CLARKSBURG WATER BOARD
HARRISON COUNTY, WEST VIRGINIA

HIGH SERVICE PUMPS VARIABLE FREQUENCY DRIVES

ADDENDUM #2

JANUARY 13, 2022

THRASHER PROJECT #101-010-10174.00

TO WHOM IT MAY CONCERN:
The following are clarifications and responses to written questions received to date.

A. GENERAL

1. THE BID OPENING TIME AND DATE HAS BEEN CHANGED UNTIL 2:00 PM, LOCAL PREVAILING TIME, ON THURSDAY, FEBRUARY 17, 2022.

2. TWO (2) SEPARATE BIDS WILL BE RECEIVED,

   A. BID PACKAGE 1 - BIDS WILL BE RECEIVED FROM GENERAL CONTRACTORS FOR ALL LABOR, MATERIALS, AND EQUIPMENT (EXCEPT FOR THE VARIABLE FREQUENCY DRIVE EQUIPMENT) ON A LUMP SUM, BASIS. A REVISED BID FORM FOR THIS BID IS ATTACHED AND MUST BE USED. REVISED BID OPENING REQUIREMENTS ARE ALSO ATTACHED AND MUST BE USED.

   B. BID PACKAGE 2 - SEPARATE BIDS FROM VENDORS FOR FURNISHING AND DELIVERY OF THE VARIABLE FREQUENCY DRIVE EQUIPMENT TO THE LARGE OVERHEAD DOOR IN THE PUMP ROOM WILL BE RECEIVED ON A LUMP SUM BASIS. A SEPARATE BID FORM FOR THIS BID IS ATTACHED. IT MUST BE USED BY VENDORS BIDDNG THE VARIABLE FREQUENCY DRIVE EQUIPMENT. BID OPENING REQUIREMENTS (BOR) FOR THIS BID PACKAGE ARE ALSO ATTACHED AND MUST BE USED.

B. SPECIFICATIONS

1. SECTION 262923 "VARIABLE-FREQUENCY MOTOR CONTROLLERS" IS FOR INFORMATION ONLY FOR GENERAL CONTRACTORS BIDDNG THE ALL LABOR AND MATERIALS (EXCEPT FOR THE VARIABLE FREQUENCY DRIVE EQUIPMENT) UNDER BID PACKAGE 1

2. SECTION 262923 "VARIABLE-FREQUENCY MOTOR CONTROLLERS" IS PROVIDED FOR ALL VENDORS BIDDING THE VARIABLE FREQUENCY DRIVE EQUIPMENT UNDER BID PACKAGE 2.

C. DRAWINGS

PLEASE SEE THE ATTACHED REVISED DRAWINGS AND ADDITIONAL DRAWINGS.

ADDITIONAL DRAWINGS C1 AND C2 SHOW WORK REQUIRED TO REMOVE THE EXISTING DOOR, FRAME, LINTEL, AND CONCRETE MASONARY UNITS (CMU) AND REPLACE WITH A NEW, LARGER DOOR AND FRAME, LINTEL AND CMU. THIS WORK WILL BE PART OF BID PACKAGE 1.

D. QUESTIONS AND RESPONSES

Specification Page 260010 - 15 & 16

QUESTION 1
Section 2.7 Closeout Activities A.1.b. has reference to Specification Section 260573.16 "Coordination Studies" this does not exist in the specifications provided for this project. Is a coordination study needed? If so, provide spec.

RESPONSE
A coordination study is not required.

QUESTION 2
Section 2.7 Closeout Activities A.1.c. has reference to Specification Section 260573.19 "Arc Flash Hazard Analysis" this does not exist in the specifications provided for this project. Is an arc-flash hazard analysis needed? If so, provide spec.

RESPONSE
An arc-flash hazard analysis is not required.

QUESTION 3
Section 2.7 Closeout Activities A.1.d. has reference to Specification Section 260913 "Electrical Power Monitoring" this does not exist in the specifications provided for this project. Is electrical power monitoring needed? If so, provide spec.

RESPONSE
Electrical power monitoring is not required.

QUESTION 4
Section 2.7 Closeout Activities A.1.e. has reference to Specification Section 261116.13 "Secondary Unit Substations with Motor Control Center Secondary" this does not exist in the specifications provided for this project. Are secondary unit substations with motor control center secondary needed? If so, provide specs.

RESPONSE
Secondary unit substations are not required.

Specification Section 260011

QUESTION 5
This specification appears incomplete.

RESPONSE
Specification Section 260011 is not required.

Specification Section 260513

QUESTION 6
Page 2 Section 2.2. Cables A. The link bares no results.

RESPONSE
A list of available manufacturers has been added.

QUESTION 7
Page 2 Section 2.3. Connectors A. The link bares no results.

RESPONSE
A list of available manufacturers has been added.

QUESTION 8
Page 2 Section 2.4. Solid Terminations A. The link bares no results.

RESPONSE
A list of available manufacturers has been added.

QUESTION 9

Page 4 Section 2.5 Separable Insulated Connectors I. this lists a tool set, is this to be furnished for owner?

RESPONSE
A tool set is not required.

QUESTION 10
Page 4 Section 2.7. Medium Voltage Tapes B. The link bares no results.

RESPONSE
A list of available manufacturers has been added.

Specification Section 262923-4

QUESTION 11
Section 2.2 System Description J.2. has reference to Specification Section 264313 "Surge Protection for Low Electrical Power Circuits" this does not exist in the specifications provided for this project. If needed, provide spec.

RESPONSE
Surge protection for low electrical power circuits is not required.

Page E3
QUESTION 12
Please provide specifications on 5KV Bus Cabinet. What type of medium voltage termination is needed to connect to disconnect?

RESPONSE
We do not have specifications on the 5KV Bus Cabinet. An appointment will need to be arranged at a time when the system is not in operation in order to obtain internal details of the cabinets.

QUESTION 13
Please provide conduit specification.

RESPONSE
The conduit specs have been added.

QUESTION 14
Please provide one line diagram.

RESPONSE
The detailed information was not attained to derive a one line diagram. This information will need to be attained by an appointment to have access to the cabinets while the pumps are not in service.

QUESTION 15

Note J – Is each 2 ½" conduit supposed to have (3) #2/0 conductors and (1) #6 ground? Please clarify.

RESPONSE
Each 2 ½" conduit "J" shall contain (6) 2/0 conductors and (2) #6 grounds. One conduit "J" is for supply power from the existing disconnect CB to the new VFD. The second conduit "J" is for motor lead from the new VFD to the existing motor leads.

QUESTION 16
Note M – Where is disconnect located and what is the amperage of fuses? What type of medium voltage termination is needed to connect to disconnect?

RESPONSE
This information can not be obtained without opening the cabinet doors. An appointment needs to be made to derive the information while the pumps are not in service.

QUESTION 17
Regarding Instruction to Bidders Page 9 1. Article 24 - Do Davis Bacon wages apply or any other wage rate requirement?

RESPONSE
Neither Federal Davis Wage Rates or State Wage Rates (no longer applicable) apply.

E. CLARIFICATIONS

It is anticipated that delivery of the VFD's may take up to ten (10) months after submittal review based on current market conditions. Bidders on Bid Package 1 shall account for this anticipated delivery time in their Bids,

Sincerely,

THE THRASHER GROUP, INC.

Ken Smith

Ken Smith, PE

Enclosures: Revised Bid Opening Requirements and Bid Form for Bid Package 1
New Bid Opening Requirements and Bid Form for Bid Package 2
Revised Drawings E1, E2 and E3 for Bid Package 1
Additional Drawings E5, C1 and C2 for Bid Package 1
Revised Specification Sections 260513 and 262923 for Bid Package 1
Additional Specification Section 260533 for Bid Package 1

PROPOSED BID PACKAGE #1
HIGH SERVICE PUMPS VARIABLE FREQUENCY DRIVES
(EXCEPT FOR VARIABLE FREQUENCY DRIVE EQUIPMENT)
FOR THE
CLARKSBURG WATER BOARD
HARRISON COUNTY, WEST VIRGINIA
THRASHER PROJECT #010-10174

A two envelope system will be used. Envelope No. 1 will be opened first and the Bid Opening Requirement items checked for compliance, as outlined on this page. If such documents are found to be in order, sealed Envelope No. 2 "Bid Proposal", which shall also be placed inside of Envelope #1, will then be opened and will be publicly read aloud. If the documents required to be contained in Envelope No. 1 are not in order, Envelope No. 2 "Bid Proposal" will not be opened and the Bid will be considered non-responsive and will be returned to the Bidder. At that time, the Owner will declare the Bidder non-responsive

BID OPENING REQUIREMENT CHECKLIST

Item		**Completed Satisfactory (Check if completed)**
1.	Bid submitted on time	_____
2.	Bid Bond (Sample BOR-2 & 3)	_____
3.	Certification of receipt of all addenda to Plans and Specifications. (BOR-4)	_____
4.	West Virginia Code §21-1D-5 Drug Free Workplace Conformance Affidavit (BOR-5 & 6)	_____
5.	Copy of Contractor's License included.	_____

BID BOND

Any singular reference to Bidder, Surety, Owner or other party shall be considered plural where applicable.

BIDDER *(Name and Address)*:

SURETY *(Name, and Address of Principal Place of Business)*:

OWNER *(Name and Address)*:
Clarksburg Water Board
1001 South Chestnut Street
Clarksburg, WV 26301

BID
Bid Due Date:
Description *(Project Name— Include Location)*: High Frequency Pumps Variable Frequency Drives (Except for Variable Frequency Drive Equipment)

BOND
Bond Number:
Date:
Penal sum _____ $ _____
(Words) (Figures)

Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.

BIDDER	**SURETY**
_____ (Seal)	_____ (Seal)
Bidder's Name and Corporate Seal	Surety's Name and Corporate Seal
By: _____	By: _____
Signature	Signature (Attach Power of Attorney)
_____	_____
Print Name	Print Name
_____	_____
Title	Title
Attest: _____	Attest: _____
Signature	Signature
Title	Title

Note: Addresses are to be used for giving any required notice.
Provide execution by any additional parties, such as joint venturers, if necessary.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal

sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond shall be Owner's sole and exclusive remedy upon default of Bidder.

2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.

3. This obligation shall be null and void if:

3.1 Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or

3.2 All Bids are rejected by Owner, or

3.3 Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).

4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.

5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.

6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after the Bid due date.

7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.

8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.

9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.

10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

PROPOSED BID PACKAGE #1
HIGH SERVICE PUMPS VARIABLE FREQUENCY DRIVES
(EXCEPT FOR VARIABLE FREQUENCY DRIVE EQUIPMENT)

FOR THE

CLARKSBURG WATER BOARD
HARRISON COUNTY, WEST VIRGINIA

Certification of Receipt of Addenda

In submitting this Bid, Bidder represents, as more fully set forth in the Agreement, that:

(a) Bidder has examined copies of all the Contract Documents and the following addenda:

Date	Number

_____
Signature Date

_____
Name and Title of Signer
(Please Type)

To Be Submitted in Envelope No. 1
Item No. 3 on Checklist

CLARKSBURG WATER BOARD
HARRISON COUNTY, WEST VIRGINIA
PROPOSED
HIGH SERVICE PUMPS VARIABLE FREQUENCY DRIVES
THRASHER PROJECT #010-10174

BID FORM
BID PACKAGE #1 (GENERAL CONTRACTOR)
(All Labor, Materials and Equipment Except for the Variable Frequency Drive Equipment)

ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to:

Clarksburg Water Board
1001 South Chestnut Street
Clarksburg, WV 26301

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

ARTICLE 2 – BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 90 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 – BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, and any data and reference items identified in the Bidding Documents, and hereby acknowledges receipt of the following Addenda:

Addendum No.	Addendum Date
_____	_____
_____	_____
_____	_____

B. Bidder has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfied itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

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

D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface

structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.

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

F. Bidder agrees, based on the information and observations referred to in the preceding paragraph, that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.

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

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

I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work.

J. The submission of this Bid constitutes an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, and that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 Bidder certifies that:

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

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

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

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

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

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

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

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

ARTICLE 5 – BASIS OF BID

GENERAL

The Bidder shall take notice of and shall be responsible for any local or state taxes levied and applicable, and the cost for the same shall be included as part of the submitted Bid.

The total Bid cost stated includes a complete operating installation including furnishing and installation of any and all changes or additions in plans, piping, mechanical work, additional electrical work, accessories, controls, etc. necessary to accommodate alternative equipment systems or materials used in construction.

BID PROPOSAL

The Bidder agrees to perform all required Work described in the detailed Specifications and as shown on the Plans for the complete construction and placing in satisfactory operation the High Service Pumps Variable Frequency Drives. The Project "Sequence of Construction" has been detailed in the Drawings and Specification Division 1, Project Summary, Section 011000. The Bidder agrees to perform all the Work proposed for the total of the following Bid prices.

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

PROPOSED BID PACKAGE #1
HIGH SERVICE PUMPS VARIABLE FREQUENCY DRIVES
(EXCEPT FOR VARIABLE FREQUENCY DRIVE EQUIPMENT)

FOR THE

CLARKSBURG WATER BOARD
HARRISON COUNTY, WEST VIRGINIA

THRASHER PROJECT #010-10174

BID SCHEDULE – BID PACKAGE #1

(GENERAL CONTRACTOR)

NOTE: Bid Unit PRICE amounts are to be shown in both words and figures. In case of discrepancy, the amount shown in words will govern. Bids shall include sales tax and all other applicable taxes and fees.

Item	Quantity	Description with Unit Price Written	Unit Price	Total Price
1	LS	High Service Pumps Variable Frequency Drives (All Labor, Materials and Equipment Except for the Variable Frequency Drive Equipment)		
		_____ Dollars		
		_____ Cents	_____	_____

TOTAL LUMP SUM BID: _____

($)

(Amounts are to be shown in both words and figures. In case of discrepancy, the amount shown in words will govern.)

NOTE: THE CONTRACTOR'S UNIT PRICES SHALL INCLUDE PURCHASE AND INSTALLATION, COMPLETE IN PLACE, PER BID ITEM IN ACCORDANCE WITH THE DETAILED SPECIFICATIONS.

Bidder acknowledges that (1) each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and (2) estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all unit price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

METHOD OF AWARD

If at the time this contract is to be awarded, the lowest total bid submitted by a qualified, responsive, responsible Bidder does not exceed the amount of funds then estimated by the Owner, as available to finance the contract, the construction contract will be awarded. If such bids exceed such amount, the Owner may reject all bids.

The owner may award the contract on the Total Bid submitted by a qualified responsible Bidder less the amount(s) of the Deductive Alternate(s) subtracted in numerical order, as listed in the contract to produce the lowest bid within the funds available for financing.

A. Unit prices have been computed in accordance with paragraph 13.03.A of the General Conditions.

B. Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

ARTICLE 6 – TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

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

ARTICLE 7 – ATTACHMENTS TO THIS BID

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

A. Bid Opening Requirements

ARTICLE 8 – DEFINED TERMS

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

ARTICLE 9 – BID SUBMITTAL

BIDDER: *[Indicate correct name of bidding entity]*

_____

By:
[Signature] _____

[Printed name] _____
(If Bidder is a corporation, a limited liability company, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest:
[Signature] _____

[Printed name] _____

Title: _____

Submittal Date: _____

Address for giving notices:

_____

_____

_____

Telephone Number: _____

Fax Number: _____

Contact Name and e-mail address: _____

_____

Bidder's License No.: _____
(where applicable)

NOTE TO USER: Use in those states or other jurisdictions where applicable or required.

PROPOSED VENDOR BID PACKAGE #2
HIGH SERVICE PUMPS VARIABLE FREQUENCY DRIVES
(VARIABLE FREQUENCY DRIVE EQUIPMENT)
FOR THE
CLARKSBURG WATER BOARD
HARRISON COUNTY, WEST VIRGINIA
THRASHER PROJECT #010-10174

A two envelope system will be used. Envelope No. 1 will be opened first and the Bid Opening Requirement items checked for compliance, as outlined on this page. If such documents are found to be in order, sealed Envelope No. 2 "Bid Proposal", which shall also be placed inside of Envelope #1, will then be opened and will be publicly read aloud. If the documents required to be contained in Envelope No. 1 are not in order, Envelope No. 2 "Bid Proposal" will not be opened and the Bid will be considered non-responsive and will be returned to the Bidder. At that time, the Owner will declare the Bidder non-responsive

BID OPENING REQUIREMENT CHECKLIST

Item		**Completed Satisfactory (Check if completed)**
1.	Bid submitted on time	_____
2.	Bid Bond (Sample BOR-2 & 3)	_____
3.	Certification of receipt of all addenda to Plans and Specifications. (BOR-4)	_____

BID BOND

Any singular reference to Bidder, Surety, Owner or other party shall be considered plural where applicable.

BIDDER *(Name and Address)*:

SURETY *(Name, and Address of Principal Place of Business)*:

OWNER *(Name and Address)*:
Clarksburg Water Board
1001 South Chestnut Street
Clarksburg, WV 26301

BID
Bid Due Date:
Description *(Project Name— Include Location)*: High Frequency Pumps Variable Frequency Drives (Variable Frequency Drive Equipment)

BOND
Bond Number:
Date:
Penal sum _____ $ _____
(Words) (Figures)

Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.

BIDDER	**SURETY**
_____ (Seal)	_____ (Seal)
Bidder's Name and Corporate Seal	Surety's Name and Corporate Seal
By: _____	By: _____
Signature	Signature (Attach Power of Attorney)
_____	_____
Print Name	Print Name
_____	_____
Title	Title
Attest: _____	Attest: _____
Signature	Signature
Title	Title

Note: Addresses are to be used for giving any required notice.
Provide execution by any additional parties, such as joint venturers, if necessary.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal

sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond shall be Owner's sole and exclusive remedy upon default of Bidder.

2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.

3. This obligation shall be null and void if:

3.1 Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or

3.2 All Bids are rejected by Owner, or

3.3 Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).

4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.

5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.

6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after the Bid due date.

7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.

8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.

9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.

10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

PROPOSED VENDOR BID PACKAGE #2
HIGH SERVICE PUMPS VARIABLE FREQUENCY DRIVES
(VARIABLE FREQUENCY DRIVE EQUIPMENT)

FOR THE

CLARKSBURG WATER BOARD
HARRISON COUNTY, WEST VIRGINIA

Certification of Receipt of Addenda

In submitting this Bid, Bidder represents, as more fully set forth in the Agreement, that:

(a) Bidder has examined copies of all the Contract Documents and the following addenda:

Date	Number

_____
Signature Date

_____
Name and Title of Signer
(Please Type)

To Be Submitted in Envelope No. 1
Item No. 3 on Checklist

CLARKSBURG WATER BOARD
HARRISON COUNTY, WEST VIRGINIA
PROPOSED
HIGH SERVICE PUMPS VARIABLE FREQUENCY DRIVES
THRASHER PROJECT #010-10174

BID FORM
BID PACKAGE #2 (VENDOR)
(Furnishing and Delivery of the Variable Frequency Drive Equipment to the Large Overhead Door in the Pump Room)

ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to:

Clarksburg Water Board
1001 South Chestnut Street
Clarksburg, WV 26301

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

ARTICLE 2 – BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 90 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 – BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, and any data and reference items identified in the Bidding Documents, and hereby acknowledges receipt of the following Addenda:

Addendum No.	Addendum Date
_____	_____
_____	_____
_____	_____

B. Bidder has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfied itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

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

D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.

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

F. Bidder agrees, based on the information and observations referred to in the preceding paragraph, that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.

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

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

I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work.

J. The submission of this Bid constitutes an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, and that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 Bidder certifies that:

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

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

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

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

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

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

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

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

ARTICLE 5 – BASIS OF BID

GENERAL

The Bidder shall take notice of and shall be responsible for any local or state taxes levied and applicable, and the cost for the same shall be included as part of the submitted Bid.

The total Bid cost stated includes a complete operating installation including furnishing and installation of any and all changes or additions in plans, piping, mechanical work, additional electrical work, accessories, controls, etc. necessary to accommodate alternative equipment systems or materials used in construction.

BID PROPOSAL

The Bidder agrees to perform all required Work described in the detailed Specifications and as shown on the Plans for the complete construction and placing in satisfactory operation the High Service Pumps Variable Frequency Drives. The Project "Sequence of Construction" has been detailed in the Drawings and Specification Division 1, Project Summary, Section 011000. The Bidder agrees to perform all the Work proposed for the total of the following Bid prices.

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

PROPOSED VENDOR BID PACKAGE #2
HIGH SERVICE PUMPS VARIABLE FREQUENCY DRIVES
(VARIABLE FREQUENCY DRIVE EQUIPMENT)

FOR THE

CLARKSBURG WATER BOARD
HARRISON COUNTY, WEST VIRGINIA

THRASHER PROJECT #010-10174

BID SCHEDULE – BID PACKAGE #2
(VENDOR)

NOTE: Bid Unit PRICE amounts are to be shown in both words and figures. In case of discrepancy, the amount shown in words will govern. Bids shall include sales tax and all other applicable taxes and fees.

Item	Quantity	Description with Unit Price Written	Unit Price	Total Price
1	LS	High Service Pumps Variable Frequency Drive (Furnishing and Delivery of the Variable Frequency Drive Equipment to the Large Overhead Door in the Pump Room) _____ Dollars _____ Cents	_____	_____

TOTAL LUMP SUM BID: _____

($)

(Amounts are to be shown in both words and figures. In case of discrepancy, the amount shown in words will govern.)

NOTE: THE CONTRACTOR'S UNIT PRICES SHALL INCLUDE PURCHASE AND INSTALLATION, COMPLETE IN PLACE, PER BID ITEM IN ACCORDANCE WITH THE DETAILED SPECIFICATIONS.

Bidder acknowledges that (1) each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and (2) estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all unit price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

METHOD OF AWARD

If at the time this contract is to be awarded, the lowest total bid submitted by a qualified, responsive, responsible Bidder does not exceed the amount of funds then estimated by the Owner, as available to finance the contract, the construction contract will be awarded. If such bids exceed such amount, the Owner may reject all bids.

The owner may award the contract on the Total Bid submitted by a qualified responsible Bidder less the amount(s) of the Deductive Alternate(s) subtracted in numerical order, as listed in the contract to produce the lowest bid within the funds available for financing.

A. Unit prices have been computed in accordance with paragraph 13.03.A of the General Conditions.

B. Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

ARTICLE 6 – TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

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

ARTICLE 7 – ATTACHMENTS TO THIS BID

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

A. Bid Opening Requirements

ARTICLE 8 – DEFINED TERMS

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

ARTICLE 9 – BID SUBMITTAL

BIDDER: *[Indicate correct name of bidding entity]*

_____

By:
[Signature] _____

[Printed name] _____
(If Bidder is a corporation, a limited liability company, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest:
[Signature] _____

[Printed name] _____

Title: _____

Submittal Date: _____

Address for giving notices:

_____

_____

_____

Telephone Number: _____

Fax Number: _____

Contact Name and e-mail address: _____

_____

Bidder's License No.: _____
(where applicable)

NOTE TO USER: Use in those states or other jurisdictions where applicable or required.

SECTION 260513 - MEDIUM-VOLTAGE CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cables.
2. Connectors.
3. Solid terminations.
4. Separable insulated connectors.
5. Splice kits.
6. Medium-voltage tapes.
7. Arc-proofing materials.
8. Fault indicators.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of cable. Include splices and terminations for cables and cable accessories.

B. Samples: 16 inch (400 mm) lengths for each type of cable specified.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with IEEE C2 and NFPA 70.

C. Source Limitations: Obtain cables and accessories from single source from single manufacturer.

2.2 CABLES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. General Cable; Prysmian Group North America.
2. Hendrix Wire and Cable; Marmon Holdings, Inc.; Berkshire Hathaway Inc.
3. Prysmian Cables and Systems; Prysmian Group North America.
4. Southwire Company, LLC.

B. Cable Type: Type MV 90.

C. Conductor Insulation: Crosslinked polyethylene or Ethylene-propylene rubber.

1. Voltage Rating: 5 kV.
2. Insulation Thickness: 100 percent insulation level.

D. Conductor: Copper.

E. Comply with UL 1072, AEIC CS8, ICEA S-93-639/NEMA WC 74, and ICEA S-97-682.

F. Conductor Stranding: Compact round, concentric lay, Class B.

G. Strand Filling: Conductor interstices are filled with impermeable compound.

H. Shielding: Solid copper wires, helically applied over semiconducting insulation shield.

I. Shielding and Jacket: Corrugated copper drain wires embedded in extruded, chlorinated, polyethylene jacket.

J. Cable Jacket: Sunlight-resistant PVC.

2.3 CONNECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. 3M.
2. ABB, Electrification Business.
3. Eaton.
4. G&W Electric Company.

B. Comply with ANSI C119.4 for connectors between aluminum conductors or for connections between aluminum to copper conductors.

C. Copper-Conductor Connectors: Copper barrel crimped connectors.

2.4 SOLID TERMINATIONS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. 3M.
2. ABB, Electrification Business.
3. G&W Electric Company.
4. Shawflex; Shawcor Ltd.

B. Multiconductor Cable Sheath Seals: Type recommended by seal manufacturer for type of cable and installation conditions, including orientation.
1. Heat-shrink sheath seal kit with phase- and ground-conductor rejacketing tubes, cable-end sealing boot, and sealing plugs for unused ground-wire openings in boot.

C. Shielded-Cable Terminations: Comply with the following classes of IEEE 48. Insulation class shall be equivalent to that of cable. Include shield ground strap for shielded cable terminations.

1. Class 1 Terminations: Modular type, furnished as a kit, with stress-relief tube; multiple, molded-silicone-rubber, insulator modules; shield ground strap; and compression-type connector.
2. Class 2 Terminations, Indoors: Kit with stress-relief tube, nontracking insulator tube, shield ground strap, and compression-type connector. Include cold-shrink-rubber sleeve moisture seal for end of insulation whether or not supplied with kits.

2.5 SEPARABLE INSULATED CONNECTORS

A. Description: Modular system with disconnecting, single-pole, cable terminators and with matching, stationary, plug-in, dead-front terminals designed for cable voltage and for sealing against moisture.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. ABB, Electrification Business.
2. Eaton.
3. Richards Manufacturing Co.

C. Standard: Comply with IEEE 386.

D. Terminations at Distribution Points: Modular type, consisting of terminators installed on cables and modular, dead-front, terminal junctions for interconnecting cables.

E. Load-Break Cable Terminators: Elbow-type units with 200 A load make/break and continuous-current rating; coordinated with insulation diameter, conductor size, and material of cable being terminated. Include test point on terminator body that is capacitance coupled.

F. Dead-Break Cable Terminators: Elbow-type unit with 200 A continuous-current rating; designed for de-energized disconnecting and connecting; coordinated with insulation diameter,

conductor size, and material of cable being terminated. Include test point on terminator body that is capacitance coupled.

G. Dead-Front Terminal Junctions: Modular bracket-mounted groups of dead-front stationary terminals that mate and match with above cable terminators. Two-, three-, or four-terminal units as indicated, with fully rated, insulated, watertight conductor connection between terminals and complete with grounding lug, manufacturer's standard accessory stands, stainless steel mounting brackets, and attaching hardware.

1. Protective Cap: Insulating, electrostatic-shielding, water-sealing cap with drain wire.
2. Portable Feed-Through Accessory: Two-terminal, dead-front junction arranged for removable mounting on accessory stand of stationary terminal junction.
3. Grounding Kit: Jumpered elbows, portable feed-through accessory units, protective caps, test rods suitable for concurrently grounding three phases of feeders, and carrying case.
4. Standoff Insulator: Portable, single dead-front terminal for removable mounting on accessory stand of stationary terminal junction. Insulators suitable for fully insulated isolation of energized cable-elbow terminator.

H. Test-Point Fault Indicators: Applicable current-trip ratings and arranged for installation in test points of load-break separable connectors, and complete with self-resetting indicators capable of being installed with shotgun hot stick and tested with test tool.

I. Tool Set: Shotgun hot stick with energized terminal indicator, fault-indicator test tool, and carrying case.

2.6 SPLICE KITS

A. Description: For splicing medium voltage cables; type as recommended by cable or splicing kit manufacturer for the application.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. 3M.
2. ABB, Electrification Business.
3. DSG-Canusa; Shawcor Ltd.
4. Eaton.
5. TE Connectivity Ltd.

C. Standard: Comply with IEEE 404.

D. Splicing Products: As recommended, in writing, by splicing kit manufacturer for specific sizes, materials, ratings, and configurations of cable conductors. Include all components required for complete splice, with detailed instructions.

2.7 MEDIUM-VOLTAGE TAPES

A. Description: Electrical grade, insulating tape for medium voltage application.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. 3M.
2. HellermannTyton.
3. Scapa Industrial: Scapa Group plc.

C. Ethylene/propylene rubber-based, 30 mil (0.76 mm) splicing tape, rated for 130 deg C operation. Minimum 3/4 inch (20 mm) wide.

D. Silicone rubber-based, 12 mil (0.30 mm) self-fusing tape, rated for 130 deg C operation. Minimum 1-1/2 inch (38 mm) wide.

E. Insulating-putty, 125 mil (3.175 mm) elastic filler tape. Minimum 1-1/2 inches (38 mm) wide.

2.8 SOURCE QUALITY CONTROL

A. Test and inspect cables according to ICEA S-97-682 before shipping.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cables according to IEEE 576.

B. Proof conduits prior to conductor installation by passing a wire brush mandrel and then a rubber duct swab through the conduit. Separate the wire brush and the rubber swab by 48 to 72 inch (1200 to 1800 mm) on the pull rope.

1. Wire Brush Mandrel: Consists of a length of brush approximately the size of the conduit inner diameter with stiff steel bristles and an eye on each end for attaching the pull ropes. If an obstruction is felt, pull the brush back and forth repeatedly to break up the obstruction.
2. Rubber Duct Swab: Consists of a series of rubber discs approximately the size of the conduit inner diameter on a length of steel cable with an eye on each end for attaching the pull ropes. Pull the rubber duct swab through the duct to extract loose debris from the duct.

C. Pull Conductors: Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

1. Where necessary, use manufacturer-approved pulling compound or lubricant that does not deteriorate conductor or insulation.
2. Use pulling means, including fish tape, cable, rope, and basket-weave cable grips, that do not damage cables and raceways. Do not use rope hitches for pulling attachment to cable.

3. Use pull-in guides, cable feeders, and draw-in protectors as required to protect cables during installation.
4. Do not pull cables with ends unsealed. Seal cable ends with rubber tape.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.

E. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

F. Install sufficient cable length to remove cable ends under pulling grips. Remove length of conductor damaged during pulling.

G. Install cable splices at pull points and elsewhere as indicated; use standard kits.

H. Install terminations at ends of conductors, and seal multiconductor cable ends with standard kits.

I. Install separable insulated-connector components as follows:

1. Protective Cap: At each terminal junction, with one on each terminal to which no feeder is indicated to be connected.
2. Portable Feed-Through Accessory: At each terminal junction, with one on each terminal.
3. Standoff Insulator: At each terminal junction, with one on each terminal.

J. Seal around cables passing through fire-rated elements according to Section 078413 "Penetration Firestopping."

K. Ground shields of shielded cable at terminations, splices, and separable insulated connectors. Ground metal bodies of terminators, splices, cable and separable insulated-connector fittings, and hardware.

L. Ground shields of shielded cable at one point only. Maintain shield continuity and connections to metal connection hardware at all connection points.

M. Identify cables according to Section 260553 "Identification for Electrical Systems." Identify phase and circuit number of each conductor at each splice, termination, pull point, and junction box. Arrange identification so that it is unnecessary to move the cable or conductor to read the identification.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters.
2. After installing medium-voltage cables and before electrical circuitry has been energized, test for compliance with requirements.
3. Perform Partial Discharge test of each new conductor according to NETA ATS, Ch. 7.3.3 and to test equipment manufacturer's recommendations.

4. Perform Dissipation Factor test of each new conductor according to NETA ATS, Ch. 7.3.3 and to test equipment manufacturer's recommendations.

B. Prepare test and inspection reports.

END OF SECTION 260513

SECTION 262923 - VARIABLE-FREQUENCY MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes separately enclosed, preassembled, combination VFCs, rated 5KV and less, for speed control of three-phase, squirrel-cage induction motors.

1.2 DEFINITIONS

A. CE: Conformite Europeene (European Compliance).

B. CPT: Control power transformer.

C. DDC: Direct digital control.

D. EMI: Electromagnetic interference.

E. OCPD: Overcurrent protective device.

F. PID: Control action, proportional plus integral plus derivative.

G. RFI: Radio-frequency interference.

H. VFC: Variable-frequency motor controller.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and rating of VFC indicated.

B. Shop Drawings: For each VFC indicated.

1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Seismic Qualification Data: Certificates, for each VFC, accessories, and components, from manufacturer.

1. Certificate of compliance.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based, and their installation requirements.

C. Product certificates.

D. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace VFCs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Eaton

B. AB Rockwell Automation Power Flex

2.2 SYSTEM DESCRIPTION

A. General Requirements for VFCs:

1. VFCs and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with NEMA ICS 7, NEMA ICS 61800-2, and UL 508A.

B. Application: Constant torque and variable torque.

C. VFC Description: Variable-frequency motor controller, consisting of power converter that employs pulse-width-modulated inverter, factory built and tested in an enclosure, with integral

disconnecting means and overcurrent and overload protection; listed and labeled by an NRTL as a complete unit; arranged to provide self-protection, protection, and variable-speed control of one or more three-phase induction motors by adjusting output voltage and frequency.

1. Units suitable for operation of NEMA MG 1 motors.
2. Listed and labeled for integrated short-circuit current (withstand) rating by an NRTL acceptable to authorities having jurisdiction.

D. Design and Rating: Match load type, such as fans, blowers, and pumps; and type of connection used between motor and load such as direct or through a power-transmission connection.

E. Output Rating: Three phase; 10 to 60 Hz, with voltage proportional to frequency throughout voltage range; maximum voltage equals input voltage.

F. Unit Operating Requirements:

1. Input AC Voltage Tolerance: Plus 10 and minus 10 percent of VFC input voltage rating.
2. Input AC Voltage Unbalance: Not exceeding 3 percent.
3. Input Frequency Tolerance: Plus or minus 3 percent of VFC frequency rating.
4. Minimum Efficiency: 96 percent at 60 Hz, full load.
5. Minimum Displacement Primary-Side Power Factor: 96 percent under any load or speed condition.
6. Minimum Short-Circuit Current (Withstand) Rating: 10 kA.
7. Ambient Temperature Rating: Not less than 32 deg F (0 deg C) and not exceeding 104 deg F (40 deg C).
8. Humidity Rating: Less than 95 percent (noncondensing).
9. Altitude Rating: Not exceeding 3300 feet (1000 m).
10. Vibration Withstand: Comply with NEMA ICS 61800-2.
11. Overload Capability: 1.5 times the base load current for 60 seconds; minimum of 1.8 times the base load current for three seconds.
12. Starting Torque: Minimum 100 percent of rated torque from 3 to 60 Hz.
13. Speed Regulation: Plus or minus 5 percent.
14. Output Carrier Frequency: Selectable; 0.5 to 15 kHz.
15. Stop Modes: Programmable; includes fast, free-wheel, and dc injection braking.

G. Inverter Logic: Microprocessor based, 16 or 32 bit, isolated from all power circuits.

H. Isolated Control Interface: Allows VFCs to follow remote-control signal over a minimum 40:1 speed range.

1. Signal: Electrical.

I. Internal Adjustability Capabilities:

1. Minimum Speed: 5 to 25 percent of maximum rpm.
2. Maximum Speed: 80 to 100 percent of maximum rpm.
3. Acceleration: 0.1 to 999.9 seconds.
4. Deceleration: 0.1 to 999.9 seconds.
5. Current Limit: 30 to minimum of 150 percent of maximum rating.

J. Self-Protection and Reliability Features:

1. Surge Suppression: Factory installed as an integral part of the VFC, complying with UL 1449 SPD, Type 1 or Type 2.
2. Surge Suppression: Field-mounted surge suppressors complying with Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits," UL 1449 SPD, Type 2.
3. Loss of Input Signal Protection: Selectable response strategy, including speed default to a percent of the most recent speed, a preset speed, or stop; with alarm.
4. Under- and overvoltage trips.
5. Inverter overcurrent trips.
6. VFC and Motor-Overload/Overtemperature Protection: Microprocessor-based thermal protection system for monitoring VFCs and motor thermal characteristics, and for providing VFC overtemperature and motor-overload alarm and trip; settings selectable via the keypad.
7. Critical frequency rejection, with three selectable, adjustable deadbands.
8. Instantaneous line-to-line and line-to-ground overcurrent trips.
9. Loss-of-phase protection.
10. Reverse-phase protection.
11. Short-circuit protection.
12. Motor-overtemperature fault.

K. Automatic Reset/Restart: Attempt three restarts after drive fault or on return of power after an interruption and before shutting down for manual reset or fault correction; adjustable delay time between restart attempts.

L. Power-Interruption Protection: To prevent motor from re-energizing after a power interruption until motor has stopped, unless "Bidirectional Autospeed Search" feature is available and engaged.

M. Torque Boost: Automatically varies starting and continuous torque to at least 1.5 times the minimum torque to ensure high-starting torque and increased torque at slow speeds.

N. Motor Temperature Compensation at Slow Speeds: Adjustable current fall-back based on output frequency for temperature protection of self-cooled, fan-ventilated motors at slow speeds.

O. Integral Input Disconnecting Means and OCPD: UL 489, instantaneous-trip circuit breaker with pad-lockable, door-mounted handle mechanism.

1. Disconnect Rating: Not less than 115 percent of VFC input current rating.
2. Disconnect Rating: Not less than 115 percent of NFPA 70 motor full-load current rating or VFC input current rating, whichever is larger.
3. Auxiliary Contacts: NO or NC, arranged to activate before switch blades open.
4. Auxiliary contacts "a" and "b" arranged to activate with circuit-breaker handle.
5.

2.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: VFCs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7. The designated VFCs shall be tested and certified by an NRTL as meeting the ICC-ES AC 156 test procedure requirements.

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.4 CONTROLS AND INDICATION

A. Status Lights: Door-mounted LED indicators displaying the following conditions:

1. Power on.
2. Run.
3. Overvoltage.
4. Line fault.
5. Overcurrent.
6. External fault.

B. Panel-Mounted Operator Station: Manufacturer's standard front-accessible, sealed keypad and plain-English-language digital display; allows complete programming, program copying, operating, monitoring, and diagnostic capability.

1. Keypad: In addition to required programming and control keys, include keys for HAND, OFF, and AUTO modes.
2. Security Access: Provide electronic security access to controls through identification and password with at least one level of access: View only; view and operate; and view, operate, and service.

    a. Control Authority: Supports at least four conditions: Off, local manual control at VFC, local automatic control at VFC, and automatic control through a remote source.

C. Historical Logging Information and Displays:

1. Real-time clock with current time and date.
2. Running log of total power versus time.
3. Total run time.
4. Fault log, maintaining last four faults with time and date stamp for each.

D. Indicating Devices: Digital display mounted flush in VFC door and connected to display VFC parameters including, but not limited to:

1. Output frequency (Hz).
2. Motor speed (rpm).

3. Motor status (running, stop, fault).
4. Motor current (amperes).
5. Motor torque (percent).
6. Fault or alarming status (code).
7. PID feedback signal (percent).
8. DC-link voltage (V dc).
9. Set point frequency (Hz).
10. Motor output voltage (V ac).

E. Control Signal Interfaces:

1. Electric Input Signal Interface:

   a. A minimum of two programmable analog inputs: .
   b. A minimum of six multifunction programmable digital inputs.

2. Remote Signal Inputs: Capability to accept any of the following speed-setting input signals from the DDC system for HVAC or other control systems:

   a. 0- to 10-V dc.
   b. 4- to 20-mA dc.
   c. Potentiometer using up/down digital inputs.
   d. Fixed frequencies using digital inputs.

3. Output Signal Interface: A minimum of one programmable analog output signal(s) (), which can be configured for any of the following:

   a. Output frequency (Hz).
   b. Output current (load).
   c. DC-link voltage (V dc).
   d. Motor torque (percent).
   e. Motor speed (rpm).
   f. Set point frequency (Hz).

F. PID Control Interface: Provides closed-loop set point, differential feedback control in response to dual feedback signals. Allows for closed-loop control of fans and pumps for pressure, flow, or temperature regulation.

1. Number of Loops: One.

2.5 BYPASS SYSTEMS

A. Bypass Operation: Manually transfers motor between power converter output and bypass circuit. Unit is capable of stable operation (starting, stopping, and running) with motor completely disconnected from power converter.

B. Bypass Mode: Manual operation only; requires local operator selection at VFC. Transfer between power converter and bypass contactor, and retransfer shall only be allowed with the motor at zero speed.

C. Bypass Controller: Two-contactor-style bypass allows motor operation via the power converter or the bypass controller; with input isolating switch and barrier arranged to isolate the power converter and permit safe troubleshooting and testing, both energized and de-energized, while motor is operating in bypass mode.

1. Bypass Contactor: Load-break, NEMA-rated contactor.
2. Output Isolating Contactor: Non-load-break, NEMA-rated contactor.
3. Isolating Switch: Non-load-break switch arranged to isolate power converter and permit safe troubleshooting and testing of the power converter, both energized and de-energized, while motor is operating in bypass mode; pad-lockable, door-mounted handle mechanism.

D. Bypass Contactor Configuration: Full-voltage (across-the-line) type.

1. NORMAL/BYPASS selector switch.
2. HAND/OFF/AUTO selector switch.
3. NORMAL/TEST Selector Switch: Allows testing and adjusting of VFC while the motor is running in the bypass mode.
4. Contactor Coils: Pressure-encapsulated type.

a. Operating Voltage: Depending on contactor NEMA size and line-voltage rating, manufacturer's standard matching control power or line voltage.
b. Power Contacts: Totally enclosed, double break, and silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.

5. Control Circuits: 120-V ac; obtained from integral CPT, with primary and secondary fuses, with CPT of sufficient capacity to operate all integral devices and remotely located pilot, indicating, and control devices.

a. CPT Spare Capacity: 100 VA.

6. Overload Relays: NEMA ICS 2.

2.6 OPTIONAL FEATURES

A. Damper control circuit with end-of-travel feedback capability.

B. Communication Port: RS-232 port, USB 2.0 port, or equivalent connection capable of connecting a printer.

2.7 ENCLOSURES

A. VFC Enclosures: NEMA 250, to comply with environmental conditions at installed location.

1. Dry and Clean Indoor Locations: Type 1.

B. Plenum Rating: UL 1995; NRTL certification label on enclosure, clearly identifying VFC as "Plenum Rated."

2.8 ACCESSORIES

A. General Requirements for Control-Circuit and Pilot Devices: NEMA ICS 5; factory installed in VFC enclosure cover unless otherwise indicated.

1. Push Buttons: Unguarded.
2. Pilot Lights: Push to test.
3. Selector Switches: Rotary type.

B. Control Relays: Auxiliary and adjustable solid-state time-delay relays.

C. Phase-Failure, Phase-Reversal, and Undervoltage and Overvoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connections. Provide adjustable undervoltage, overvoltage, and time-delay settings.

1. Current Transformers: Continuous current rating, basic impulse insulating level (BIL) rating, burden, and accuracy class suitable for connected circuitry. Comply with IEEE C57.13.

D. Supplemental Digital Meters:

1. Elapsed-time meter.
2. Kilowatt meter.
3. Kilowatt-hour meter.

E. Cooling Fan and Exhaust System: For NEMA 250, Type 1; UL 508 component recognized: Supply fan, with composite intake and exhaust grills; 120-V ac; obtained from integral CPT.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Wall-Mounting Controllers: Install with tops at uniform height and with disconnect operating handles not higher than 79 inches (2000 mm) above finished floor, unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not on walls, provide freestanding racks complying with Section 260529 "Hangers and Supports for Electrical Systems."

B. Roof-Mounting Controllers: Install VFC on roofs with tops at uniform height and with disconnect operating handles not higher than 79 inches (2000 mm) above finished roof surface unless otherwise indicated, and by bolting units to curbs or mounting on freestanding, lightweight, structural-steel channels bolted to curbs. Seal roof penetrations after raceways are installed.

1. Curbs and roof penetrations are specified in Section 077200 "Roof Accessories."
2. Structural-steel channels are specified in Section 260529 "Hangers and Supports for Electrical Systems."

C. Seismic Bracing: Comply with requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

E. Install fuses in each fusible-switch VFC.

F. Install fuses in control circuits if not factory installed. Comply with requirements in Section 262813 "Fuses."

G. Install heaters in thermal-overload relays. Select heaters based on actual nameplate full-load amperes after motors are installed.

H. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.

I. Comply with NECA 1.

3.2 CONTROL WIRING INSTALLATION

A. Install wiring between VFCs and remote devices. Comply with requirements in Section 260523 "Control-Voltage Electrical Power Cables."

B. Bundle, train, and support wiring in enclosures.

3.3 IDENTIFICATION

A. Identify VFCs, components, and control wiring. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each VFC with engraved nameplate.
3. Label each enclosure-mounted control and pilot device.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections with the assistance of a factory-authorized service representative.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each VFC element, bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Inspect VFC, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
2. Test insulation resistance for each VFC element, component, connecting motor supply, feeder, and control circuits.
3. Test continuity of each circuit.
4. Verify that voltages at VFC locations are within 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Construction Manager and Owner before starting the motor(s).
5. Test each motor for proper phase rotation.
6. Perform tests according to the Inspection and Test Procedures for Adjustable Speed Drives stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
8. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. VFCs will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies the VFC and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations made after remedial action.

3.5 ADJUSTING

A. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.

B. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.

C. Adjust the trip settings of instantaneous-only circuit breakers and thermal-magnetic circuit breakers with adjustable, instantaneous trip elements. Initially adjust to 6 times the motor nameplate full-load amperes and attempt to start motors several times, allowing for motor cool-down between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed 8 times the motor full-load amperes (or 11 times

for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify Construction Manager and Owner before increasing settings.

D. Set the taps on reduced-voltage autotransformer controllers.

E. Set field-adjustable circuit-breaker trip ranges per NEC.

F. Set field-adjustable pressure switches.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, reprogram, and maintain VFCs.

END OF SECTION 262923

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SECTION 260533 - RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1. Raceways include the following:

a. RMC.
b. EMT.

2. Boxes, enclosures, and cabinets include the following:

a. Device boxes.
b. Pull and junction boxes.

1.2 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. RMC: Rigid metal conduit.

1.3 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

1.4 QUALITY ASSURANCE

A. Listing and Labeling: Provide raceways and boxes specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.

B. Comply with NECA's "Standard of Installation."

C. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate layout and installation of raceways and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Metal Conduit and Tubing:

   a. Alflex Corp.
   b. Anamet, Inc.; Anaconda Metal Hose.
   c. Anixter Brothers, Inc.
   d. Carol Cable Co., Inc.
   e. Cole-Flex Corp.
   f. Electri-Flex Co.
   g. Flexcon, Inc.; Coleman Cable Systems, Inc.
   h. Grinnell Co.; Allied Tube and Conduit Div.
   i. Monogram Co.; AFC.
   j. Spiraduct, Inc.
   k. Triangle PWC, Inc.
   l. Wheatland Tube Co.

2. Conduit Bodies and Fittings:

   a. American Electric; Construction Materials Group.
   b. Crouse-Hinds; Div. of Cooper Industries.
   c. Emerson Electric Co.; Appleton Electric Co.
   d. Hubbell, Inc.; Killark Electric Manufacturing Co.
   e. Lamson & Sessions; Carlon Electrical Products.
   f. O-Z/Gedney; Unit of General Signal.
   g. Scott Fetzer Co.; Adalet-PLM.
   h. Spring City Electrical Manufacturing Co.

3. Metal Wireways:

   a. Hoffman Engineering Co.
   b. Keystone/Rees, Inc.
   c. Square D Co.

4. Boxes, Enclosures, and Cabinets:

   a. American Electric; FL Industries.
   b. Butler Manufacturing Co.; Walker Division.
   c. Crouse-Hinds; Div. of Cooper Industries.
   d. Electric Panelboard Co., Inc.
   e. Erickson Electrical Equipment Co.
   f. Hoffman Engineering Co.; Federal-Hoffman, Inc.
   g. Hubbell Inc.; Killark Electric Manufacturing Co.
   h. Hubbell Inc.; Raco, Inc.
   i. Lamson & Sessions; Carlon Electrical Products.

j. O-Z/Gedney; Unit of General Signal.
k. Parker Electrical Manufacturing Co.
l. Robroy Industries, Inc.; Electrical Division.
m. Scott Fetzer Co.; Adalet-PLM.
n. Spring City Electrical Manufacturing Co.
o. Thomas & Betts Corp.
p. Woodhead Industries, Inc.; Daniel Woodhead Co.

2.2 OUTLET AND DEVICE BOXES

A. Sheet Metal Boxes: NEMA OS 1.

2.3 PULL AND JUNCTION BOXES

A. Small Sheet Metal Boxes: NEMA OS 1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of raceway installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 WIRING METHODS

A. Outdoors: Use the following wiring methods:

1. Exposed: Rigid steel.
2. Concealed: Rigid steel.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes and Enclosures: NEMA 250, Type 3R or Type 4.

B. Indoors: Use the following wiring methods:

1. Exposed: EMT or RMC.
2. Concealed: EMT, or RMC.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment) and Recessed Lighting fixtures: FMC; except in wet or damp locations, use LFMC.
4. Damp or Wet Locations: Rigid steel conduit.
5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:

a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.

3.3 INSTALLATION

A. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.

B. Minimum Raceway Size: 3/4-inch trade size.

C. Conceal conduit and EMT, unless otherwise indicated, within finished walls, ceilings, and floors.

D. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

E. Install raceways level and square and at proper elevations. Provide adequate headroom.

F. Complete raceway installation before starting conductor installation.

G. Use temporary closures to prevent foreign matter from entering raceways.

H. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.

I. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

J. Use raceway fittings compatible with raceways and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, unless otherwise indicated.

K. Run concealed raceways, with a minimum of bends, in the shortest practical distance considering the type of building construction and obstructions, unless otherwise indicated.

L. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.

1. Run parallel or banked raceways together, on common supports where practical.
2. Make bends in parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

M. Join raceways with fittings designed and approved for the purpose and make joints tight.

1. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
2. Use insulating bushings to protect conductors.

N. Tighten set screws of threadless fittings with suitable tools.

O. Terminations: Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against the box. Where terminations are not secure with 1 locknut, use 2 locknuts: 1 inside and 1 outside the box.

P. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align raceways so the coupling is square to the box and tighten the chase nipple so no threads are exposed.

Q. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of the pull wire.

R. Install raceway sealing fittings according to manufacturer's written instructions. Locate fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. :

S. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded flush plugs flush with floor for future equipment connections.

T. Flexible Connections: Use maximum of 6 feet of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquidtight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections.

U. Do not install aluminum conduits embedded in or in contact with concrete.

V. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.

W. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying the raceways to receptacle or fixture ground terminals.

1. Select each surface raceway outlet box, to which a lighting fixture is attached, of sufficient diameter to provide a seat for the fixture canopy.
2. Where a surface raceway is used to supply a fluorescent lighting fixture having central-stem suspension with a backplate and a canopy (with or without extension ring), no separate outlet box is required.
3. Provide surface metal raceway outlet box, and the backplate and canopy, at the feed-in location of each fluorescent lighting fixture having end-stem suspension.
4. Where a surface metal raceway extension is made from an existing outlet box on which a lighting fixture is installed, no additional surface-mounted outlet box is required. Provide a backplate slightly smaller than the fixture canopy.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer that ensure coatings, finishes, and cabinets are without damage or deterioration at the time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.5 CLEANING

A. On completion of installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

END OF SECTION 260533

CLARKSBURG WATER BOARD

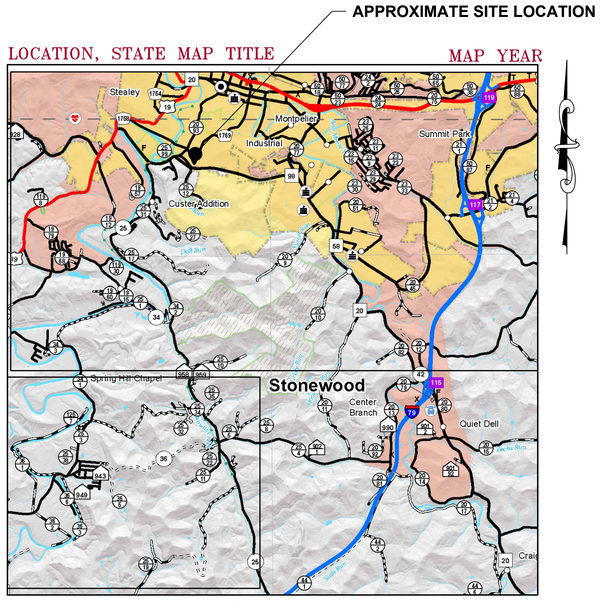
ISSUED FOR PERMITTING PLANS FOR THE

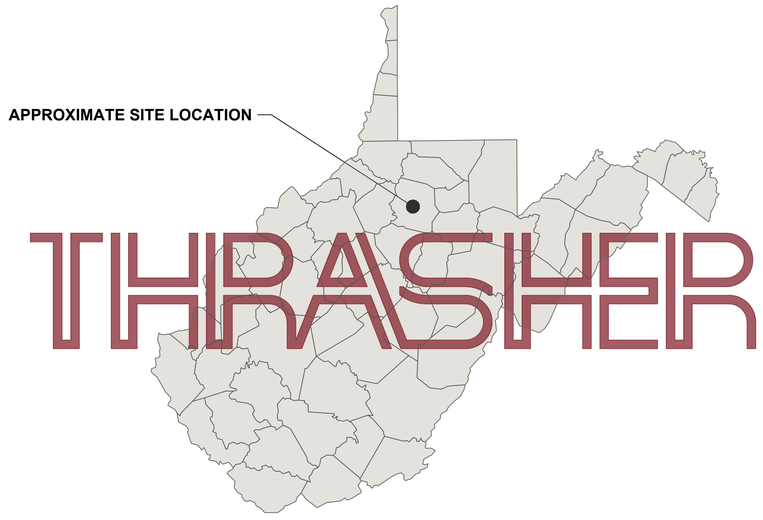
HIGH SERVICE PUMPS
VARIABLE FREQUENCY DRIVES
010-10174

HARRISON COUNTY, WEST VIRGINIA

NOVEMBER 2021

DRAWING INDEX:





THRASHER

CONTRACTOR SHALL NOTIFY THE ONE-CALL SYSTEM OF THE INTENDED EXCAVATION OR DEMOLITION NOT LESS THAN FORTY-EIGHT (48) HOURS, EXCLUDING SATURDAYS, SUNDAYS AND LEGAL FEDERAL OR STATE HOLIDAYS, NOR MORE THAN TEN (10) WORK DAYS PRIOR TO THE BEGINNING OF SUCH WORK.
CALL811.COM/811-IN-YOUR-STATE

CLARKSBURG WATER BOARD
PHONE: (304) 623-3711 | FAX: (304) 624-5468
1001 SOUTH CHESTNUT STREET
CLARKSBURG, WEST VIRGINIA 26301

CONTACTS

CLIENT'S CONTACT
GENERAL MANAGER
ATTN: JASON L. MYERS
(304) 623-3711

CHARLESTON, WV OFFICE
300 ASSOCIATION DRIVE
CHARLESTON, WV 25311
(304) 343-7601

ENGINEER
THE THRASHER GROUP
ATTN: KEN SMITH
(304) 343-7601

PLAN REPRODUCTION WARNING

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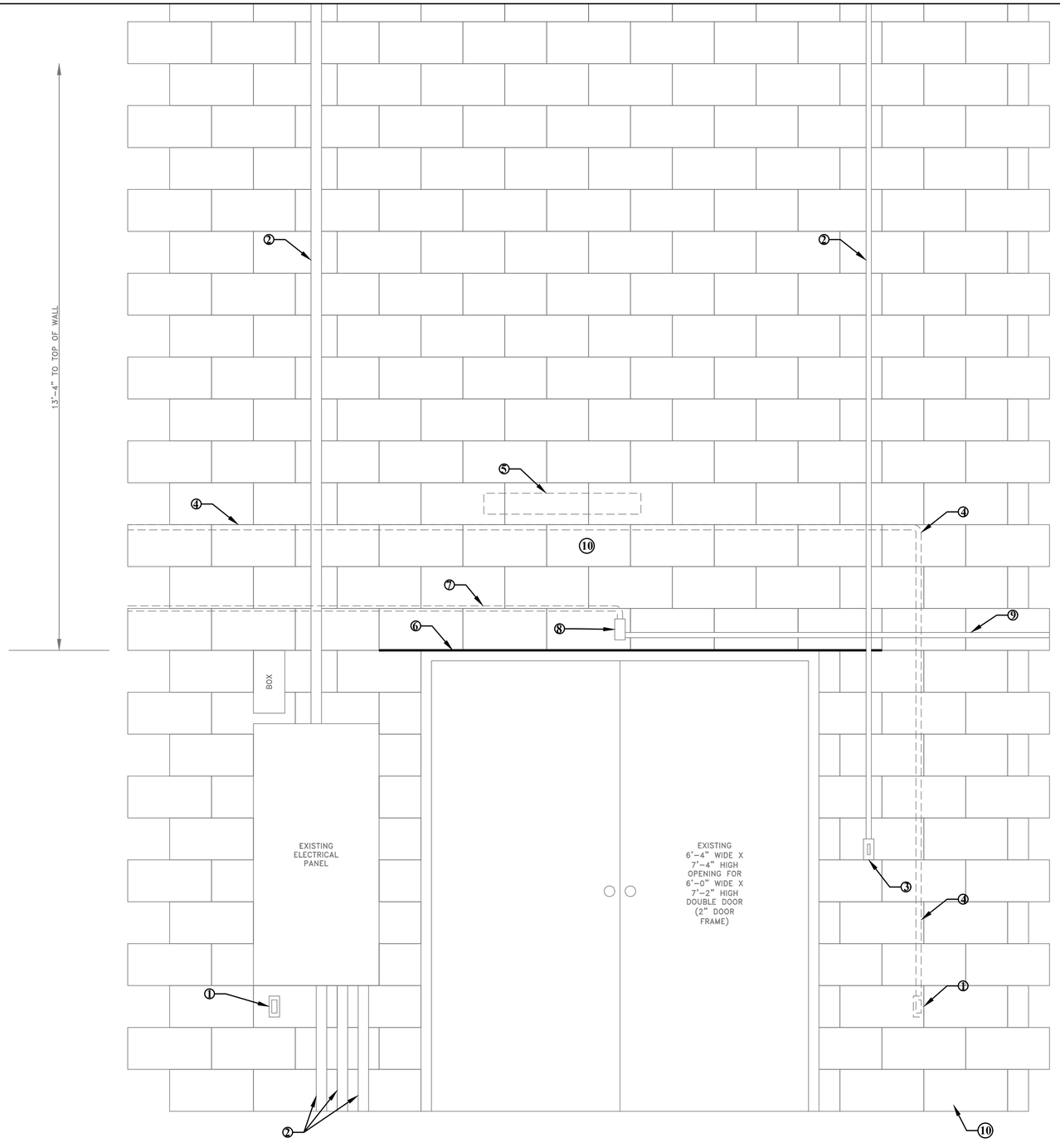
THIS PLAN SET DEPICTS THE NECESSARY INFORMATION FOR EROSION AND SEDIMENT CONTROL MEASURES AS REQUIRED BY THE WVDEP FOR STORM WATER PERMITTING PURPOSES.

THE AQUATIC RESOURCES DEPICTED ON THESE DRAWINGS ARE AS PROVIDED TO THE THRASHER GROUP, INC. BY OTHERS. THRASHER WILL NOT ACCEPT ANY LIABILITY FOR THE ACCURACY, OR COMPLETENESS, OF THE AQUATIC RESOURCES DEPICTED ON THESE PLANS.

KENNETH E. SMITH
REGISTERED
011672
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER
1/13/2022

KEN SMITH , WV P.E. # 011672

☐	ISSUED FOR PERMITS	DATE: _____	BY: _____
☐	ISSUED FOR BID	DATE: _____	BY: _____
☐	ISSUED FOR CONSTRUCTION	DATE: _____	BY: _____



EXISTING INTERIOR WALL ELEVATION
SCALE: 1"=1'-0"

NOTES:

1. EXISTING RECEPTACLE (TO REMAIN)
2. EXISTING CONDUIT (TO REMAIN)
3. EXISTING LIGHT SWITCH (TO REMAIN)
4. EXISTING CONDUIT ON OPPOSITE SIDE OF WALL (RELOCATE AS REQUIRED)
5. EXISTING LIGHTING ON OPPOSITE SIDE OF WALL (REMOVE AND INSTALL NEW LIGHTING)
6. EXISTING LINTEL 2-L6"X3/2"X3/8" (REMOVE)
7. EXISTING FIRE ALARM - CONDUIT ON OPPOSITE SIDE OF WALL (RELOCATE AS REQUIRED)
8. EXISTING FIRE ALARM BOX (RELOCATE AS REQUIRED)
9. EXISTING FIRE ALARM CONDUIT (RELOCATE AS REQUIRED)
10. EXISTING ACOUSTICAL BLOCK SLOTS FACING HIGH SERVICE PUMP ROOM. REMOVE AS REQUIRED TO INSTALL NEW LINTEL, DOOR FRAME, AND DOORS.

STEVEN V. BUCHANAN REGISTERED 11060 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER
1/5/2022

ADDENDUM #2
JANUARY 13, 2022

NO.	BY	DATE	DESCRIPTION

SCALE: NO SCALE	
DRAWN: A. NEWLON	DATE: 01/2022
CHECKED: S. BUCHANAN	DATE: 01/2022
APPROVED: S. BUCHANAN	DATE: 01/2022
SURVEY DATE:	
SURVEY BY:	
FIELD BOOK No.:	

THRASHER
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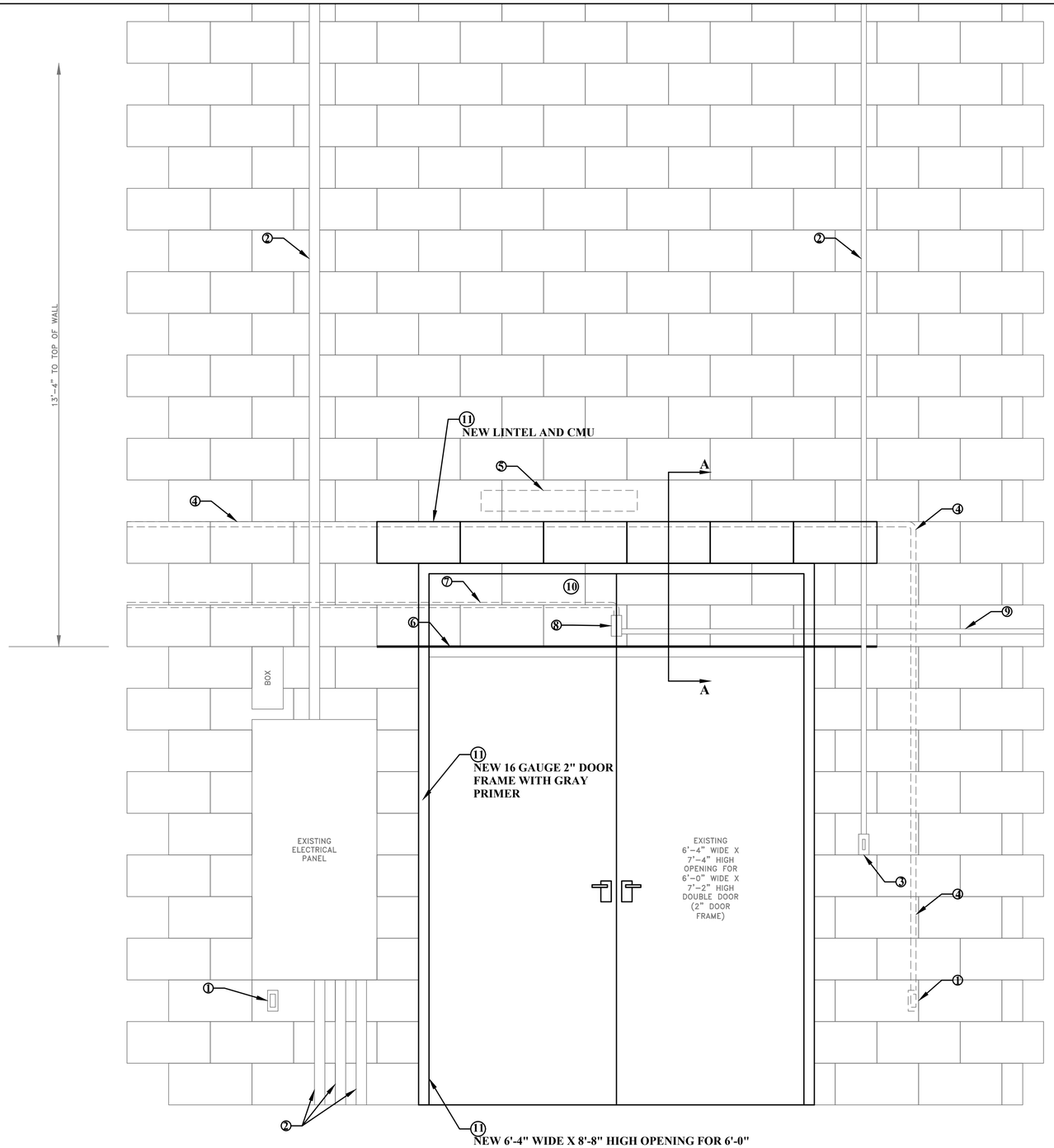
PHASE No.
CONTRACT No.
PROJECT No. 010-10174

CLARKSBURG WATER BOARD
HARRISON COUNTY, WEST VIRGINIA
HIGH SERVICE PUMPS
VARIABLE FREQUENCY DRIVES
EXISTING INTERIOR WALL ELEVATION

SHEET No. C1

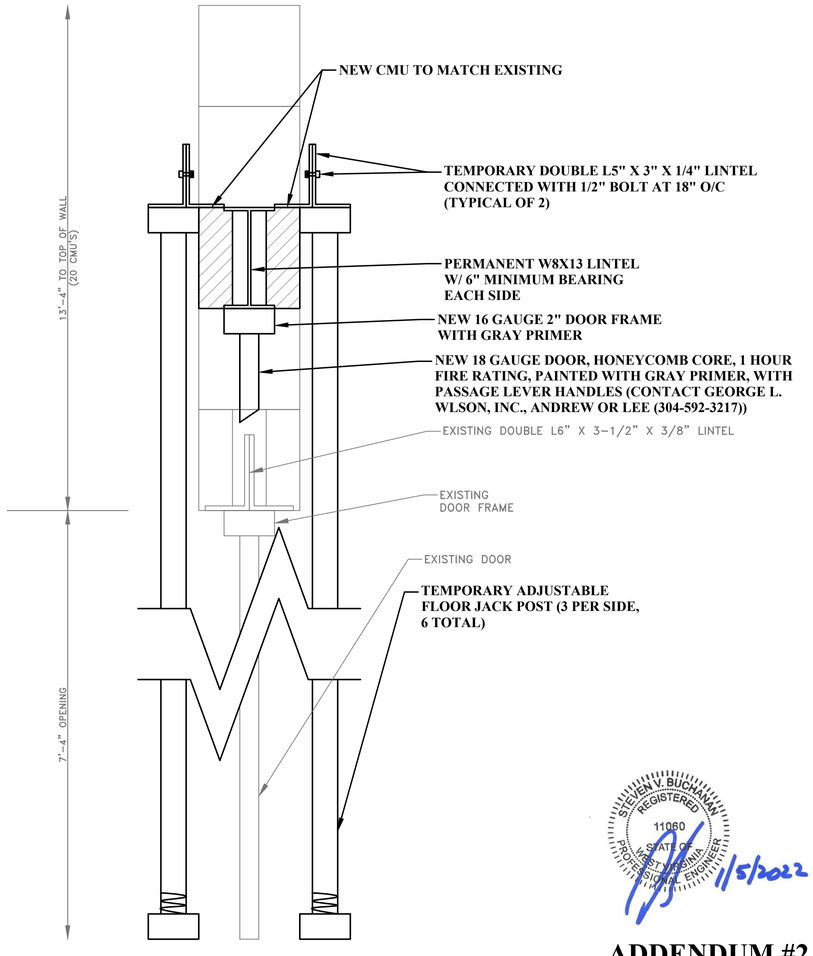
CAD FILE: R:\010\010-10174.00-High Service Pump Variable Frequency Drive-Clarksburg Water Board-\Drawing\Doorway Upgrade Details.dwg PLOT DATE/TIME: 1/5/2022 1:55 PM LAYOUT: C1 USER: adam newlon



PROPOSED INTERIOR WALL ELEVATION
SCALE: 1"=1'-0"

NOTES:

1. EXISTING RECEPTACLE (TO REMAIN)
2. EXISTING CONDUIT (TO REMAIN)
3. EXISTING LIGHT SWITCH (TO REMAIN)
4. EXISTING CONDUIT ON OPPOSITE SIDE OF WALL (RELOCATE AS REQUIRED)
5. EXISTING LIGHTING ON OPPOSITE SIDE OF WALL (REMOVE AND INSTALL NEW LIGHTING)
6. EXISTING LINTEL 2-L6"X3/2"X3/8" (REMOVE)
7. EXISTING FIRE ALARM - CONDUIT ON OPPOSITE SIDE OF WALL (RELOCATE AS REQUIRED)
8. EXISTING FIRE ALARM BOX (RELOCATE AS REQUIRED)
9. EXISTING FIRE ALARM CONDUIT (RELOCATE AS REQUIRED)
10. EXISTING ACOUSTICAL BLOCK SLOTS FACING HIGH SERVICE PUMP ROOM. REMOVE AS REQUIRED TO INSTALL NEW LINTEL, DOOR FRAME, AND DOORS.
11. PAINT NEW CMU, DOOR FRAME, AND DOOR TO MATCH EXISTING AS CLOSE AS POSSIBLE.



SECTION A-A
NOT TO SCALE

STEVEN V. BUCHANAN
REGISTERED
11060
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER
11/5/2022

ADDENDUM #2
JANUARY 13, 2022

NO.	BY	DATE	DESCRIPTION

SCALE: NO SCALE
DRAWN: A. NEWLON DATE: 01/2022
CHECKED: S. BUCHANAN DATE: 01/2022
APPROVED: S. BUCHANAN DATE: 01/2022
SURVEY DATE:
SURVEY BY:
FIELD BOOK No.:

THRASHER
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BRIDGEPORT, WV 26330
www.thethrashergroup.com
PHONE (304)-624-4108
FAX (304)-624-7831

PHASE No.
CONTRACT No.
PROJECT No. 010-10174

CLARKSBURG WATER BOARD
HARRISON COUNTY, WEST VIRGINIA
HIGH SERVICE PUMPS
VARIABLE FREQUENCY DRIVES
PROPOSED INTERIOR WALL ELEVATION

SHEET No. C2

CAD FILE: R:\010\010-10174.00-High Service Pump Variable Frequency Drive-Clarksburg Water Board-\Drawing\Doorway Upgrade Details.dwg PLOT DATE/TIME: 1/5/2022 1:56 PM LAYOUT: C2 USER: adam newlon

ELECTRICAL SYMBOL LEGEND

SYMBOL	DESCRIPTION	MTG. HEIGHT UNO
	GENERAL / RACEWAY SYSTEMS	
(A)	PLAN NOTE	
CU-1	EQUIPMENT SYMBOL – SEE LIST ON DWGS.	
	POWER AND LIGHTING SYSTEMS	
	DIRECT CONNECTION	
GFI	GROUND FAULT INTERRUPTER TYPE DUPLEX RECEPTACLE	18" AFF
	SUSPENDED CEILING MOUNT 8' LED LIGHT FIXTURE	
	MOTOR OR PUMP	
	FUSED SAFETY DISCONNECT SWITCH, HEAVY DUTY, "NFSS" DENOTES NON-FUSED SAFETY SWITCH.	

GENERAL ELECTRICAL NOTES

1. COORDINATE LOCATIONS OF CEILING-MOUNTED LIGHTING FIXTURES, SPEAKERS AND OTHER ITEMS WITH THE CEILING PATTERN AND MECHANICAL/ELECTRICAL EQUIPMENT.
2. LOCATE ALL BOXES TO BE ACCESSIBLE WITH PROPER CLEARANCES.
3. LOCATE ALL CONDUITS AND RACEWAYS TO AVOID INTERFERENCE WITH DUCTS, PIPES, MECHANICAL EQUIPMENT, WITH THE REMOVAL OF CEILING TILE, OR WITH ACCESS TO EQUIPMENT THAT REQUIRES PERIODIC ADJUSTMENT OR MAINTENANCE.
4. DO NOT SUPPORT RACEWAYS OR EQUIPMENT FROM PIPES, DUCTS, OR A CEILING SUSPENSION SYSTEM.
5. BRANCH CIRCUIT AND FEEDERS ARE DESIGNATED BY A NUMBER AND LETTER.
6. INSTALL FEEDER RACEWAYS WITH NO MORE THAN 3 CURRENT-CARRYING CONDUCTORS PLUS A NEUTRAL CONDUCTOR, PLUS A GROUND CONDUCTOR.
7. INDICATED BRANCH CIRCUIT CONDUCTOR SIZES ARE BASED ON NO MORE THAN 3 CURRENT-CARRYING CONDUCTORS AND A NON-CURRENT-CARRYING NEUTRAL CONDUCTOR IN EACH RACEWAY. WHERE THE NUMBER OF CONDUCTORS EXCEEDS THIS AMOUNT, ADJUST THE CONDUCTOR SIZES IF AND AS NECESSARY TO ACCOUNT FOR DERATING THEIR AMPACITY IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE.
8. IN MECHANICAL/ELECTRICAL ROOMS ADJUST LIGHTING FIXTURE LOCATIONS AS NECESSARY TO COORDINATE WITH EQUIPMENT AND TO PROVIDE OPTIMUM ILLUMINATION.
9. EQUIPMENT SHALL BE GROUNDED IN ACCORDANCE WITH SPECIFICATIONS AND AS REQUIRED BY THE NATIONAL ELECTRIC CODE.
10. ALL WORK SHALL COMPLY WITH NFPA 70.
11. ELECTRICAL BRANCH CIRCUITS SHALL NOT SHARE A COMMON NEUTRAL.
12. SIZE ALL FUSES FOR FUSED SAFETY SWITCHES WITH EQUIPMENT MANUFACTURER.
13. NEW VFD CABINETS SHALL BE SUPPLIED BY THE OWNER.

600V WIRE AND CONDUIT SIZE SCHEDULE

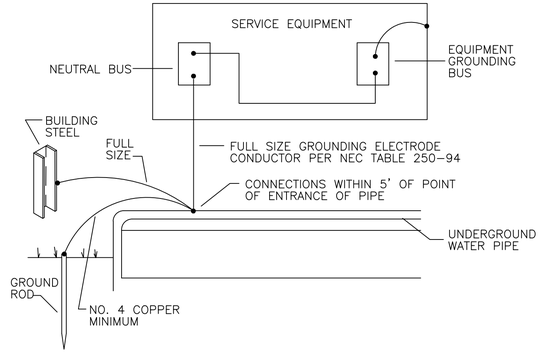
BREAKER	WIRE	GROUND	CONDUIT SIZE WITH GROUND		
AMP SIZE	SIZE	SIZE	1-POLE	2-POLE	3-POLE
20	#12	#12	3/4"	3/4"	3/4"
30	#10	#10	3/4"	3/4"	3/4"
40	#8	#10	3/4"	3/4"	3/4"
50	#8	#10	3/4"	3/4"	3/4"
60	#6	#8	3/4"	3/4"	3/4"
70	#4	#8	1"	1"	1"
80	#4	#8	-	1"	1"
90	#3	#8	-	1 1/4"	1 1/4"
100	#2	#8	-	1 1/4"	1 1/4"
110	#2	#6	-	1 1/4"	1 1/4"
125	#1	#6	-	1 1/4"	1 1/4"
150	#1/0	#6	-	1 1/2"	1 1/2"
175	#2/0	#6	-	1 1/2"	2"
200	#3/0	#6	-	1 1/2"	2"
225	#4/0	#4	-	-	2-1/2"
250	250MCM	#3	-	-	2 1/2"
300	350MCM	#3	-	-	3"
350	500MCM	#3	-	-	3 1/2"
400	500MCM	#3	-	-	3 1/2"

CONTRACTOR IS RESPONSIBLE FOR INCREASING WIRE SIZE AS REQUIRED FOR MAXIMUM VOLTAGE DROP OF 3%.

ELECTRIC HEATER SCHEDULE

MARK	MANUFACTURER	MODEL NO.	WEIGHT (LBS)	KW	CFM	BTU	VOLTS - PHASE	AMPS	NOTES
EUH-1	QMARK	MUH0321-PRO	27	3.0	350	10200	208/240 - 1	11.0/12.5	1

NOTES:
1. PROVIDE WITH MOUNTING BRACKET, WALL MOUNT THERMOSTAT, WIRE, CONDUIT, BREAKER AND DISCONNECT.



GENERAL GROUNDING DETAIL
NOT TO SCALE

ADDENDUM #2
JANUARY 13, 2022

NO.	BY	DATE	DESCRIPTION
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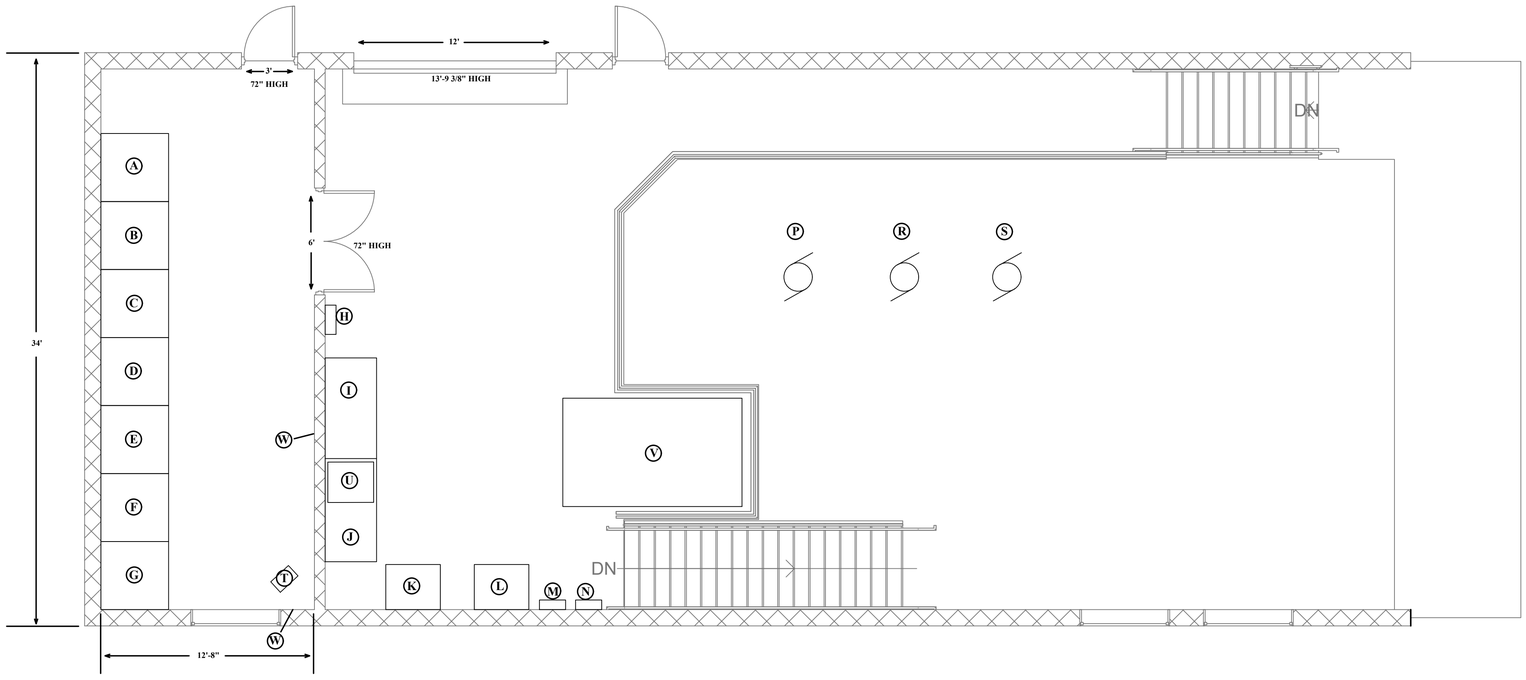
PHASE No.
CONTRACT No.
PROJECT No. 010-10174

CLARKSBURG WATER BOARD
HARRISON COUNTY, WEST VIRGINIA
HIGH SERVICE PUMPS
VARIABLE FREQUENCY DRIVES
ELECTRICAL SYMBOLS LEGEND AND NOTES

SHEET No. E1

NOTES:

1. **THE EXISTING HEATER "T" AND ALL OF THE ASSOCIATED CONDUITS, WIRES AND PIPING SHALL BE REMOVED AND REPLACED WITH A NEW ELECTRIC UNIT HEATER "EUH-1" AFTER THE VFD INSTALLATION IS COMPLETE. THE NEW UNIT HEATER SHALL COME COMPLETE WITH PROPER MOUNTING HARDWARE, BREAKER, WIRE, CONDUIT, DISCONNECT AND THERMOSTAT CONTROLS. THE NEW LOCATION SHALL BE DETERMINED BY THE OWNER. SEE SHEET E1 SCHEDULE FOR DETAILS. THE NEW POWER SUPPLY BREAKER MAY BE PLACED IN PANEL "EPJ" OR PANEL "PPH".**
2. **EXISTING LIGHTS, CONDUIT AND ELECTRICAL EQUIPMENT LOCATED ON WALLS "W" SHALL BE REMOVED AND REPLACED ACCORDING TO PLAN OR AS NECESSARY TO ALLOW PROPER INSTALLATION OF THE NEW VFD CABINETS.**



EXISTING ELECTRICAL EQUIPMENT
NOT TO SCALE

EXISTING ELECTRICAL PLAN NOTES:

- (A) NDP DISCONNECT AND LV SWBD DISCONNECT.
- (B) 5,000 VOLT RAW INTAKE DISCONNECT.
- (C) SPARE CABINET.
- (D) 4160V PUMP #3 STARTER CABINET.
- (E) 4160V PUMP #3 CONTROLS CABINET.
- (F) 4160V PUMP #2 STARTER CABINET.
- (G) 4160V PUMP #2 CONTROLS CABINET.
- (H) 120V PANEL "EPJ"
- (I) MCC-6
- (J) MCC-11
- (K) 480V, 1200A, 3 PHASE, SWITCHBOARD NDP.
- (L) 480V, 1200A, 3 PHASE, SWITCHBOARD EDP.
- (M) 277/480V, 80A, 3 PHASE PANEL "LPH".
- (N) 120/208V, 125A, 3 PHASE PANEL "PPH".
- (P) 480V, 3 PHASE, 250HP PUMP #1.
- (R) 4160V, 3 PHASE, 400HP PUMP #2.
- (S) 4160V, 3 PHASE, 500HP PUMP #3.
- (T) EXISTING HEATER
- (U) EXISTING 480V PUMP #1 STARTER AND CONTROLS.
- (V) 480/4160V TRANSFORMER.
- (W) EXISTING WALL WITH ELECTRICAL EQUIPMENT TO BE REMOVED AND RELOCATED AS NECESSARY.

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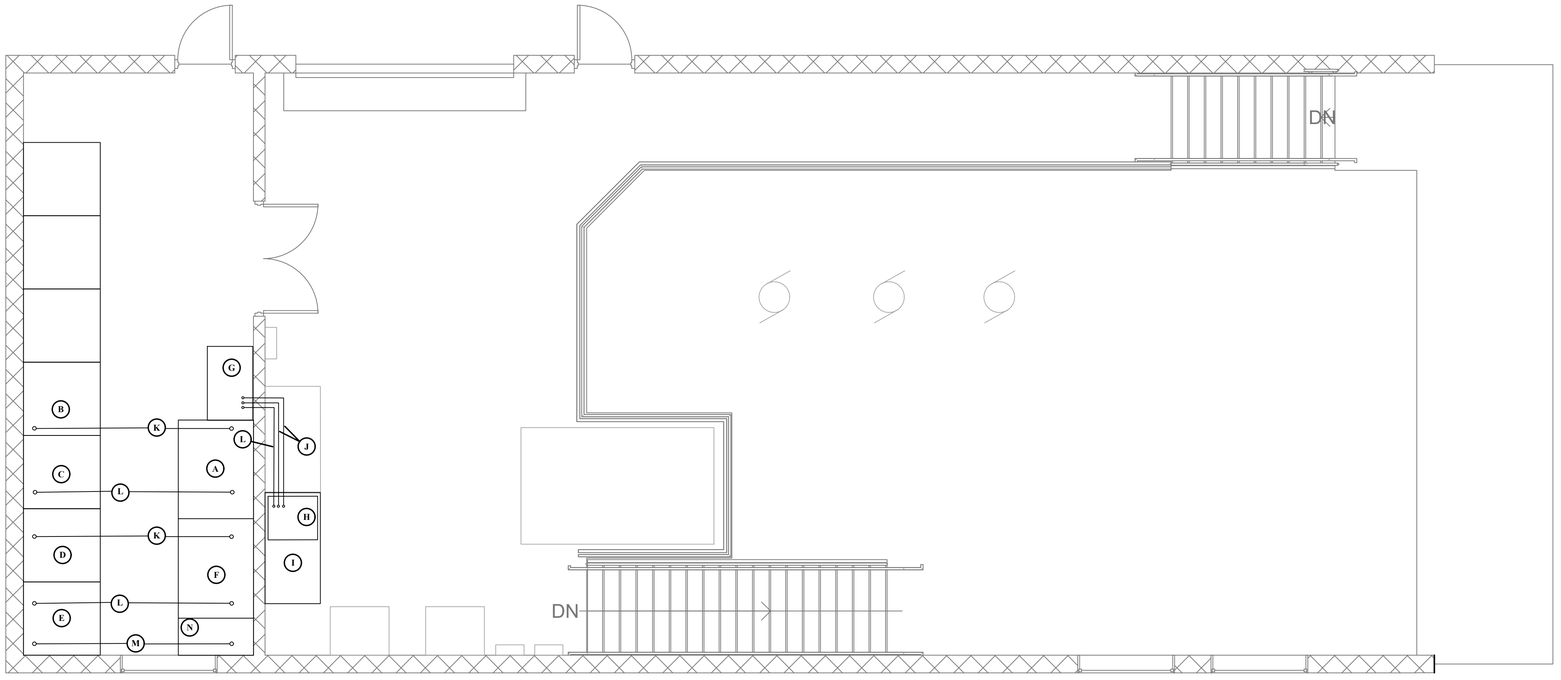
CLARKSBURG WATER BOARD
HARRISON COUNTY, WEST VIRGINIA
HIGH SERVICE PUMPS
VARIABLE FREQUENCY DRIVES
EXISTING ELECTRICAL EQUIPMENT

SHEET No. E2

NOTES:

1. THE EXISTING CONDUIT AND CABLES FROM THE PUMPS TO THEIR ASSOCIATED DRIVE CABINET SHALL BE REUSED WITH THE NEW VFD SYSTEM. NEW CONDUIT AND CABLE SHALL BE INSTALLED AS NECESSARY FROM THE NEW VFD CABINETS TO THE EXISTING CABINETS. THE NEW CABLES SHALL BE CONNECTED TO THE EXISTING CABLES ACCORDING TO NEC SPECIFICATIONS.
2. THE NEW VFD DRIVE INSTALLATION SHALL BE COORDINATED WITH THE OWNER SUCH THAT THE CONSTRUCTION DOES NOT ALTER THE PLANTS PRODUCTION.
3. PROPER CLEARANCE SHALL BE MAINTAINED BETWEEN THE EXISTING DRIVE CABINETS AND THE NEW DRIVECABINETS PER NEC.
4. ALL NECESSARY COMMUNICATION CABLES SHALL BE INSTALLED FROM THE CONTROL ROOM TO THE NEW VFD'S. CONFIRM CABLE TYPE AND CONDUIT PREFERENCES WITH OWNER. APPROXIMATE DISTANCE IS 120 FEET.
5. ALL PROGRAMMING MODIFICATIONS FOR THE NEW VFD'S AND THE EXISTING CONTROLS SHALL BE DONE BY OTHERS.



NEW VFD ELECTRICAL EQUIPMENT
NOT TO SCALE

NEW ELECTRICAL PLAN NOTES:

(A) NEW 500HP PUMP #3 5KV VFD CABINETS.

(B) EXISTING 4160V, 500HP PUMP #3 STARTER CABINET.

(C) EXISTING 4160V, 500HP PUMP #3 CONTROLS CABINET.

(D) EXISTING 4160V, 400HP PUMP #2 STARTER CABINET.

(E) EXISTING 4160V, 400HP PUMP #2 CONTROLS CABINET.

(F) NEW 400HP PUMP #2 5KV VFD CABINETS.

(G) NEW 250HP PUMP #1 480V VFD CABINETS.

(H) EXISTING 480V, 250HP PUMP #1 STARTER CABINET.

(I) EXISTING MCC-11.

(J) 2 1/2" CONDUIT WITH 6-2/0, CABLES AND 2-#6 GROUNDS. ALL CABLES SHALL BE 600V RATED.

(K) 2 1/2" CONDUIT WITH 3-#4 WIRES AND 1-#8 GROUND. ALL MOTOR FEED WIRES SHALL BE 5KV RATED.

(L) 1 1/4" CONDUIT WITH CONTROL WIRING PER MANUFACTURER.

(M) 4" CONDUIT WITH PROPERLY SIZED 5KV CABLES FOR THE EXISTING FUSED DISCONNECT PER NEC. THESE CABLES SHALL FEED THE 5KV BUS FOR PUMP #2 AND PUMP #3 DRIVES.

(N) NEW 5KV BUS CABINET.

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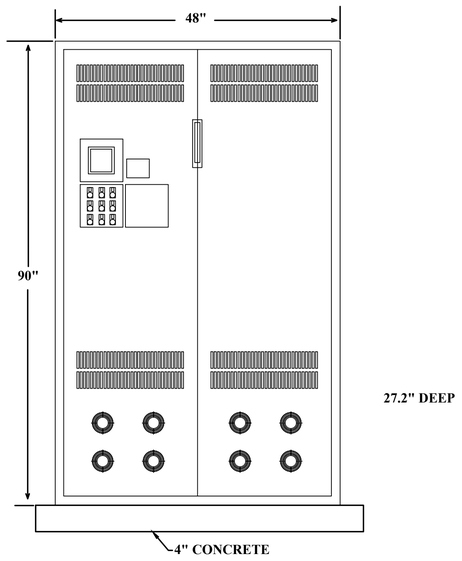
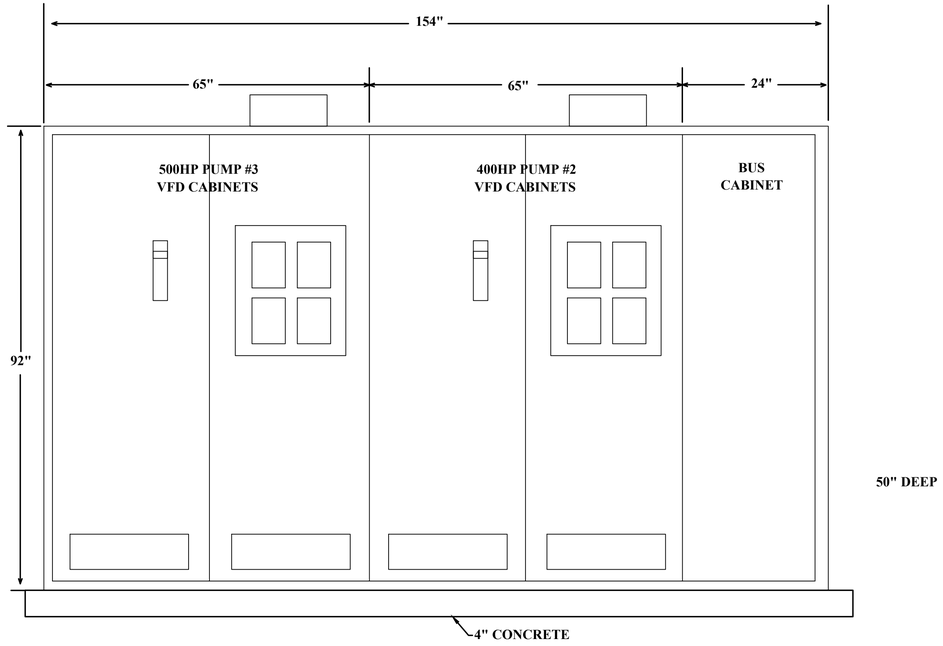
CLARKSBURG WATER BOARD
HARRISON COUNTY, WEST VIRGINIA
HIGH SERVICE PUMPS
VARIABLE FREQUENCY DRIVES
NEW VFD ELECTRICAL PLAN

SHEET No. E3



NEW PUMP #1 VFD CABINET



NEW PUMP #2 AND PUMP#3 VFD CABINETS

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CLARKSBURG WATER BOARD
HARRISON COUNTY, WEST VIRGINIA
HIGH SERVICE PUMPS
VARIABLE FREQUENCY DRIVES
NEW VFD CABINET DIMENSIONS

SHEET No. **E4**

CAD FILE: R:\010\010-10174.00-High Service Pump Variable Frequency Drive-Clarksburg Water Board-\Drawing\VFD'S Electrical Addendum #2.dwg PLOT DATE/TIME: 1/13/2022 10:22 AM LAYOUT: E4 USER: brion k. hensley

LIGHTING FIXTURE SCHEDULE

MARK	LAMPS/TYPE	MOUNTING	MANUFACTURER	SERIES	DESCRIPTION	LUMEN	VOLT	INPUT WATTS
L1	LED	SUSPENDED	LITHONIA	CSS L96 ALO4 MVOLT 50K 80CRI	96" STRIP LIGHT, WHITE, SWITCHABLE LUMENS, ACRYLIC LENS	8,535	120	72

GENERAL NOTES PERTAINING TO ALL FIXTURES:

1. VERIFY FIXTURE MOUNTING TYPE (HANGER CHAIN OR AIRCRAFT CABLE) AND HEIGHT WITH OWNER PRIOR TO PURCHASE.
2. VERIFY VOLTAGE TO OPERATE FIXTURES WITH ELECTRICAL DRAWINGS.
3. LIGHTING FIXTURES SHALL COME COMPLETE WITH NECESSARY MOUNTING HARDWARE.

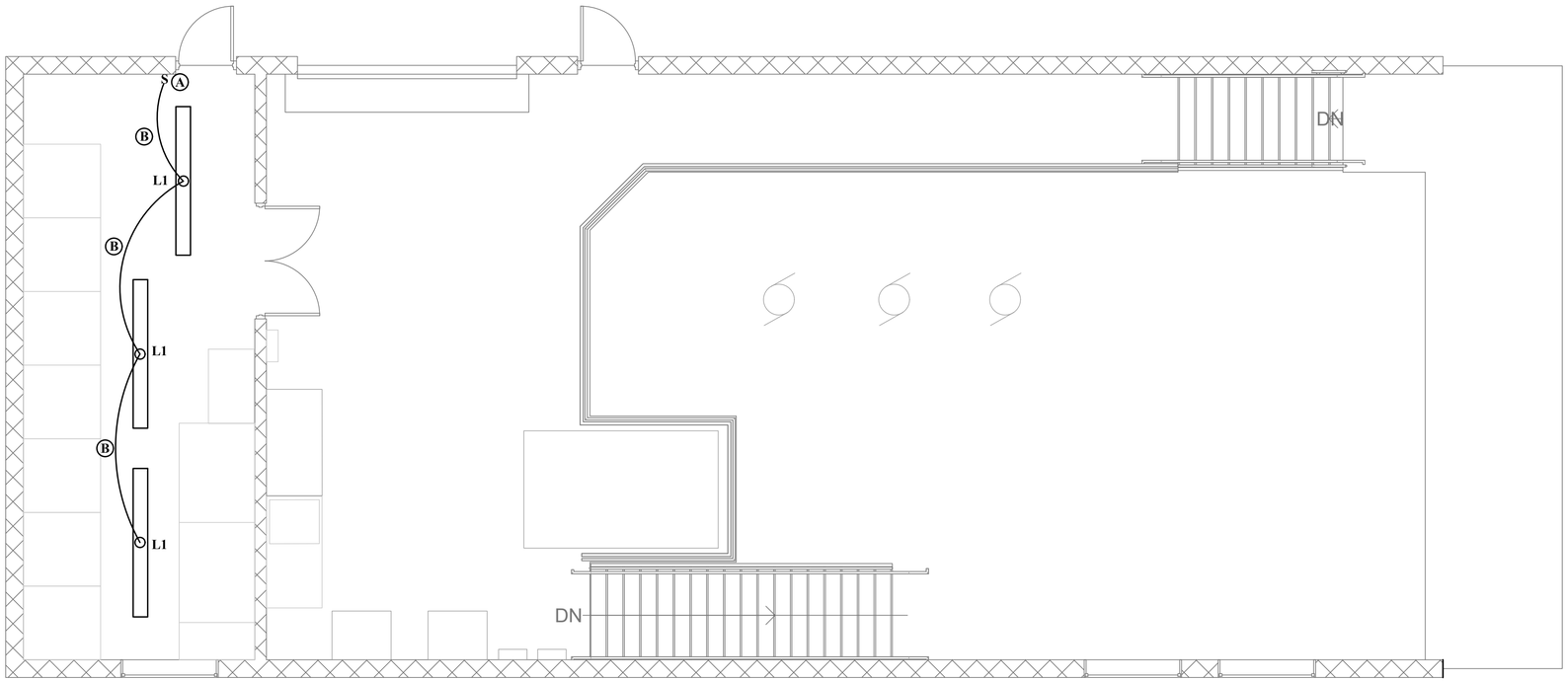
NOTES:

1. **NEW LIGHT FIXTURES SHALL BE CONNECTED TO THE EXISTING SWITCH AND 120 VOLT POWER.**

NEW ELECTRICAL PLAN NOTES:

(A) **EXISTING LIGHT SWITCH TO REMAIN.**

(B) **NEW CONDUIT AND WIRING TO MATCH EXISTING.**



NEW LIGHTING PLAN

NOT TO SCALE

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CONTRACT No.

PROJECT No. 010-00600

CITY OF CLARKERSBURG WATER BOARD
HARRISON COUNTY, WEST VIRGINIA
HIGH SERVICE PUMPS
VARIABLE FREQUENCY DRIVES
NEW LIGHTING PLAN

SHEET No. E5 (1)