducers and piezo-electric velocity sensors. Two modules shall be used for each pump.
  - f. Three 16-channel temperature modules shall be used for each pump's RTD sensors. Separate modules by pump.
3. The front face of the enclosure shall house a display which is a standard color monitor with touch screen technology to display the data of the Vibration and Temperature Monitoring System. The touchscreen displays the following information:
- a. System Event List.
  - b. Alarm Event List.
  - c. Module and Channel Data.
  - d. Rack View.
  - e. Current alarm data.
  - f. Customizable displays.

- D. Manufacturer and Model:
  - 1. GE Bently Nevada 3500 Machinery Protection System
  - 2. Or approved equal.

## 2.07 Controls and Accessories

- A. Instrumentation and Controls:
  - 1. Required instrumentation and controls shall be provided as described in 40 60 05, Instrumentation and Controls, and as shown.
- B. Local Control Stations:
  - 1. Contractor to provide local control stations for each pump furnished meeting the requirements of Section 26 29 33, Control Stations.

## 2.08 Tools and Spare Parts

- A. Each pump shall be furnished with the following:
  - 1. One mechanical seal.
  - 2. One set of gaskets.
  - 3. One shaft sleeve with keys, nuts, and o-rings.
  - 4. One impeller wear ring and fastener.
  - 5. One suction wear ring.
  - 6. One set of radial and thrust bearings.
  - 7. One Seal water Control and Monitoring Unit.
  - 8. Two sets of special tools required for normal maintenance or operation.
- B. Spare parts shall be packed in sturdy containers with clear indelible identification markings and shall be stored in a dry, warm location until transferred to the OWNER at the conclusion of the project.

## 2.09 Painting

- A. Pumps, motors, drives, frames, baseplates, appurtenances, etc., shall receive manufacturer's standard finish paint system prior to shipment.
- B. Machined, polished, and non-ferrous surfaces shall be coated with corrosion prevention compound.
- C. Field painting shall conform to the requirements of Section 09 91 00, Painting.

## 2.10 Source Quality Control

- A. Pump Shop Tests: Shop test each pump as follows:
  - 1. Hydrostatic Testing:
    - a. Hydrostatically test at twice the rated discharge head or 1.5 times pump shutoff head, whichever is greater.
    - b. Conduct all hydrostatic testing in accordance with Appendix B of ANSI/HI 14.6.
    - c. Hydrostatic testing is unwitnessed.

2. Hydraulic Performance Testing:
  - a. Pump shall be performance tested in the pump manufacturer's factory. Pump manufacturer shall provide all equipment and material required for performance test.
  - b. Furnish ENGINEER with proposed test procedure. Proposed test procedure shall set forth:
    - 1) Pump speeds at which performance test will be run.
    - 2) Sample calculations illustrating how the head/capacity performance curves at full speed will be calculated from test readings.
    - 3) Conversion factors or tables that relate test instrument readings to quantities being measured.
    - 4) Description of proposed testing facility, including diagrams of equipment and proposed test set-up and list of instruments to be used in test. All instruments shall be calibrated within one year prior to test. Provide certification of instrumentation calibration if requested by ENGINEER.
    - 5) Limitations of test stand and proposed deviations from ANSI/HI 14.6.
  - c. Preliminary Performance Tests:
    - 1) Each pump supplied is to receive an un-witnessed preliminary hydraulic test at the factory to verify the specified performance.
    - 2) Preliminary performance testing can be executed with a shop motor.
    - 3) The preliminary test results are to indicate that the pumps meet or exceed the specified performance conditions. If preliminary testing indicates that modifications are required to equipment or test facilities, all such modifications are to be carried out prior to the witnessed shop tests and revised performance testing.
    - 5) Submit the results of the preliminary performance test for review and approval prior to scheduling witnessed performance test.
  - d. Assemble the pump at the pump manufacturer's factory with shaft and driver for performance tests. Performance test shall be in accordance with ANSI/HI 14.6 and ANSI/HI 9.6.5.
  - e. For shop performance tests, operate pump for at least thirty minutes at rated condition before recording data.
  - f. Operate pump assembly from zero to maximum capacity as shown on pump curve included in approved Shop Drawing. Results of performance test shall be shown on a plot of test curves showing head, flow, brake horsepower, and efficiency. Readings shall be taken at a minimum of five evenly-spaced capacity points including shut-off, design points, and minimum head at which pump is designed to operate.
  - g. Guarantee Point is defined as: the first design point listed above in the pump performance criteria section.
  - h. Test Acceptance Grade per ANSI/HI 14.6: 1U
  - i. For variable speed pumps, run performance test at full load speed, and derive a family of curves from test data. Family of curves shall be for speeds from 40 to 100 percent of full load speed.
  - j. Each test shall be witnessed by a registered, licensed professional engineer who may be an employee of pump manufacturer. Registered professional engineer shall sign and seal all copies of test curves and certify that hydrostatic tests were performed. Professional engineer's certification shall show the state of the professional engineer's registration and registration number. Professional engineer's name on seal shall be legible.
3. Pumps shall not be shipped until the ENGINEER has approved the test reports.



## Part 3 Execution

### 3.01 Inspection

- A. CONTRACTOR shall verify that all structures, pipes, and equipment are compatible.
- B. Make adjustments required to place system in proper operating condition.

### 3.02 Installation

- A. Manufacturer's representative shall check and approve the installation prior to operation. Manufacturer's representative shall field test and calibrate the equipment to assure that the system operates to the OWNER'S satisfaction.
- B. All pumping units shall be installed on concrete bases and secured with anchor bolts in accordance with the manufacturer's recommendations and as shown. The concrete bases shall be poured up to 1-inch below the metal bases or soleplates. Concrete work and grout shall be in accordance with Division 03, Concrete. The base with the equipment mounted thereon, or the soleplate, shall then be accurately shimmed to grade and the spaces between filled with an approved non-shrink grout. After the grout has reached its initial set, exposed edges shall be cut back 1/2-inch and the edges neatly finished with 1 to 2 cement mortar. Where channel baseplates are used, the void inside the channel shall be filled with non-shrink grout and the open ends plastered with 1 to 2 cement mortar.
- C. Neatly placed 1-inch hard copper pipe shall be provided for each pump to convey leakage to nearest drainage inlet.
- D. Installation shall include furnishing and applying an initial supply of grease and oil, recommended by the manufacturer.
- E. Support piping independent of pump.
- F. Check and align all pump, motor and flexible shafting.
- G. Manufacturer is responsible for transducer installation and running probe curves on new probes.

### 3.03 Start-up and Test

- A. CONTRACTOR shall verify that structures, pipes and equipment are compatible.
- B. Make adjustments required to place system in proper operating condition.

### 3.04 Field Quality Control

- A. All equipment will be given running tests by CONTRACTOR at the job Site following installation of the equipment and controls, including the seal water stations and vibration and temperature monitoring systems. Should the tests indicate any malfunction, CONTRACTOR shall make any necessary repairs and adjustments. Such tests and adjustments shall be repeated until, in the opinion of the ENGINEER, the installation is complete and the equipment is functioning properly and accurately, and is ready for permanent operation.
- B. A factory trained representative shall be provided for installation supervision, start-up and test services and operation and maintenance personnel training services. The representative shall make a minimum of three visits, minimum 8 hours on-Site for each visit, to the Site. The first visit shall be for assistance in the installation of equipment. Subsequent visits shall be for checking the completed installation, start-up and training of the system. Manufacturer's representative shall test operate the system in the presence of the ENGINEER and verify that the equipment conforms to the requirements. Representative shall revisit the Site as often as necessary until all trouble is corrected and the installation is entirely satisfactory.
- C. All costs, including travel, lodging, meals and incidentals, shall be considered as included in CONTRACTOR'S bid price.

END OF SECTION

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