

## **JORDAN VALLEY WATER CONSERVANCY DISTRICT**

### **JVWTP Air Scour Blower Replacement**

December 6, 2018

**DESCRIPTION OF WORK:** This project supplies one replacement air scour blower package for the Jordan Valley water Treatment Plant East air scour blower. The package consists of one 1200 rpm air scour blower (6.5 psi), one inlet silencer, one outlet silencer, and one pressure relief valve.

A similar air scour blower was recently purchased for the west bower. An alternate bid is requested for an exact equivalent to this 1800 rpm newly purchased blower.

**PROJECT SCHEDULE:** Project schedule on this project is critical. The equipment shall be delivered by May 1, 2019 assuming issuance of a purchase order by January 30, 2019. If the work is not completed within the specified time frame, the bidder herein agrees to accept liquidated damages in the amount of \$500 per day. Alternate bid schedules may be provided with extended delivery dates for consideration but shall not be part of the base bid.

**RECEIPT OF BIDS:** Bids will be received by Jordan Valley Water Conservancy District, attention David McLean at 8215 South 1300 West, West Jordan, Utah 84088, or via email to [dmclean@jvwcd.org](mailto:dmclean@jvwcd.org) before 1:00 pm December 20, 2018.

**OBTAINING CONTRACT DOCUMENTS:** The Contract Documents are entitled: "JVWTP Air Scour Blower Replacement". All Contract Documents may be obtained on the District's website ([www.jvwcd.org](http://www.jvwcd.org)) beginning December 6, 2018. Prospective bidders must register at the District's web site under the project to receive project notifications and addenda, if any. Contractors are required to check the District's web site for any addenda prior to submitting a responsive bid. Bids determined to be non-responsive may be rejected.

JVWCD project manager/contact person: David McLean, PE  
Telephone Number: (801) 565-4300

**Equipment Delivery:** The equipment shall be delivered to the site of the Jordan Valley Water Treatment Plant, 15305 South 3200 West, Herriman, Utah 84065 by the date specified. The equipment will be installed by the purchaser's staff.

**AWARD OF CONTRACT:** An Award of Contract, if awarded, will be made within 30 calendar days of the opening of bids. Contract will be awarded in the best interest of the owner.

**BONDS:** Bid Bonds and Performance Bonds will not be required for this project.

**BIDDER REQUIREMENTS:**. The successful bidder will have completed a minimum of five projects of similar nature. The Owner shall be entitled to contact each and every reference listed by the contractor.

	<u>Job Name/Description</u>	<u>Contact</u>
1.		
2.		
3.		
4.		
5.		

The Bidder shall furnish the information required in the bid schedule. Failure to comply with this requirement may render the Bid non-responsive and subject to rejection. Additional sheets shall be attached as required to indicate compliance of the equipment with the project specifications.

**ADDRESS AND MARKING OF BID:** The envelope enclosing the bid shall be sealed and addressed to the Jordan Valley Water Conservancy District and delivered or mailed to 8215 South 1300 West, West Jordan, Utah 84088. The envelope shall be plainly marked in the upper left-hand corner with the name and address of the bidder and shall bear the words "Bid for," followed by the title of the Contract Documents for the work and the date and hour of opening of bids. Electronic bids shall be submitted to the project manager as an email attachment with the words "Bid for," followed by the title of the Contract Documents for the work and the date and hour of opening of bids in the subject line of the email.

**PROJECT ADMINISTRATION:** All questions relative to this project prior to the opening of bids shall be directed to the Project Manager for the project.

**OWNER'S RIGHTS RESERVED:** The Owner reserves the right to reject any or all bids, to waive any informality in a bid, and to make awards in the interest of the Owner.

Owner/ Engineer  
Jordan Valley Water Conservancy District  
Project Manager: David McLean, PE  
8215 South 1300 West  
West Jordan, Utah 84088  
Telephone: (801) 565-4300  
Email: dmclean @jvwcd.org

JORDAN VALLEY WATER CONSERVANCY DISTRICT

## **INSTRUCTIONS TO BIDDERS**

**WARRANTY:** The successful bidder shall warrant the equipment and installation to be free of defects in materials and workmanship for a period of one (1) year following satisfactory start-up and testing of the equipment.

### **SCOPE OF WORK:**

Supplier shall fabricate, and deliver equipment meeting the contract specifications by the date indicated. Installation of said equipment will be by JWCD staff under supervision of the supplier.

Bid shall include on-site inspection of the installation and equipment start-up by a qualified representative

### **PROJECT SPECIFICATIONS:**

01 33 00 Submittals  
45 05 21 Electric Motors  
43 11 33 Rotary Blowers

### **EXHIBITS:**

Exhibit A-Layout Drawing  
Exhibit B-Check Valve  
Exhibit C-Photos of west blower  
Exhibit D-Photos of east blower (to be replaced)  
Exhibit E-Photos of existing outlet silencer (to be replaced)  
Exhibit F-Submittal of new west blower

**AWARD OF PURCHASE ORDER**

The Jordan Valley Water Conservancy District (Owner) hereby accepts your Bid dated \_\_\_\_\_ . In accordance with your Bid and the Owner’s Contract Documents dated \_\_\_\_\_ , the Owner has created a purchase order in the amount of \$\_\_\_\_\_ for the project entitled “JVWTP Air Scour Blower Replacement”. The completion date is May 15, 2019.

You should sign and return this Award of Purchase Order within 10 calendar days from the date of this notice to you.

Sincerely,

Alan E. Packard, PE  
Assistant General Manager and Chief Engineer

\_\_\_\_\_  
Award Date

**ACCEPTANCE OF AWARD**

\_\_\_\_\_, a corporation qualified to do business in the State of Utah, hereby agrees to perform as specified in its Bid, the Owner’s Contract Documents, and this Award of Purchase Order.

\_\_\_\_\_

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Acceptance Date

Attachments: Bid and bid support data



**BID SCHEDULE**  
**JVWCD Air Scour Blower Replacement**

**BID ITEMS – BID SCHEDULE 1**

Item No.	Description	Quantity	Unit	Unit Price	Item Total
101	Replacement Air Blower Package (1200 rpm, east blower)	1	EA	\$	\$
102	Inlet Filter and Silencer (1200 rpm east blower)	1	EA	\$	\$
103	Pressure Relief Valve (1200 rpm east blower)	1	EA	\$	\$
104	Discharge Silencer 316L SS (for combined pressure piping)	1	EA	\$	\$
105	Discharge Check Valve (east blower, allowance)	1	EA	\$ 13,000.00	\$ 13,000.00
106	Inlet Filter and Silencer (for existing west blower)	1	EA	\$	\$
107	Pressure Relief Valve (for existing west blower)	2	EA	\$	\$
108	Discharge Check Valve (west blower, allowance)	1	EA	\$ 13,000.00	\$ 13,000.00

Total \_\_\_\_\_

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Bid Schedule 1 Bid total in words

**ALTERNATE BID ITEMS – BID SCHEDULE 2**

Item No.	Description	Quantity	Unit	Unit Price	Item Total
101a	Replacement Air Blower Package (1800 rpm east blower, exact match to west blower)	1	EA	\$	\$
102a	Inlet Filter and Silencer (1800 rpm east blower)	1	EA	\$	\$
103a	Pressure Relief Valve (1800 rpm east blower)	1	EA	\$	\$
104a	Discharge Silencer mild steel (for combined pressure piping)	1	EA	\$	\$

**Note:**

- 1 Bidders are not required to submit prices on each and every bid item.
- 2 Owner would award either Item 101 or 101a; but not both.
- 3 Owner would award either Item 102 or 102a; but not both.
- 4 Owner would award either Item 103 or 103a; but not both.

**BID SCHEDULE  
CONTRACTOR INFORMATION**

Bidder (Company name): \_\_\_\_\_

By: \_\_\_\_\_  
(Signature)

Dated: \_\_\_\_\_

Name: \_\_\_\_\_

Title: \_\_\_\_\_

1. Contractor's name: \_\_\_\_\_

2. Contractor's address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Contractor's Primary Contact: \_\_\_\_\_

Email address of Contractor's primary contact: \_\_\_\_\_

Contractor's telephone number: \_\_\_\_\_

3. Utah Department of Commerce Information  
Business Entity Number: \_\_\_\_\_  
Delinquent Date: \_\_\_\_\_

4. Contractor's Utah License Number: \_\_\_\_\_  
Expiration Date: \_\_\_\_\_  
Primary Classification: \_\_\_\_\_  
Supplemental Classification held, if any: \_\_\_\_\_

5. Number of years as a contractor in work of this type:  
\_\_\_\_\_

6. As necessary, attach to your bid technical information showing compliance with the defined scope of work and/or technical specifications.

7. As necessary, attach to your bid technical information showing compliance with the defined scope of work and/or technical specifications.

## SPECIFICATIONS

SECTION 01 33 00  
SUBMITTAL PROCEDURES

**PART 1 GENERAL**

**1.01 SUBMITTALS**

- A. Submittals covered by these requirements include manufacturers' information, shop drawings, test procedures, test results, samples, requests for substitutions, and miscellaneous work-related submittals. Submittals shall also include, but not be limited to, all mechanical, electrical and electronic equipment and systems, materials, reinforcing steel, fabricated items, and piping and conduit details. The supplier shall furnish all drawings, specifications, descriptive data, certificates, samples, tests, methods, schedules, and manufacturer's installation and other instructions as specifically required in the contract documents to demonstrate fully that the materials and equipment to be furnished and the methods of work comply with the provisions and intent of the contract documents.

**1.02 SUPPLIERS'S RESPONSIBILITIES**

- A. General:
1. The Supplier shall be responsible for the accuracy and completeness of the information contained in each submittal and shall assure that the material, equipment or method of work shall be as described in the submittal. The Supplier shall verify that all features of all products conform to the specified requirements. Submittal documents shall be clearly edited to indicate only those items, models, or series of equipment, which are being submitted for review. All extraneous materials shall be crossed out or otherwise obliterated. The Supplier shall ensure that there is no conflict with other submittals and notify the Owner in each case where his submittal may affect the work of the Owner.
  2. The Supplier shall coordinate submittals with the work so that work will not be delayed. He shall coordinate and schedule different categories of submittals, so that one will not be delayed for lack of coordination with another. No extension of time will be allowed because of failure to properly schedule submittals. The Supplier shall not proceed with work related to a submittal until the submittal process is complete. This requires that submittals for review and comment shall be returned to the Supplier stamped "No Exceptions Taken" or "Make Corrections Noted."
  3. The Supplier shall certify on each submittal document that he has reviewed the submittal, verified field conditions, and complied with the contract documents.
  4. The Supplier may authorize in writing a material or equipment Supplier to deal directly with the Owner with regard to a submittal. These dealings shall be limited to contract interpretations to clarify and expedite the work.

**1.03 CATEGORIES OF SUBMITTALS**

- A. General:
- a. Submittals fall into three general categories; Action Submittals - Action Submittals require review and response by the Engineer before the Supplier proceeds with incorporating the equipment, materials, or procedure addressed in a submittal into the work. Review comments for Action Submittals, and the

subsequent actions of the Supplier based on the review comments, shall conform to REVIEW ACTION requirements specified in this section.

- b. Informational Submittals- Informational Submittals are examined to verify that the information has been furnished as specified. If the information has not been furnished as specified the submittal will be returned marked "MAKE CORRECTIONS NOTED" and any deficiencies will be noted. If the information has been furnished as specified the submittal will be returned marked "RECEIPT ACKNOWLEDGED".
  - c. Closeout Submittals – Closeout Submittals consist of documentation that is not available for review at the time Action Submittals are submitted for review or documentation that is typically generated or furnished following incorporation of the equipment, materials, or procedure into the work. Closeout submittals include spare parts inventory listing, spare parts, extra stock materials, special tools and other materials or components that are furnished separate from the installed and completed work. Closeout Submittals require review and response by the Engineer. Closeout Submittal requirements are not satisfied until they have been reviewed and returned marked "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED".
2. At the beginning of work, the Owner will furnish the Supplier lists of those submittals specified in the project manual. Two separate lists will be provided: submittals for review and comment and product data (submittals) for information only.

**B. Submittals for review and comment:**

1. All submittals except where specified to be submitted as product data for information only shall be submitted by the Supplier to the Owner for review and comment.

**C. Submittals (product data) for information only:**

1. Where specified, the Supplier shall furnish submittals (product data) to the Owner for Information only.

## **1.04 TRANSMITTAL PROCEDURE**

**A. General:**

1. All submittals shall be prepared and submitted in electronic format (pdf) complete with cover sheet, index, bookmarks, and applicable specifications with notes acknowledging compliance or calling out deviations for each section.
2. A separate form shall be used for each specific item, class of material, equipment, and items specified in separate, discrete sections, for which the submittal is required. Submittal documents common to more than one piece of equipment shall be identified with all the appropriate equipment numbers. Submittals for various items shall be made with a single form when the items taken together constitute a manufacturer's package or are so functionally related that expediency indicates checking or review of the group or package as a whole.
3. A unique number, sequentially assigned, shall be noted on the transmittal form accompanying each item submitted. Original submittal numbers shall have the following format: "XXX"; where "XXX" is the sequential number assigned by the Supplier. Resubmittals shall have the following format: "XXX-Y"; where "XXX" is the originally assigned submittal number and "Y" is a sequential letter assigned for resubmittals, i.e., A, B, or C being the 1st, 2nd, and 3rd resubmittals, respectively. Submittal 25B, for example, is the second resubmittal of submittal 25.

- a. Prepare resubmittal, if applicable. Clearly identify each correction or change made. Include a response in writing to each of the Engineer's comments or questions for submittal packages that are resubmitted in the order that the comments or questions were presented throughout the submittal. Acceptable responses to Engineer's comments are listed below:
  - 1) "Incorporated" Engineer's comment or change is accepted and appropriate changes are made.
  - 2) "Response" Engineer's comment not incorporated. Explain why comment is not accepted or requested change is not made. Explain how requirement will be satisfied in lieu of comment or change requested by Engineer.
- b. Any resubmittal that does not contain responses to the Engineer's previous comments shall be returned for Revision and Resubmittal. No further review by the Engineer will be performed until a response for previous comments has been received.
- c. Review costs:
  - 1) Costs incurred by Owner as a result of additional reviews of a particular submittal after the second time it has been reviewed shall be borne by Supplier.
  - 2) Reimbursement to Owner will be made by deducting such costs from Suppliers subsequent progress payments.

B. Deviation from contract:

- 1. If the Supplier proposes to provide material, equipment, or method of work which deviates from the project manual, he shall indicate so under "deviations" on the transmittal form accompanying the submittal copies.

C. Submittal completeness:

- 1. Submittals which do not have all the information required to be submitted, including deviations, are not acceptable and will be returned without review.

## 1.05 REVIEW PROCEDURE

A. General:

- 1. Submittals are specified for those features and characteristics of materials, equipment, and methods of operation which can be selected based on the Supplier's judgment of their conformance to the specified requirements. Other features and characteristics are specified in a manner which enables the Supplier to determine acceptable options without submittals. The review procedure is based on the Supplier's guarantee that all features and characteristics not requiring submittals conform as specified. Review shall not extend to means, methods, techniques, sequences or procedures of construction, or to verifying quantities, dimensions, weights or gages, or fabrication processes (except where specifically indicated or required by the project manual) or to safety precautions or programs incident thereto. Review of a separate item, as such, will not indicate approval of the assembly in which the item functions.
- 2. When the contract documents require a submittal, the Supplier shall submit the specified information as follows:
  - a. One electronic (pdf) copy
  - b. Two samples whenever a physical sample or color reference is required.

B. Submittals for review and comment:

1. Unless otherwise specified, within 14 calendar days after receipt of a submittal for review and comment, the Owner shall review the submittal and return to the Supplier. The reproducible original will be retained by the Owner. The returned submittal shall indicate one of the following actions:
  - a. If the review indicates that the material, equipment or work method complies with the project manual, submittal copies will be marked "NO EXCEPTIONS TAKEN." In this event, the Supplier may begin to implement the work method or incorporate the material or equipment covered by the submittal.
  - b. If the review indicates limited corrections are required, copies will be marked "MAKE CORRECTIONS NOTED." The Supplier may begin implementing the work method or incorporating the material and equipment covered by the submittal in accordance with the noted corrections. Where submittal information will be incorporated in O&M data, a corrected copy shall be provided.
  - c. If the review reveals that the submittal is insufficient or contains incorrect data, copies will be marked "AMEND AND RESUBMIT." Except at his own risk, the Supplier shall not undertake work covered by this submittal until it has been revised, resubmitted and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED."
  - d. If the review indicates that the material, equipment, or work method does not comply with the project manual, copies of the submittal will be marked "REJECTED - SEE REMARKS." Submittals with deviations which have not been identified clearly may be rejected. Except at his own risk, the Supplier shall not undertake the work covered by such submittals until a new submittal is made and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED."

C. Submittals (product data) for information only:

1. Such information is not subject to submittal review procedures and shall be provided as part of the work under this contract and its acceptability determined under normal inspection procedures.

**1.06 EFFECT OF REVIEW OF SUPPLIER'S SUBMITTALS:**

A. General:

1. Review of contract drawings, methods of work, or information regarding materials or equipment the Supplier proposes to provide, shall not relieve the Supplier of his responsibility for errors therein and shall not be regarded as an assumption of risks or liability by the Owner, or by any officer or employee thereof, and the Supplier shall have no claim under the contract on account of the failure, or partial failure, of the method of work, material, or equipment so reviewed. A mark of "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED" shall mean that the Owner has no objection to the Supplier, upon his own responsibility, using the plan or method of work proposed, or providing the materials or equipment proposed.

**END OF SECTION**

SECTION 43 05 21  
COMMON MOTOR REQUIREMENTS FOR EQUIPMENT

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
1. Squirrel cage type, AC induction motors, up to 500 HP, for up to 4 poles (3600 or 1800 rpm nominal), or up to 250 HP for over 6 poles (1200 rpm or slower) shall be per NEMA MG1, Small or Medium.
  2. Special purpose motors with features or ratings which are not specified herein, are specified in the particular equipment specifications.

**1.02 REFERENCES**

- A. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

Reference	Title
ABMA 9	Load Ratings and Fatigue Life for Ball Bearings
ABMA 11	Load Ratings and Fatigue Life for Roller Bearings
IEEE 112	Standard Test Procedures for Polyphase Induction Motors and Generators
IEEE 841	Standard for Petroleum and Chemical Industry- Premium-Efficiency, Severe Duty Totally Enclosed Fan-Cooled (TEFC) Squirrel Cage Induction Motors - Up to and Including 500 HP
NEMA ICS 2	Industrial Control and Systems Controllers, Contactors and Overload Relays Rated Not More Than 2000 Volts AC or 750 Volts DC
NEMA 250	Enclosures for Electrical Equipment (1000 volts maximum)
NEMA MG 1	Motors and Generators
Department of Energy	Energy Policy and Conservation Act, Final Rules EERE-2010-BT-STD-0027-0117
UL 674	Electric Motors and Generators for Use in Division 1 Hazardous (Classified) Locations
UL 1004	Electric Motors

**1.03 DEFINITIONS**

- A. Terminology used in this Section conforms with NEMA MG-1. Motors covered in this specification are those defined in NEMA MG1 as Small (Fractional) and Medium (Integral) AC induction motors.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Unit Responsibility: Where Unit Responsibility is specified in the driven equipment sections of these specifications, the motor supplier shall coordinate with the provider of



the driven equipment to verify that the motor provided under this section is fully compatible with and meets the specified performance requirements for that equipment.

## **1.05 SUBMITTALS**

### **A. Action Submittals:**

1. Procedures: Section 01 33 00.
  - a. Copy of this Section, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements.
  - b. Check-marks (✓) to denote full compliance with a paragraph as a whole. Underline deviations and denote by a number in the margin to the right of the identified paragraph. The remaining portions of the paragraph not underlined will signify compliance. Include a detailed, written justification for each deviation.
  - c. Failure to include a copy of the marked-up specification sections with justification(s) for any requested deviation will cause rejection of the entire submittal with no further consideration.
2. Motor Data Sheets specified in this Section.
  - a. Motors in conformance with IEEE 841: Manufacturers to complete IEEE Standard 841 Data Sheet for AC Induction Motors.
  - b. Motor Speed-Torque curve
3. Routine Factory test data for polyphase motors.
  - a. High-potential test.
4. Factory test data, from required dynamometer tests, where specified.
5. Vibration level when measured in accordance with NEMA MG 1, for all IEEE 841 motors, and where elsewhere specified.
6. Motor heating curve, where specified,
7. Motor mounting, outline, dimensions, and weight.
8. Motor bearing and winding RTDs (resistance temperature detector), where specified.
9. Motor winding thermostat or thermistor, where specified.
10. Motor winding space heaters, where specified.
11. Motor nameplate data.

### **B. Informational Submittals:**

1. Procedures: Section 01 33 00.
2. Operation and maintenance manuals.

## **1.06 QUALITY ASSURANCE**

### **A. Factory Testing:**

1. Test each motor as follows
  - a. No load current and speed.
  - b. Locked rotor current.
  - c. Winding Resistance.

- d. Four-hour heat runs. Measure winding and bearing temperature and inspect bearing at end of heat run.
  - e. Hi-pot test in accordance with NEMA MG1-20.47.
  - f. The specified tests shall be performed in accordance with NEMA MG1-12 or MG1-20, as applicable. Copies of the results, plus the computer design calculations printout for efficiency and power factor (at 100 percent, 75 percent and 50 percent of full load) and locked rotor current shall be provided.
- B. Where specified for use in corrosive or hazardous locations, motor testing shall additionally be per IEEE 841. Test report shall be certified by the motor manufacturer's test personnel and submitted to the Engineer.
- 1. For motors larger than 100 horsepower, test and submit results for the following:
    - a. Routine tests per NEMA MG1 and IEEE 112. Provide tests as noted in paragraph 1.05 Factory Testing. Test report shall be certified by the motor manufacturer's test personnel and submitted to the Engineer.
    - b. For motors larger than 200 horsepower, efficiency and power factor by Test Method B, IEEE 112. Submit Form B and B-2.

#### **1.07 DELIVERY, STORAGE AND HANDLING**

- A. Procedures shall be in accordance with Section 43 11 33.

#### **1.08 SPECIAL WARRANTY**

- A. Provide warranty in accordance with Section 43 11 33.
- B. Submit warranties in writing to include 100 percent full payment coverage for parts and labor for repair or replacement of the motor (s) during the warranty period.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. The following candidate manufacturers are capable of producing equipment and/or products that will satisfy the requirements of this Section. The manufacturer's standard product may require modification to conform to specified requirements:
  - 1. Baldor
  - 2. General Electric
  - 3. Siemens
  - 4. US Motors
  - 5. WEG
  - 6. Approved Equal

#### **2.02 PERFORMANCE/DESIGN CRITERIA**

- A. Service Conditions:
  - 1. Temperature: -25-degree C to +40 degree C.
  - 2. Altitude: 4733 feet above sea level minimum.

3. Derate motors for higher ambient temperature and for higher altitude with motor size based on brake-horsepower.
- B. Design Requirements:
1. Operation: Continuous.
  2. Compliance: Energy Policy Act of 1992 (EPAAct), Final Rule 2014.
  3. Tolerance: +/- 10-percent of rated voltage at rated frequency; +/- 5-percent of rated frequency at rated voltage.
  4. Standard design: NEMA Design B.
- C. Service Factor (percent of additional horsepower):
1. 1.15 for sine-wave motors.
  2. Dual rating: 1.15 Sine-wave and 1.0 Inverter Duty for Inverter Duty motors.
- D. Motor Efficiency:
1. NEMA Premium™ efficiency electric motor, single-speed, polyphase, 1-500 horsepower, 3600-rpm 2-pole, 1800-rpm 4-pole, and 1200-rpm 6-pole (1-250 HP), squirrel cage induction motors, NEMA Design B, continuous rated. NEMA Standards Publication MG 1 2011, in Table 12-12.

**Table 12-12**  
**Full-Load Efficiencies for 60 HZ Premium Efficiency Electric Motors**  
**Rated 600 Volts or Less (Random Wound)**

Open Motors								
HP	2 Pole		4 Pole		6 Pole		8 Pole	
	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency
1	77.0	74.0	85.5	82.5	82.5	80.0	75.5	72.0
1.5	84	81.5	86.5	84.0	86.5	84.0	77.0	74.0
2	85.5	82.5	86.5	84.0	87.5	85.5	86.5	84.0
3	85.5	82.5	89.5	87.5	88.5	86.5	87.5	85.5
5	86.5	84.0	89.5	87.5	89.5	87.5	88.5	86.5
7.5	88.5	86.5	91.0	89.5	90.2	88.5	89.5	87.5
10	89.5	87.5	91.7	90.2	91.7	90.2	90.2	88.5
15	90.2	88.5	93.0	91.7	91.7	90.2	90.2	88.5
20	91.0	89.5	93.0	91.7	92.4	91.0	91.0	89.5
25	91.7	90.2	93.6	92.4	93.0	91.7	91.0	89.5
30	91.7	90.2	94.1	93.0	93.6	92.4	91.7	90.2
40	92.4	91.0	94.1	93.0	94.1	93.0	91.7	90.2
50	93.0	91.7	91.5	93.6	94.1	93.0	92.4	91.0
60	93.6	92.5	95.0	94.1	94.5	93.6	93.0	91.7
75	93.6	92.4	95.0	94.1	94.5	93.6	94.1	93.0
100	93.6	92.4	95.4	94.5	95.0	94.1	94.1	93.0
125	94.1	93.0	95.4	94.5	95.0	94.1	94.1	93.0
150	94.1	93.0	95.8	95.0	95.4	94.5	94.1	93.0
200	95.0	94.1	95.8	95.0	95.4	94.5	94.1	93.0
250	95.0	94.1	95.8	95.0	95.8	95.0	95.0	94.1
300	95.4	94.5	95.8	95.0				
350	95.4	94.5	95.8	95.0				
400	95.8	95.0	95.8	95.0				
450	96.2	95.4	96.2	95.4				
500	96.2	95.4	96.2	95.4				

**Table 12-12**  
**Full-Load Efficiencies for 60 HZ Premium Efficiency Electric Motors**  
**Rated 600 Volts or Less (Random Wound)**

Enclosed Motors								
HP	2 Pole		4 Pole		6 Pole		8 Pole	
	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency
1	77.0	74.0	85.5	82.5	82.5	80.0	75.5	72.0
1.5	84.0	81.5	86.5	84.0	87.5	85.5	78.5	75.5
2	85.5	82.5	86.5	84.0	88.5	86.5	84.0	81.5
3	86.5	84.0	89.5	87.5	89.5	87.5	85.5	82.5
5	88.5	86.5	89.5	87.5	89.5	87.5	86.5	84.0
7.5	89.5	87.5	91.7	90.2	91.0	89.5	86.5	84.0
10	90.2	88.5	91.7	90.2	91.0	89.5	89.5	87.5
15	91.0	89.5	92.4	91.0	91.7	90.2	89.5	87.5
20	91.0	89.5	93.0	91.7	91.7	90.2	90.2	88.5
25	91.7	90.2	93.6	92.4	93.0	91.7	90.2	88.5
30	91.7	90.2	93.6	92.4	93.0	91.7	91.7	90.2
40	92.5	91.0	94.2	93.0	94.1	93.0	91.7	90.2
50	93.0	91.7	94.5	93.6	94.1	93.0	92.4	91.0
60	93.6	92.5	95.0	94.1	94.5	93.6	92.4	91.0
75	93.6	92.4	95.4	94.5	94.5	93.6	93.6	92.4
100	94.1	93.0	95.4	94.5	95.0	94.1	93.6	92.4
125	95.0	94.1	95.4	94.5	95.0	94.1	94.1	93.0
150	95.0	94.1	95.8	95.0	95.8	95.0	94.1	93.0
200	95.4	94.5	96.2	95.4	95.8	95.0	94.5	93.6
250	95.8	95.0	96.2	95.4	95.8	95.0	95.0	94.1
300	95.8	95.0	96.2	95.4				
350	95.8	95.0	96.2	95.4				
400	95.8	95.0	96.2	95.4				
450	95.8	95.0	96.2	95.4				
500	95.8	95.0	96.2	95.4				

## 2.03 MATERIALS

- A. Motor frames:
  - 1. TEFC motors shall be cast iron.
  - 2. Aluminum frame motors are not permitted.
- B. Stator windings:
  - 1. Shall be copper with Class F minimum insulation not to exceed Class B temperature rise of 80-degree C at rated load and with Design B torque /current characteristics for all Medium (Integral) motors.
  - 2. Small (fractional) motors shall be supplied with Class F insulation where available.
- C. Rotor material shall be aluminum or copper.
- D. Fans shall be non-sparking fan blades.
- E. Motor leads shall be non-hygroscopic.

## 2.04 MOTOR TYPES

- A. General Requirements for motors 1/2 horsepower through 500 horsepower:
  - 1. Three phase, squirrel cage, with copper windings.
  - 2. Rated for full voltage starting and continuous duty.
  - 3. Rating shall be:
    - a. 460volts, three-phase, 60-Hertz.
  - 4. Severe Duty Type Motors, which may also be called Type 2 per the project equipment specifications, shall be in accordance with IEEE 841.
    - a. Totally Enclosed Fan-Cooled Motors (TEFC) shall be defined per NEMA MG1.
    - b. Enclosure: totally enclosed, fan cooled, with external fan blowing air to the motor frame cooling fins for cooling.
    - c. Applications: severe duty and most outdoor installations.
    - d.

## 2.05 COMPONENTS

- A. Thermal Protection:
  - 1. Motors larger than 50 horsepower up to and including 250 horsepower:
    - a. Unless another form of thermal protection is specified in the driven equipment specification, provide a NEMA Type 1 temperature sensing device embedded in the motor winding which is sensitive to motor running over temperature.
    - b. Sensor: Wired to a terminal strip on the motor.
    - c. Motor Nameplate: Marked "OVER TEMP PROT 1" in accordance with NEMA MG 1 12.43.
  - 2. Motors larger than 250 horsepower:

- a. Unless another form of thermal protection is specified in the driven equipment specification, provide 100 ohm platinum RTDs, two per phase embedded in each winding phase.
- b. RTDs shall be brought out to a separate control terminal box mounted on the motor.
- c. Motor Nameplate: Marked "OVER TEMP PROT 1" in accordance with NEMA MG 1 12.43.

B. Motor Nameplates:

1. Materials: Engraved or stamped stainless steel.
2. Features shall be as follows:
  - a. NEMA Standard MG 1 motor data.
  - b. Permanently fastened to the motor frame.
  - c. ABMA bearing identification number for motors meeting IEEE 841.
  - d. NEMA nominal efficiency for all motors.
  - e. NEMA nominal and minimum efficiency for motors meeting IEEE 841.
  - f. Space heater data.
  - g. Over Temperature Protection Type Number.
  - h. Temperature device rating and alarm and shutdown setpoint.

C. Conduit Boxes:

1. Provide oversized boxes, with split construction with threaded hubs and petroleum-resistant gaskets.
2. Conduit boxes can be rotated in order to permit installation in any of four positions 90 degrees apart.
3. Provide grounding lug located within the conduit box for ground connection.
4. Provide separate conduit boxes for temperature devices and space heaters.
5. Separate terminal box for any signal leads (RTD, thermistor, vibration transmitter, etc.).

D. Bearings:

1. Provide grease lubricated ball bearings, and cylindrical bearings for radial-only loads.
2. Rated for a minimum L-10 life of 50,000 hours for direct-connected loads.
3. Cartridge type bearings will not be accepted.
4. Fitted with lubricant relief fittings.

E. Bearing lubrication shall be grease as per these requirements:

1. Grease lubricated bearings:
  - a. Shall be for electric motor use only.
  - b. Grease shall be capable of higher temperatures associated with electric motors and shall be compatible with Polyurea-based greases.
  - c. Provide grease fittings, similar to Alemite™ type (or equivalent).
  - d. Shielded bearings with re-greasable provisions are permissible.

F. Lifting Eyes:

1. Provide lifting eyes with a safety factor of 5.
2. Provide one lifting eye for motors more than 50 pounds.
3. Provide two lifting eyes for motors over 150 pounds.

## **2.06 FINISHES**

- A. Paint Finish:
1. Provide standard manufacturer paint finish.
  2. Provide motors with semi-gloss finish, scratch and heat resistance electric motor paint.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Delivery Inspection:
1. Inspect driven equipment-motor assembly and components immediately upon delivery and unloading at the job site for damages.
  2. Take photos of damage(s) if any, to substantiate the delivery inspection report.

### **3.02 INSTALLATION**

- A. Grounding of Motors:
1. Connect the motor feeder ground cable (green) to the grounding lug terminal in the conduit terminal box.

### **3.03 FIELD QUALITY CONTROL**

- A. Field Testing:
1. Measure winding insulation resistance of motors to no less than 10-megohm with a 1000-Vac megohmmeter.
  2. Perform motor phases current imbalance testing for motors 20 horsepower and larger.
  3. Test motors for proper rotation prior to connection to the driven equipment.
  4. Perform thermographic survey per NETA ATS, for motors over 100 horsepower.
- B. Field Inspection:
1. Compare equipment nameplate data with drawings and specifications.
  2. Inspect physical and mechanical condition.
  3. Inspect anchorage, alignment, and grounding.
  4. Verify the installation of breather fittings as specified herein.
  5. Check for proper connections of space heaters, winding and RTDs and or thermostats.
  6. Visually check for correct phase and ground connections:
- C. Manufacturer Services: Provide where specified.



1. Provide services to the driven equipment manufacturer for the inspection and certification of the installation of the motor driven equipment.
2. Provide assistance in the start up and operational testing of the motor driven equipment.

#### **3.04 SYSTEM START UP**

- A. Commissioning Test: Provide where specified or shown on the drawings.
  1. Provide assistance during the commissioning test of the motor driven equipment.

#### **3.05 CLOSEOUT ACTIVITIES**

- A. Operation and Maintenance:
  1. Provide the operation and maintenance manual of the motor(s). Include testing result information in the O&M manual.

**END OF SECTION**

SECTION 43 11 33  
ROTARY POSITIVE DISPLACEMENT BLOWERS

**PART 1 GENERAL**

**1.01 DESCRIPTION**

**A. BACKGROUND:**

1. The Jordan Valley Water Treatment Plant (JVWTP), located in Herriman, UT, has two existing rotary-lobe positive displacement blowers that run in a duty/standby configuration to provide air scour for filter backwashes. The west blower was replaced in the spring of 2018. The blower specified in this section shall replace the east blower.
  - a. Refer to Exhibit A for record drawings showing the existing blower room and dimensional restrictions.
  - b. Refer to Exhibit B for images of the existing unit to be replaced. The selected blower shall fit within the dimensional constraints as shown in these references.
  - c. Supplier is encouraged to make a site visit before submitting a proposal.

**B. SCOPE:**

1. This section specifies rotary-lobe positive displacement air blowers suitable for constant speed service. The blower(s) will supply air to an air scour system for filter backwashes at a water treatment plant. Included with each blower shall be the drive motor, base, vibration isolation, inlet filter, inlet silencer, discharge silencer, discharge flexible coupling, pressure relief valve, and other appurtenances as required to provide a complete and operational system.
2. Owner will install the blower and appurtenances, with installation support and startup services provided by the blower Supplier.

**C. DEFINITIONS:** Terminology used in this Section conforms to the following definitions:

1. **STANDARD CUBIC FEET PER MINUTE (scfm):** The volumetric flow rate in cubic feet per minute at 68°F, 14.70 pounds per square inch absolute pressure, and 36 percent relative humidity.
2. **ABSOLUTE PRESSURE:** Total pressure measured from an absolute vacuum. Units are pounds per square inch absolute (psia).
3. **GAUGE PRESSURE:** The amount by which total pressure exceeds atmospheric pressure. Units are pounds per square inch gauge (psig).
4. **INLET PRESSURE:** The upstream pressure prior to any losses associated with the blower assembly.
5. **DISCHARGE PRESSURE:** The pressure at the blower discharge at site conditions. Units are pounds per square inch gauge (psig).
6. **CAPACITY:** the net rate of flow compressed and delivered, expressed in terms of standard cubic feet per minute (scfm) at the prevailing inlet temperature and pressure. Measure airflow on the discharge side of the compressor at zero percent tolerance.

D. TYPE:

1. Blower shall be rotary lobe, positive displacement type vertical flow (to match existing pipe configuration) and straight two-lobe involute impellers. Blower and appurtenances shall be designed for air scour service.

E. EQUIPMENT LIST:

Equipment Number	Equipment Name
ME-66	East Air Scour Blower

1. Each blower shall include the following accessories. Accessory tag numbers will be determined by Owner.
  - a. Inlet silencer
  - b. Inlet filter
  - c. Filter differential pressure gauge
  - d. Discharge silencer
  - e. Motor winding heater
  - f. Motor temperature switch
  - g. Pressure relief valve
  - h. Check valve

F. PERFORMANCE AND DESIGN REQUIREMENTS:

1. GENERAL: The blower provided under this section will be operated in a duty/standby configuration to produce air for the air scour system.
  - a. PERFORMANCE REQUIREMENTS: The equipment provided under this section shall meet the following performance requirements:

Equipment Number	Design Discharge Capacity, cfm <sup>c</sup>	Design Discharge Pressure, psig <sup>b, c</sup>	Type of Equipment
ME-66	5200	6.5	East Air Scour Blower

Notes:

<sup>a</sup> Cubic feet per minute (cfm) based on average air conditions at the project location

<sup>b</sup> Discharge pressure as measured at the blower's discharge pressure gauge.

<sup>c</sup> The blower must develop this airflow and discharge pressure under normal operation under all atmospheric conditions as specified below.

2. In order to prevent the generation of excessive noise by the blowers, the speed of the blowers shall be limited as described below, and the drive motors shall be of the low noise type whose unloaded noise level shall not exceed 85 dBA measured at 3 feet. Noise performance shall be expressed as sound pressure levels (SPL) in decibels as read on the "A" weighting scale of a standard sound meter (dBA); all measurements shall be made in relation to a reference pressure of 0.0002 microbar. Factory noise tests shall be performed with the blower operating at the design airflow with the design discharge pressures at the outlet silencers.
3. DESIGN REQUIREMENTS: The equipment provided under this section shall meet the following design requirements:

Equipment Number	Blower Design Speed, rpm	Max Motor Power, HP <sup>a</sup>	Max Motor Speed, rpm	Inlet Filter Pressure Loss, psig <sup>b</sup>	Intake and Discharge Silencer Combined Maximum Pressure Loss, psig
ME-66	1200	-	1200	0.10	0.50

Notes:

<sup>a</sup> Motor shaft ampere draw shall not exceed the nameplate motor rating when the discharge pressure is 1 psi above the design value, under all ambient air conditions.

<sup>b</sup> Pressure loss including clean filter and filter housing.

4. OPERATING CONDITIONS: The blower will be installed indoors. The blower shall meet the specified performance and design requirements under the following atmospheric conditions:

Item	Normal
Elevation, feet	4733
Barometric pressure, psia	12.35
Temperature, degrees F	70.0
Relative humidity, percent	36.0
Maximum inlet temperature, degrees F	95
Minimum inlet temperature, degrees F	10

G. VIBRATION:

1. Vibration testing shall be performed by the Supplier. Equipment shall operate without any lateral or torsional vibration characteristics that may accelerate wear. The Supplier shall provide manufacturer's certification that the manufacturer has inspected the machine under operating conditions and found it to comply with the requirements of this paragraph.

1.02 QUALITY ASSURANCE

A. MANUFACTURER'S QUALIFICATIONS:

1. The equipment provided under this section shall be the product of a firm regularly engaged in the design and manufacture of this type of equipment.
2. Equipment furnished under this Section shall be the product of a single manufacturer able to demonstrate a minimum of ten North American installations with blowers having capacities 200 hp or greater and no less than five years of continuous operation at each installation.

B. UNIT RESPONSIBILITY:

1. The Supplier shall provide the blower as part of a complete system including all appurtenances to make a complete and operable system. The Supplier shall select all components of the system to assure compatibility, ease of construction, and efficient maintenance.

2. The Supplier shall coordinate selection and design of all system components such that all equipment furnished under the purchase order, including equipment specified in other Sections but referenced in the purchase order documents, is compatible and operates properly to achieve the performance requirements specified.

C. FACTORY TEST:

1. Perform manufacturer's standard test, which shall at a minimum comply with the requirements of ISO 1217.
  - a. TEST PLAN: Submit a test plan prior to proposing a test date. The Engineer will review the test plan and provide comments within 14 days of receipt. Schedule test date a minimum of 30 days after the factory test plan is designated Code 1 or Code 2 per Section 01 33 00. At a minimum, the test plan should include:
    - 1) Proposed test date and location.
    - 2) Identification of manufacturer's test engineer responsible for executing the test plan.
    - 3) Operating conditions to be verified.
    - 4) Conversions required, if any, to calculate the equivalent flow rate and pressure to simulate operating conditions specified in this Section.
    - 5) Test plan definitions, abbreviations, and parameters.
    - 6) A detailed description of the test procedures.
    - 7) Test facility arrangement including piping and instrument locations.
    - 8) A detailed description of the test facility instruments including type, make, model, and range.
    - 9) Instrument calibration results and sensor accuracy.
    - 10) Equations, conversions, and calculations to be used to convert raw data into test results.
    - 11) Pass/fail criteria for all factory tests.
      - a) Format for presenting testing results, clearly indicating outcome of all testing performed, and comparison of results to the pass/fail criteria.
    - 12) Test each motor as follows:
      - a) No load current and speed.
      - b) Locked rotor current.
      - c) Winding resistance.
      - d) Four-hour heat runs. Measure winding and bearing temperature and inspect bearing at end of heat run.
      - e) Hi-pot test in accordance with NEMA MG1-20.47.
      - f) The specified tests shall be performed in accordance with NEMA MG 1-12 or MG 1-20, as applicable. Copies of the results, plus the computer design calculation printout for efficiency and power factor (at 100 percent, 75 percent and 50 percent of full load) and locked rotor current shall be provided.
  - b. FACTORY TEST REPORT: Once testing is complete and the data evaluated, submit a test report. Test report shall include, as a minimum:
    - 1) The entire test plan including any revisions made between the submittal of the test plan and the actual test.

- 2) Identification of attendees witnessing the test.
- 3) Manufacturer, model, and serial number of each unit.
- 4) Raw data and the time of each recording.
- 5) Equations, conversions, and calculations used to convert raw data into test results.
- 6) Verification that the specified operating requirements have been met.
- 7) Motor test results.
- 8) Comments provided based on review of the test plan (if any) as well as agreed upon resolution.
- 9) Signature of a manufacturer's representative certifying the test results as accurate.

**D. REFERENCES:**

1. This paragraph references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

Reference	Title
AISI-85	Pocket Book of AISI Standard Steels
ANSI H35.1-90	Alloy and Temper Designation Systems
ANSI/IEEE 112-91	Polyphase Induction Motors and Generators
ISO 1217	Displacement Compressors – Acceptance Criteria
ASTM A36/A36M-93	Structural Steel
ASTM A48-94	Gray Iron Castings
NEMA MG1	Motors and Generators

**1.03 SUBMITTALS**

- A. The following submittals shall be provided in accordance with Section 01 33 00:
1. A copy of the contract document, control diagrams and process and instrumentation diagrams relating to the submitted equipment, with addendum updates that apply to the equipment in this section, marked to show specific changes necessary for the equipment proposed in the submittal. If no changes are required, the drawing or drawings shall be marked "no changes required". Failure to include copies of the relevant drawings with the submittal shall be cause for rejection of the entire submittal with no further review.
  2. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated and, therefore requested by the Supplier, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph. The remaining portions of the paragraph not underlined will signify compliance on the part of the Supplier with the specifications. The submittal shall be

accompanied by a detailed, written justification for each deviation. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

3. Manufacturer's catalog data and shop drawings confirming dimensions, weight, construction, and installation details of blower and all associated equipment.
4. Predicted performance data and/or curves as applicable developed for the specific application, confirming conformance to specified design and operating requirements and characteristics. Capacity shall be shown in inlet acfm and scfm. All performance parameters shall reflect site conditions as specified in this Section.
5. Spatial requirements, showing clearances required for maintenance purposes.
6. Motor data as specified in Section 43 05 21.
7. Manufacturer's Warranty. The equipment shall be warranted by the Manufacturer for a minimum one-year period after the date of final acceptance. Whenever available, longer warranties on subassemblies or individual equipment items shall be given. Wear items may be prorated for any warranty over one year.
8. Weight of largest element.
9. Manufacturer's detailed recommendations for installation and start-up.
10. Provide name and expected usage of all oil / grease / lubrication requirements for the first two years of operation. Assume the equipment is operated continuously under design conditions. This should include initial fill.
11. Recommendations for short and long-term storage.
12. List of required spare parts and special tools.
13. Operating noise levels shall be provided for the motor and blower combination. Noise shall be expressed as sound pressure levels (SPL) in decibels as read on the "A" weighting network of a standard sound level meter (dBa); all measurements shall be made in relation to a reference pressure of 0.0002 microbar.
14. Special requirements, showing clearances required for maintenance purposes.
15. Proposed testing procedures.
16. Factory test report.
17. Installation list demonstrating the manufacturer's required qualifications as specified in 1.02.A.

#### **1.04 ENVIRONMENTAL CONDITIONS**

- A. The equipment furnished under this section shall be suitable for installation and operation indoors.

#### **1.05 SHIPMENT, PROTECTION AND STORAGE**

- A. The equipment to be furnished under this section shall be shipped to the site with weathertight covers on all piping and electrical connections and all shaft housing penetrations sealed in a manner which shall protect against damage from the elements and deterioration of the equipment due to moisture, corrosive gases, dirt and debris.

- B. MONITORING:

1. Affix a recording accelerometer to each separately packed assembly or packing crate and record the magnitude of sudden impacts in three directions (X, Y, Z) with both time and "g" force scale. The data shall be provided in digital form that can be downloaded to a computer. Suggested accelerometer suppliers include: Sensr, Impact-O-Graph, Impact Register, and Bruel & Kjaer.
  2. The Owner may refuse the equipment if recording accelerometers were not supplied, properly installed, and actuated.
  3. Upon arrival, immediately notify the Owner; remove the accelerometer in the presence of the Owner. The Owner will review the acceleration data. If the magnitude of the maximum acceleration exceeds 3.0 g, the Owner may require dismantling, inspecting, or testing of the equipment by the manufacturer's representative to investigate any damage.
  4. Correct all damage to the complete satisfaction of the Owner before the assembly is incorporated into the Work.
  5. Pay all costs arising out of dismantling, inspection, testing, repair, and reassembly, even if no damage is found.
- C. SHIPMENT: Package equipment in crating constructed for normal shipping, handling and storage, and deliver, FOB Jordan Valley Water Treatment Plant. Damaged items will not be permitted except in cases of minor damage that can be satisfactorily repaired and are accepted in writing by the Engineer. Ship according to manufacturer's instructions and recommendations and provide protection against damage from moisture, dust, handling, or other cause during transport from manufacturer's premises to site.

## PART 2 PRODUCTS

### 2.01 ACCEPTABLE PRODUCTS

- A. Rotary lobe positive displacement blowers shall be Tuthill, Roots, Gardner Denver/Sutorbilt, or Kaeser, modified to meet the requirements of this section. Consideration of alternate manufacturers is at the sole discretion of the Owner.

### 2.02 MATERIALS

Component	Material
Housing	ASTM A48 Grade 35 or Equivalent
Impeller	ASTM A48 Grade 35 or Equivalent
Shaft	ASTM 1038 CS or Equivalent
Inter connecting piping between components	Carbon Steel
End plates	Cast iron
Timing gears	Carburized and ground alloy steel

### 2.03 EQUIPMENT FEATURES

- A. GENERAL:
1. The blowers shall be complete with compressor, motor, and accessories as a package system.



B. BLOWER:

1. Blowers shall be the rotary lobe, positive displacement type. The blowers shall have vertical inlets and discharges.
2. The blower shall be rated for intermittent duty and shall have labyrinth air seals. Pressure rating of blower shall be 125 percent of design pressure. Rotors shall be ductile iron and shall be statically and dynamically balanced to assure vibration-free operation. Drive end bearings shall be grease lubricated or oil splash lubricated and gear end bearings and gears shall be oil splash lubricated. Air vents shall be provided between the seals and the rotor chamber to relieve the air pressure on the seals. Blower shall have lifting eye to facilitate removal from enclosure. Bearings shall have a minimum L-10 bearing life of 100,000 hours at design-rated pressure and flow rate.
  - a. Oil and grease shall be NSF approved and/or food grade.

C. MOTOR:

1. Blowers shall be provided with Type 2 TEFC, premium efficient motors as specified in Section 43 05 21. Provide with isolated bearings or grounded motor shaft. Motors and blowers shall be direct drive coupled. Provide winding heaters and motor winding over-temperature protection. Motor high winding temperature trip setpoint shall be identified in the submittal drawings or stamped on the motor nameplate.
2. Motor shall comply with the submittal and grounding requirements set forth in Section 43 05 21.

D. SILENCERS AND FILTERS:

1. Each blower shall include one discharge silencer having an operating differential pressure of not more than the listed in paragraph 1.01.D.3 at design capacity. This silencer will be installed on the combined outlet piping from the two alternating blowers (only one blower at a time operates). Combined discharge silencer shall be of all-welded 316L Stainless Steel construction (bid alternate for mild steel construction). Discharge silencer shall utilize acoustic absorption and baffling for noise attenuation and pulsation control, and shall be the straight through type end-inlet, end-outlet to replace the existing silencer. Discharge silencer shall have 16-inch flanged connections, a bottom drain with NPT plug, and shipped separately for field mounting in piping system. Silencers shall be as manufactured by Stoddard, Universal, or equal and shall meet the maximum pressure loss requirements specified.
2. Each blower shall be equipped with an intake filter(s) as manufactured by Stoddard, Universal F64 with optional A40-108 Pressure Drop Indicator or equal. Filter shall be located indoors and shall be integral with the inlet silencer. Filter media shall be pleated polyester felt. Filter shall be rated for not less than 99% efficiency on particles larger than 10 microns. Clean filter pressure drop shall not exceed that specified in paragraph 1.01.D.3. Housing shall be painted steel with one cartridge per housing. All metal joints shall be sealed to prevent dirt and air from bypassing the filter media.
3. Each blower shall be equipped with an intake silencer(s) as manufactured by Stoddard, Universal, or equal. Silencer(s) shall be of all-welded mild steel construction (painted) and shall utilize acoustic absorption and baffling for noise attenuation and pulsation control, and shall be the top inlet, bottom outlet type. The silencer shall be provided with connections to match pipe size for inlet, including a

manifold if multiple silencers/filters are required. Silencers shall meet the maximum pressure loss requirements specified.

**E. EQUIPMENT BASE:**

1. The motor and blower shall be mounted to an integral equipment base. Forklift provisions to be integral with the base. The base shall have open end for easy fork lifting of package with fork slots for easy maneuverability and fork slot covers as standard.
2. The blower shall have vibration isolation pads; pads shall be provided to minimize transmitted vibration from the blower package base to the support level or surrounding structures where the blower is situated.

**F. PRESSURE RELIEF VALVE:**

1. The blower shall be provided with one adjustable pressure relief valve shipped separately for field mounting to the existing piping. The valve shall act as a safety device releasing air to the atmosphere should line pressure exceed levels that may cause overloading of blower motors.
2. Pressure relief valves shall be of the spring-type, Anderson Greenwood Type 4130 or equal. Valve seats, cylinders, body and valve stem shall be constructed of 316 stainless steel. Valves shall be sized for full blower capacity; initial valve setting shall be 0.5 psi above the design discharge pressure.

**G. CHECK VALVE:**

1. The check valve shall be a low opening pressure check valve
2. The check valve shall be constructed of 316 stainless steel
3. Flexi-Hinge Series 504 or equal (bid schedule allowance provided)
4. Reference Exhibit B.

**H. FLEXIBLE CONNECTOR:**

1. Flexible connectors/expansion joints shall be provided for the blower discharge connection. Flexible connectors shall be flanged and suitable for pressures up to 55 psig and temperatures up to 350 degrees F. Flexible connectors shall be Unaflex model 150 EPDM or equal and shall have a wire reinforced dacron body with EPDM tube and cover and stainless steel retaining rings. The flexible connectors at the blower discharge shall be restrained with steel expansion control units.

**I. COATINGS:**

1. All motors, pumps, drives and valves shall be shipped with the manufacturer's standard coatings.

**2.04 SPARE PARTS**

A. These spare parts shall be provided for each blower:

Item	Quantity
Filter elements	(2) sets per blower
Blower spare parts kit	(1) set per blower

## **2.05 PRODUCT DATA**

- A. The following information shall be provided:
  - 1. All operation and maintenance information.
  - 2. Vibration information
  - 3. Motor data.
  - 4. Wiring and connection diagrams indicating all electrical connections.
  - 5. Piping connections, locations, sizes, and details for all fittings.
  - 6. Proposed testing and start-up procedures.
  - 7. Testing report specified in paragraph 3.02.
  - 8. Warranty specified in paragraph 3.04.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. The package shall be pre-assembled including all accessories (which can reasonably be included the pre-assembled blower package), ready for operation. The inlet silencer, discharge silencer and pressure relief valve shall be provided separately.
- B. The Supplier shall provide factory-trained personnel to supervise commissioning and testing for 1 day. The blowers shall be aligned, connected and installed by the Owner at the locations shown and in accordance with the manufacturer's recommendations. The Supplier shall provide an installation certificate form.

### **3.02 START-UP AND TESTING**

- A. The equipment provided under this section shall be started and tested only under the direction of personnel approved by the equipment manufacturer. To that end, the Supplier shall cause the manufacturer to furnish start-up and testing specialist(s) that has been factory trained in the proper procedures for initial installation, initial testing, and commissioning of the equipment. All such activities shall be performed under the direction of these specialist(s).
- B. Test procedures shall contain the following features:
  - 1. Static tests of all control and protective circuits.
  - 2. Not less than two cold starts.

### **3.03 TRAINING**

- A. The Supplier shall cause the equipment manufacturer, as a part of the commissioning services, to provide not less than 2 hours of on-the-job training. Training shall include the following:
  - 1. Rotary lobe blower theory.

2. General operational information for the specific equipment provided under this section.
3. Troubleshooting and routine maintenance.
4. Assembly and disassembly.

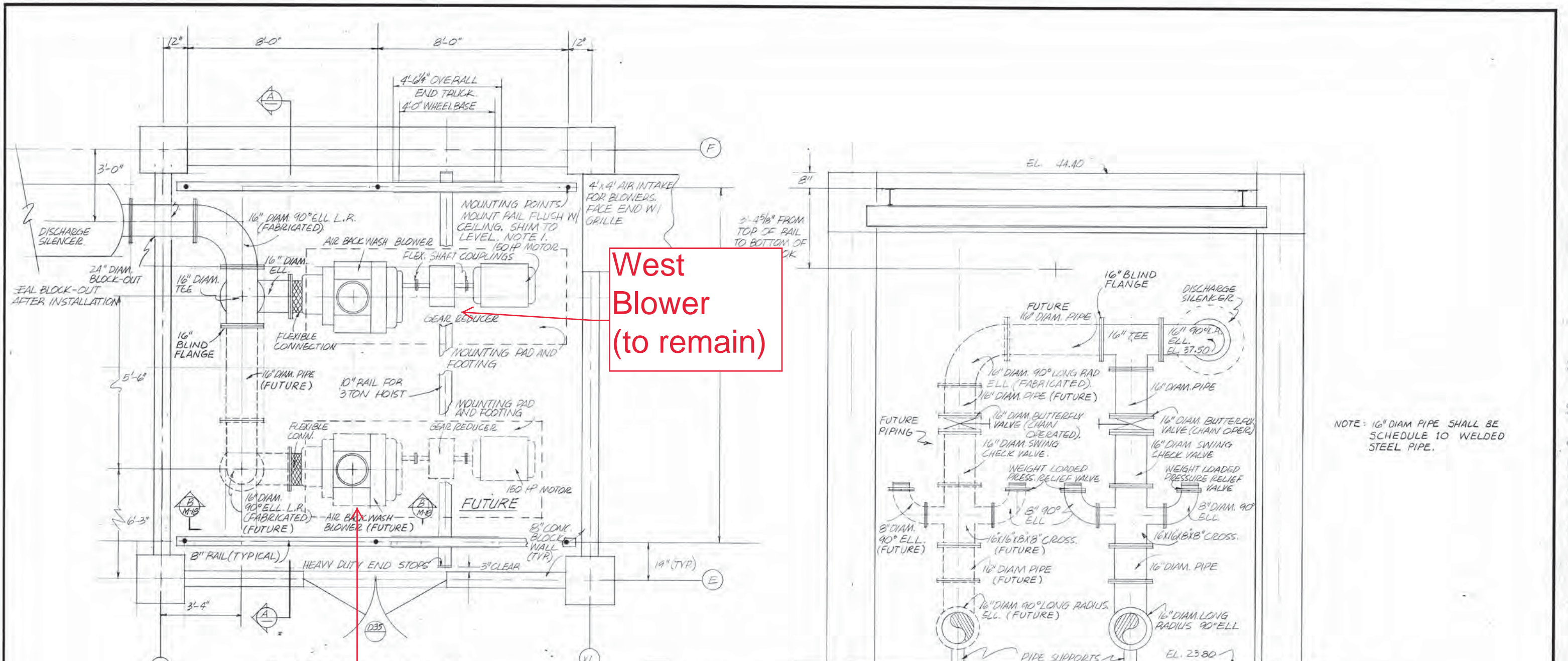
#### **3.04 SYSTEM WARRANTY**

- A. All equipment furnished under this section shall be warranted to be free from defects in material and workmanship for a period of 12 months after final acceptance of the installation or 18 months after delivery, whichever occurs first.

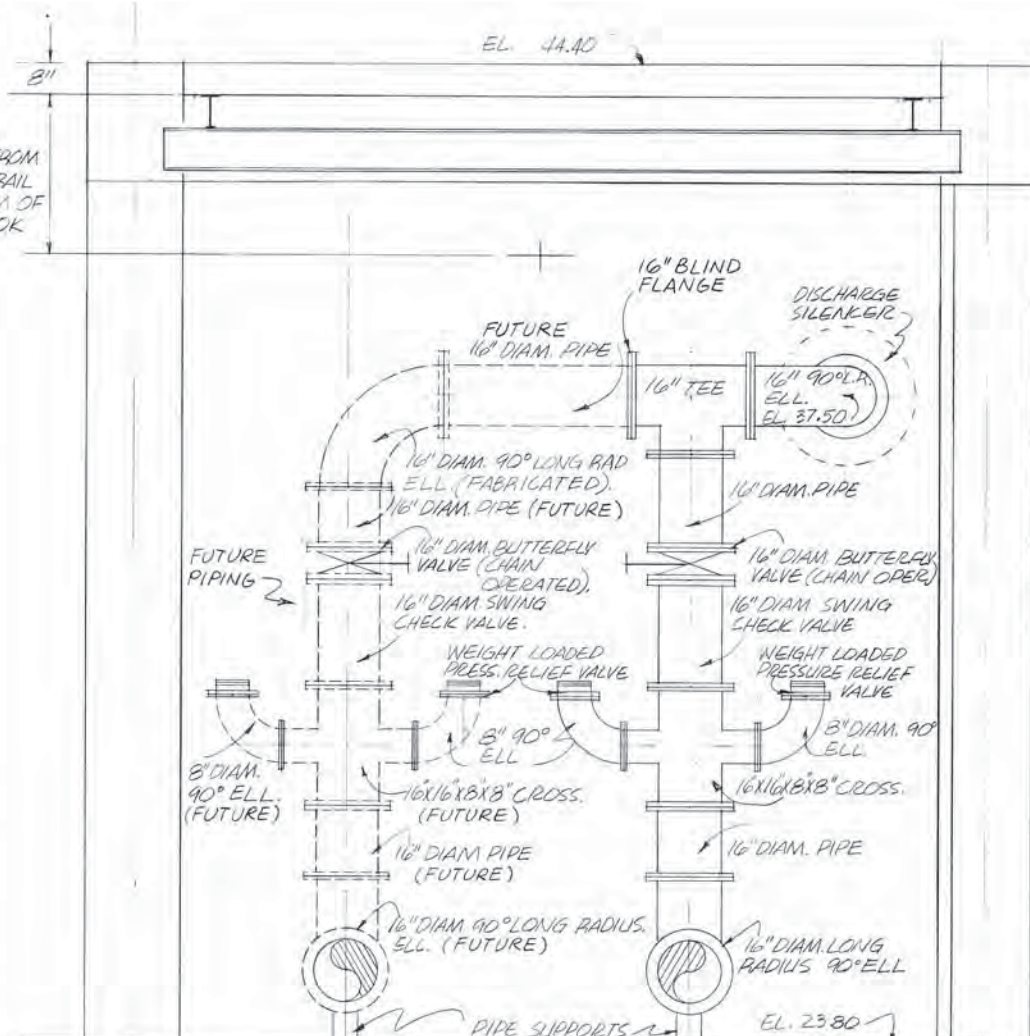
**END OF SECTION**

## Exhibit A-Layout drawing





PLAN-BACKWASH BLOWER RM.-  
SCALE 1/2" = 1'-0"

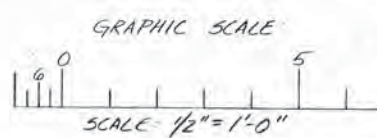


SECTION A  
SCALE 1/2" = 1'-0"

NOTE: 16" DIAM PIPE SHALL BE SCHEDULE 10 WELDED STEEL PIPE.

SECTION A  
SCALE 1/2" = 1'-0"

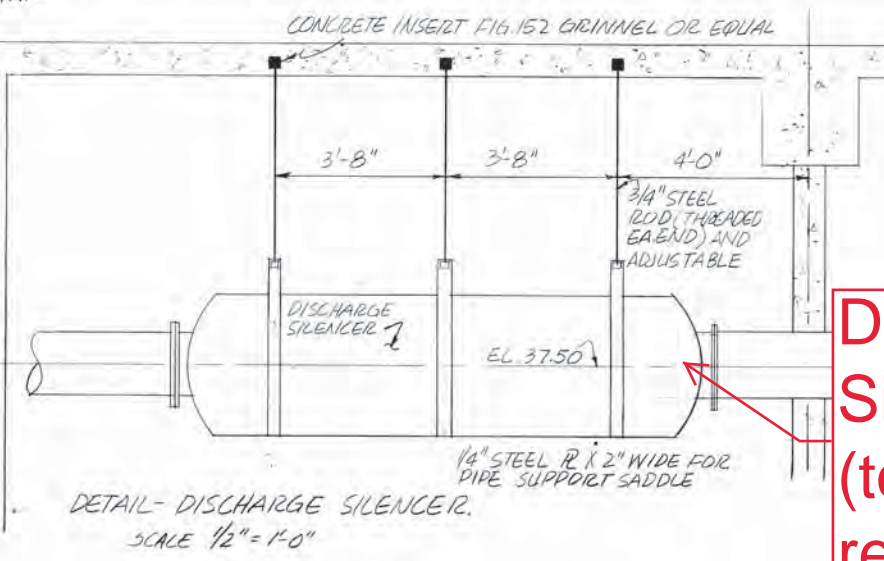
NOTE:  
BACKWASH BLOWERS SIZE BASED UPON A VELOCITY OF 50 FT./SEC. AND A FLOW RATE OF 4224 CUBIC FT./MIN. (ACTUAL) AT AN ALTITUDE OF 5000 FT. DISCHARGE PRESSURE TO BE 6 PSIG @ BLOWER.



NOTE 1. MOUNT RAILS WITH 4 (FOUR) 5/8" DIAMETER ANCHOR BOLTS PER MOUNTING POINT. USE 15" LONG, HOOKED ANCHOR BOLTS WITH 1 1/2" PROJECTING. SUPPLY WITH HEX NUT

East Blower (to be replaced)

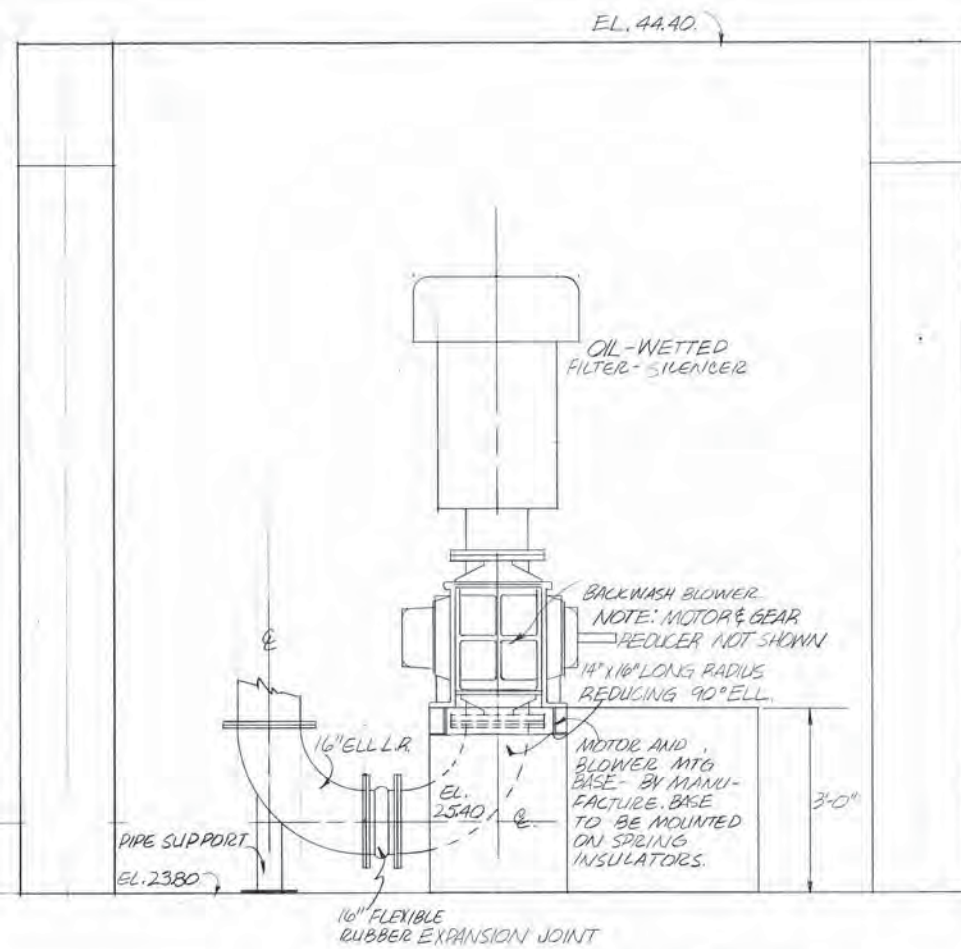
Discharge Silencer (to be replaced)



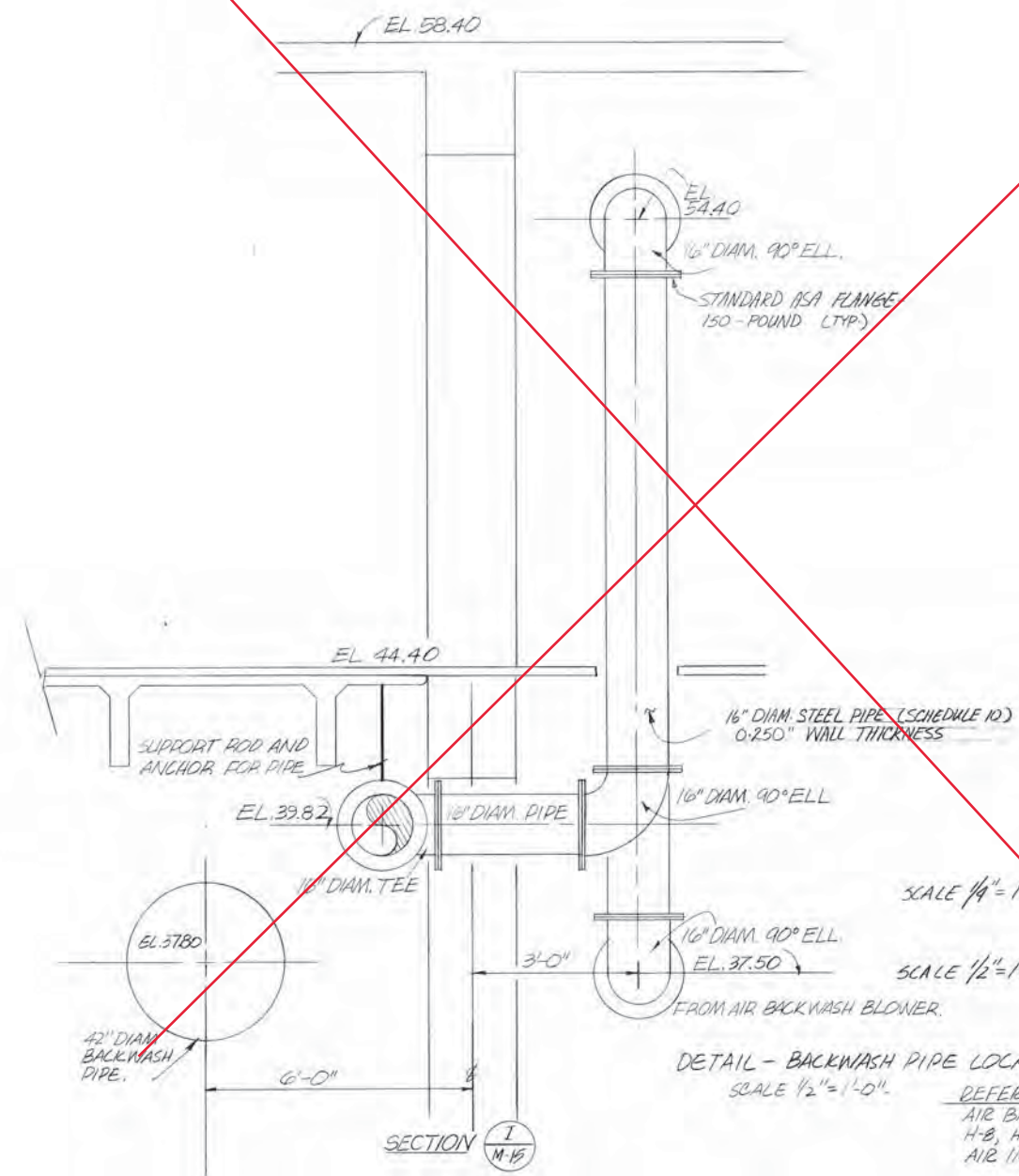
DETAIL-DISCHARGE SILENCER.  
SCALE 1/2" = 1'-0"

TEMPLETON, LINKE & ALSUP - CONSULTING ENGINEERS 40 WEST 2950 SOUTH - SALT LAKE CITY, UTAH		
CENTRAL UTAH WATER CONSERVANCY DISTRICT JORDAN WATER PURIFICATION PLANT BACKWASH BLOWER PIPING DETAIL CHEMICAL & FILTER BUILDING - SEC. 10		
DRAWN C.L.	SCALE AS SHOWN	DWG. NO. 10-M-17
CHECKED L.E.Y.	DATE OCTOBER, 1971	FILE NO. 237-91-D 137 OF 203
NO.	DATE	REVISION
		BY



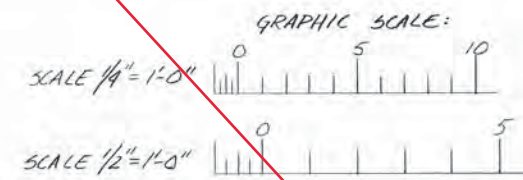


SECTION **B** BACKWASH BLOWER INSTALLATION  
 SCALE 1/2" = 1'-0" (M-11)



DETAIL - BACKWASH PIPE LOCATION  
 SCALE 1/2" = 1'-0"

REFERENCE DRAWINGS:  
 AIR BACKWASH BLOWERS M-16, M-17, H-1  
 H-8, H-9, C-1,  
 AIR INTAKE A-3, M-19.



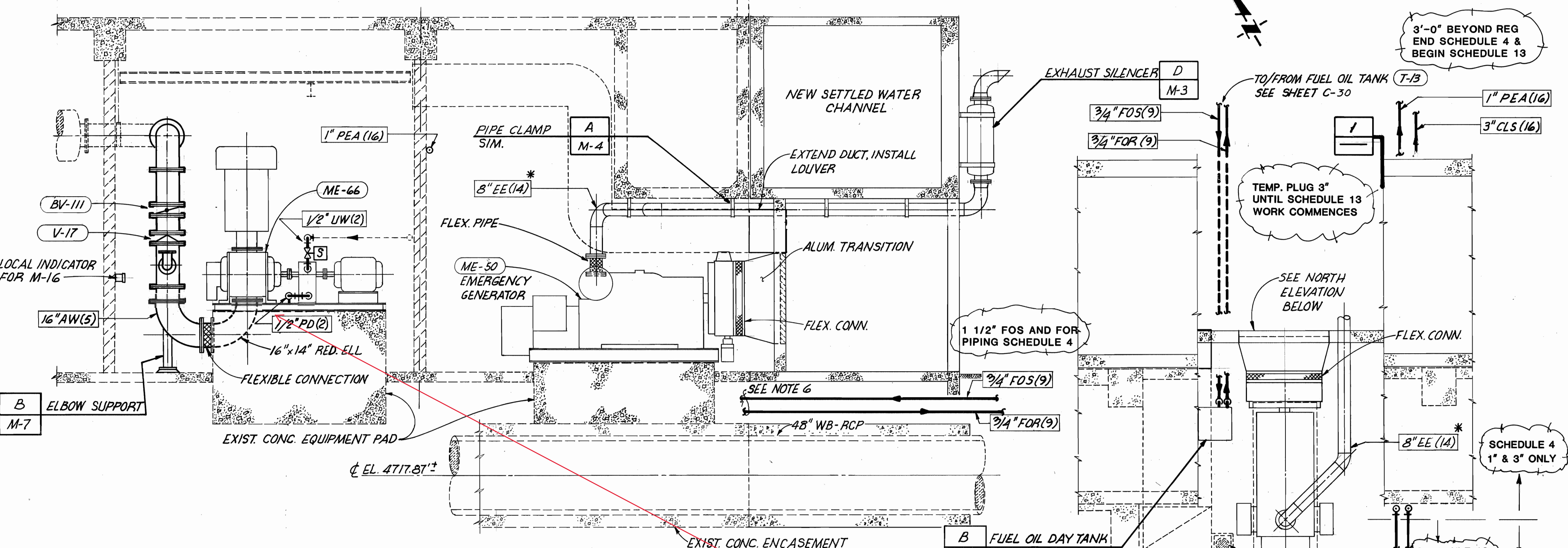
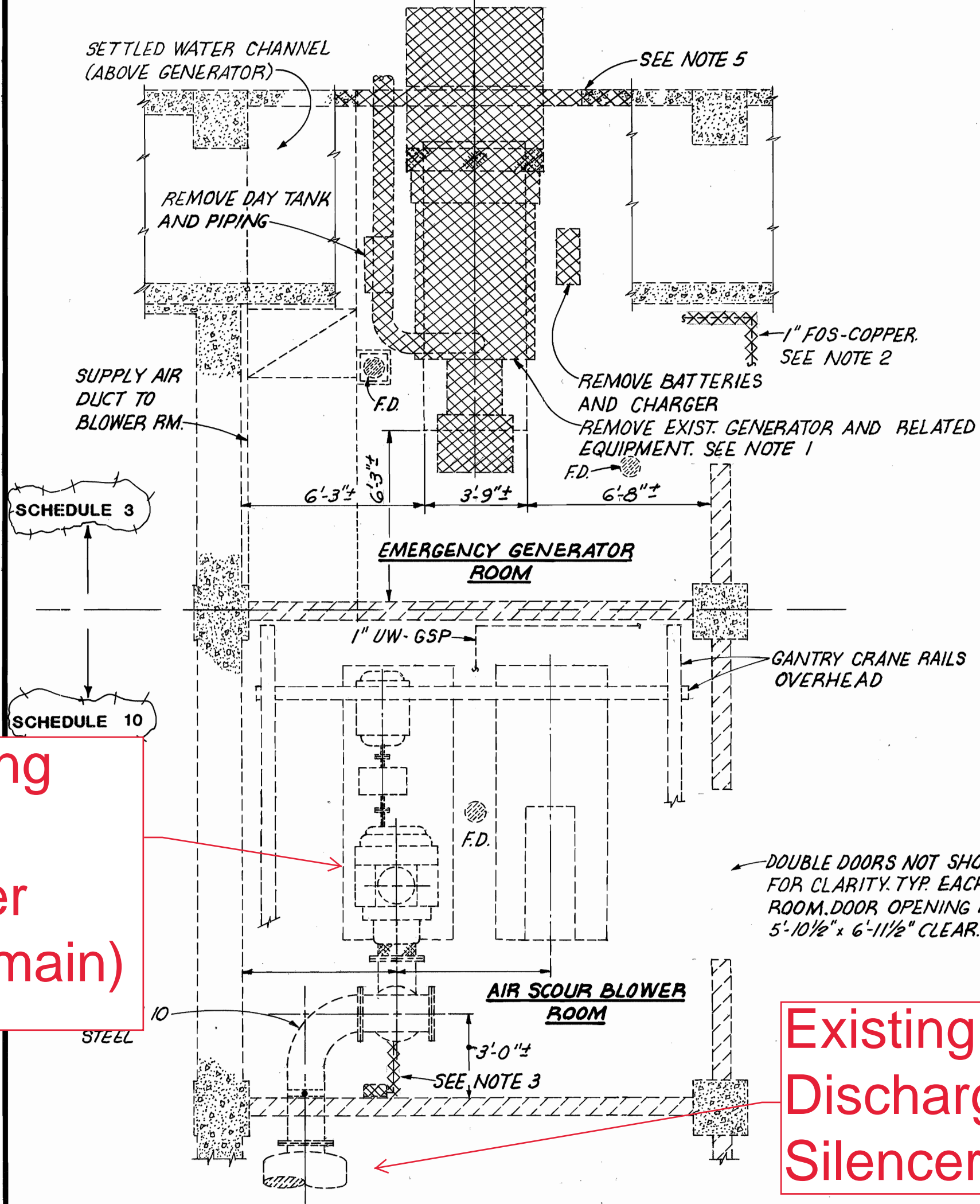
TEMPLETON, LINKE & ALSUP - CONSULTING ENGINEERS 40 WEST 2950 SOUTH - SALT LAKE CITY, UTAH			
CENTRAL UTAH WATER CONSERVANCY DISTRICT JORDAN WATER PURIFICATION PLANT CHEMICAL BUILDING - BACKWASH BLOWER DETAILS SECTION 10			
DRAWN	C.L.	SCALE	DWG. NO.
CHECKED	L.E.Y.	AS SHOWN	10-M-18
APPROVED		DATE	FILE NO.
		OCTOBER, 1971	237-90-D
NO.	DATE	REVISION	BY

2			
1			
NO.	DATE	REVISION	BY

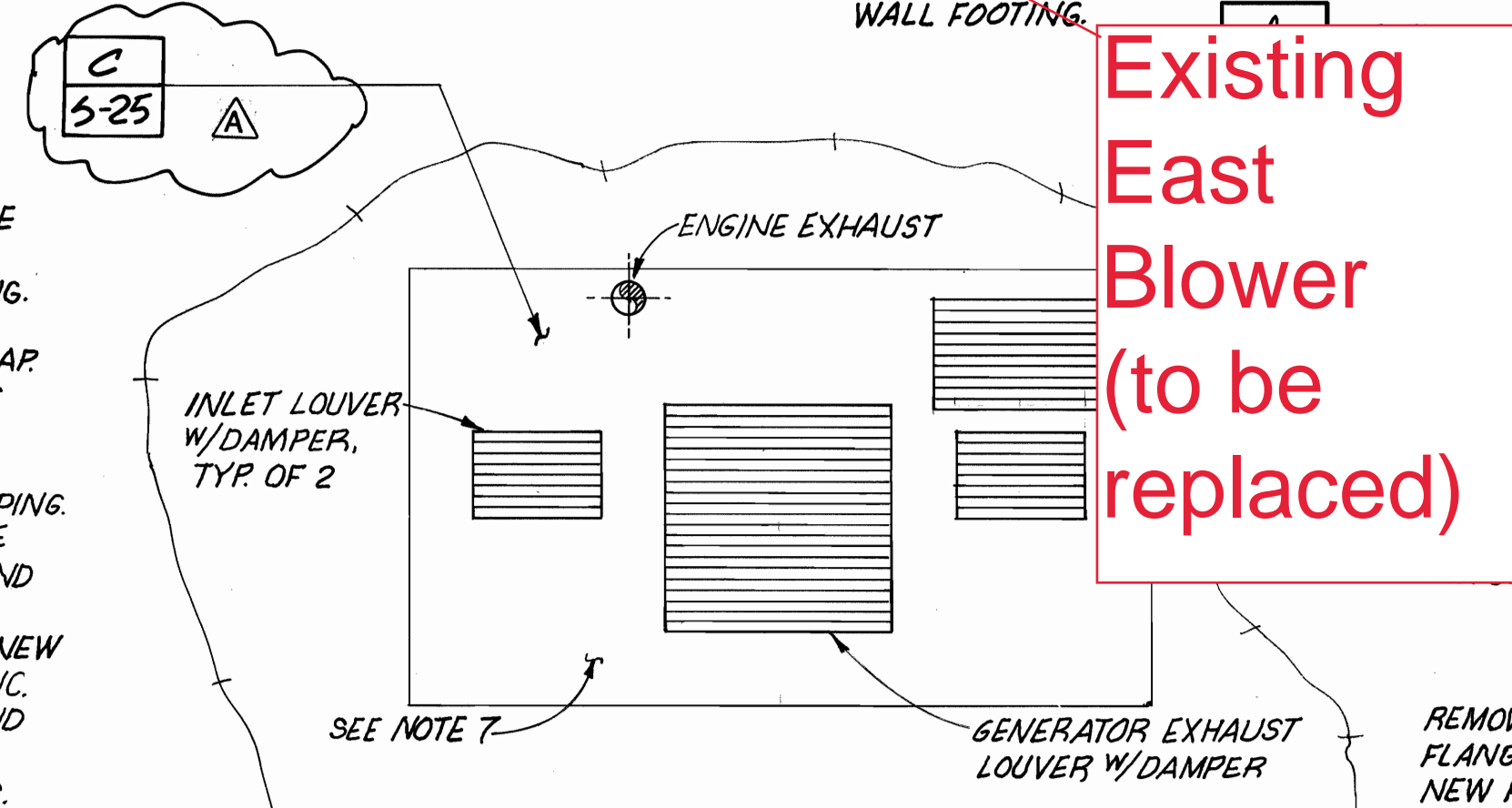


SCHEDULE 10 SCHEDULE 3 UNLESS NOTED OTHERWISE

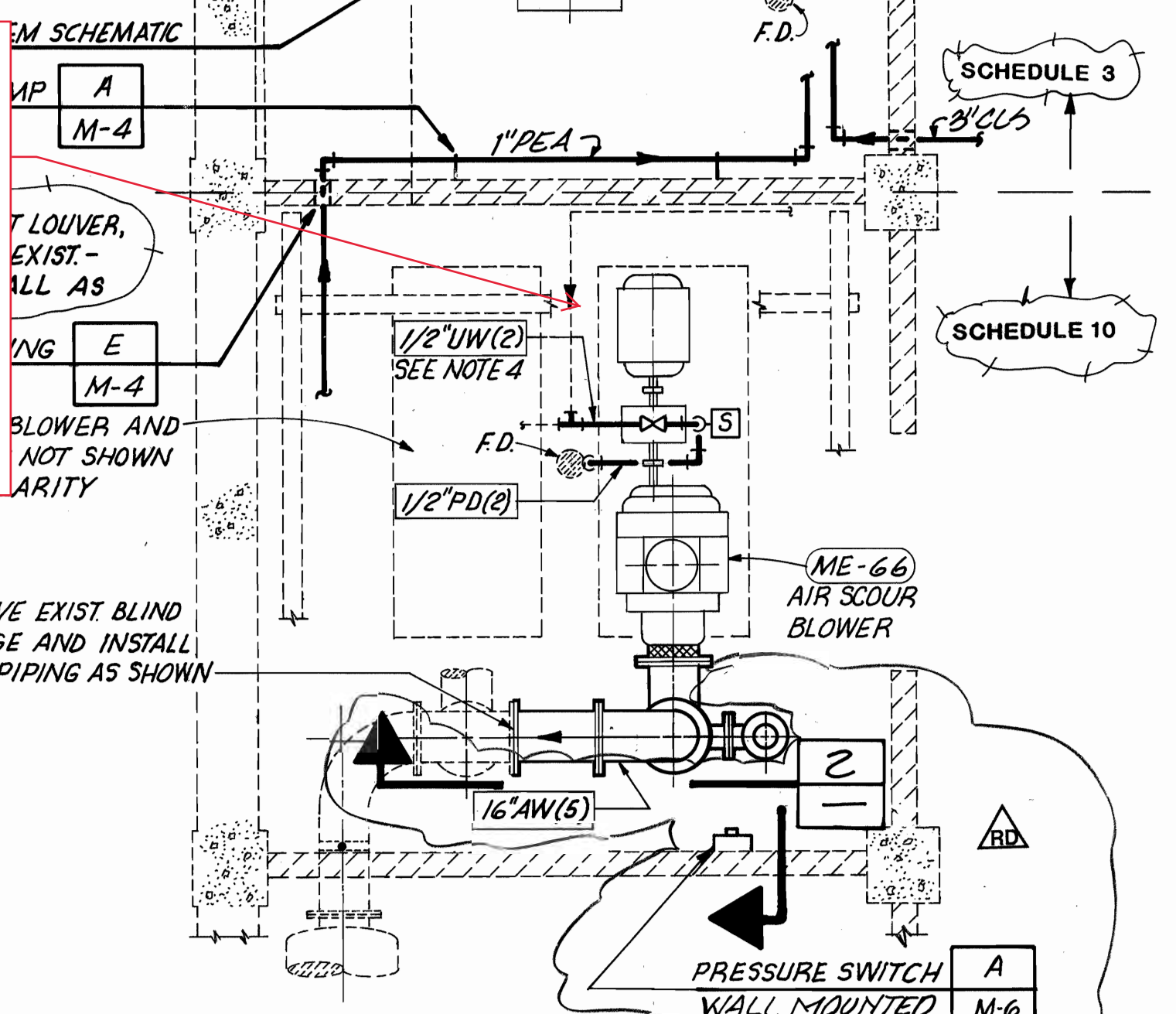
3'-0" BEYOND REG  
END SCHEDULE 4 &  
BEGIN SCHEDULE 13



SECTION 1  
SCALE: 1/4" = 1'-0"



NORTH ELEVATION  
GENERAL EQUIPMENT ORIENTATION  
N.T.S. (SEE STRUCT. 5-25 FOR CORRECT LOUVER LAYOUT)



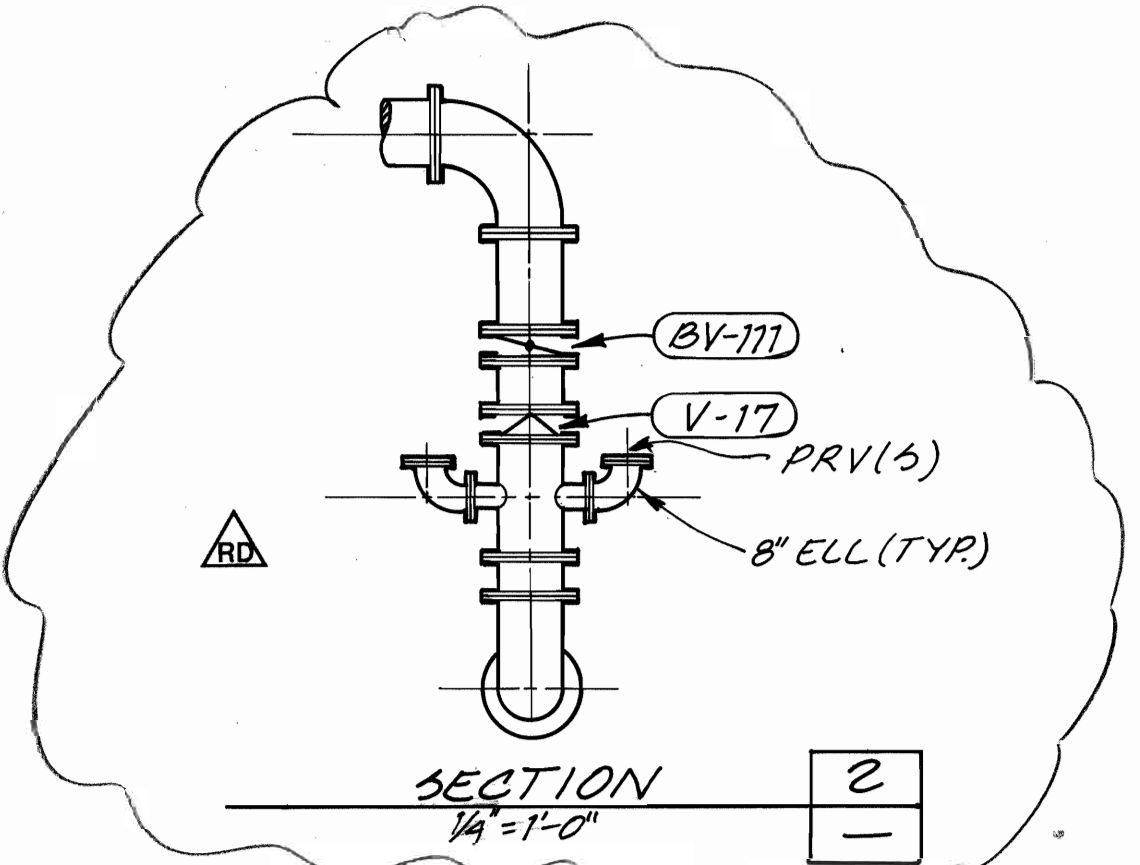
REVISED PLAN  
SCALE: 1/4" = 1'-0"

- NOTES:
- EXISTING EMERGENCY GENERATOR, EXHAUST LOUVER, FUEL PIPING, BATTERIES AND OTHER RELATED EQUIPMENT ARE TO BE REMOVED.
  - REMOVE EXISTING FUEL OIL CONNECTIONS AND PIPING. REMOVE FUEL OIL SUPPLY PIPING BACK TO VICINITY OF EXISTING BOILERS AT SOUTH END OF FIRST FLOOR AND CAP.
  - REMOVE EXISTING MANOMETER AND TUBING. PLUG TUBING CONNECTIONS IN EXISTING AIR MANIFOLD.
  - CONNECT TO EXISTING UTILITY WATER PIPING AS REQUIRED FOR NEW GEAR REDUCER COOLING WATER PIPING.
  - REMOVE EXIST. CONC. WALL AND AIR INTAKE LOUVERS. THE DUCT FROM THE BLOWER ROOM SHALL BE EXTENDED AND EXIST LOUVER INSTALLED IN NEW WALL.
  - ROUTE NEW FUEL OIL SUPPLY AND RETURN PIPING TO NEW GENERATOR AS REQUIRED. CORE DRILL ANY EXIST. CONC. FOOTING OR FLOOR SLAB INTERFERENCES. SEAL AROUND PIPE AND OPENING WITH SEALANT/CAULKING.
  - REFER TO HVAC DRAWING FOR LOUVER DETAILS AND SIZES. SPECIFIC LOCATION OF LOUVERS AND EXHAUST PIPING SHALL BE DEVELOPED BY CONTRACTOR UPON APPROVAL OF STANDBY GENERATOR. SUBMIT COORDINATION DRAWING FOR APPROVAL.

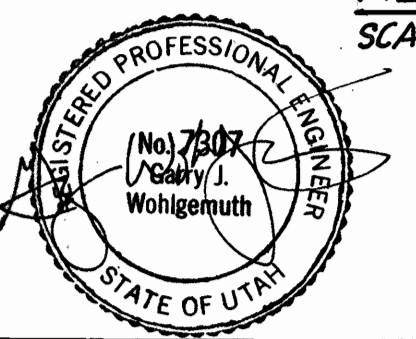
Existing Discharge Silencer

Existing East Blower (to be replaced)

Existing West Blower (to remain)



SECTION 2  
1/4" = 1'-0"



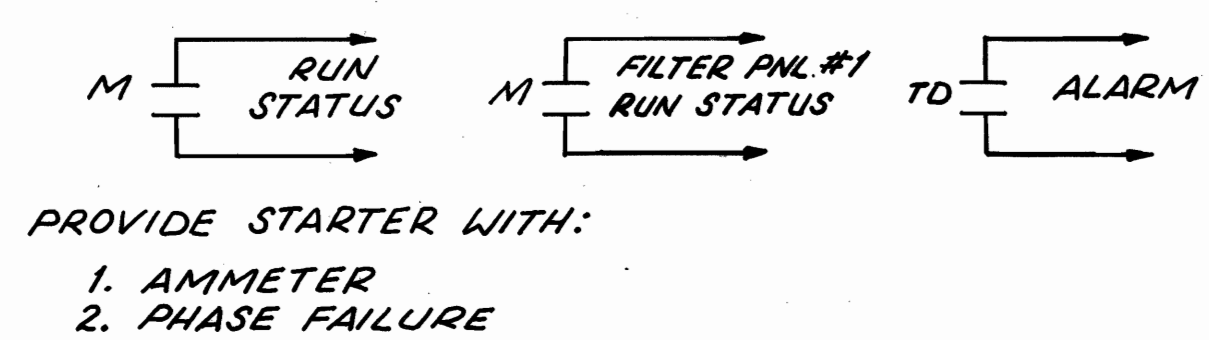
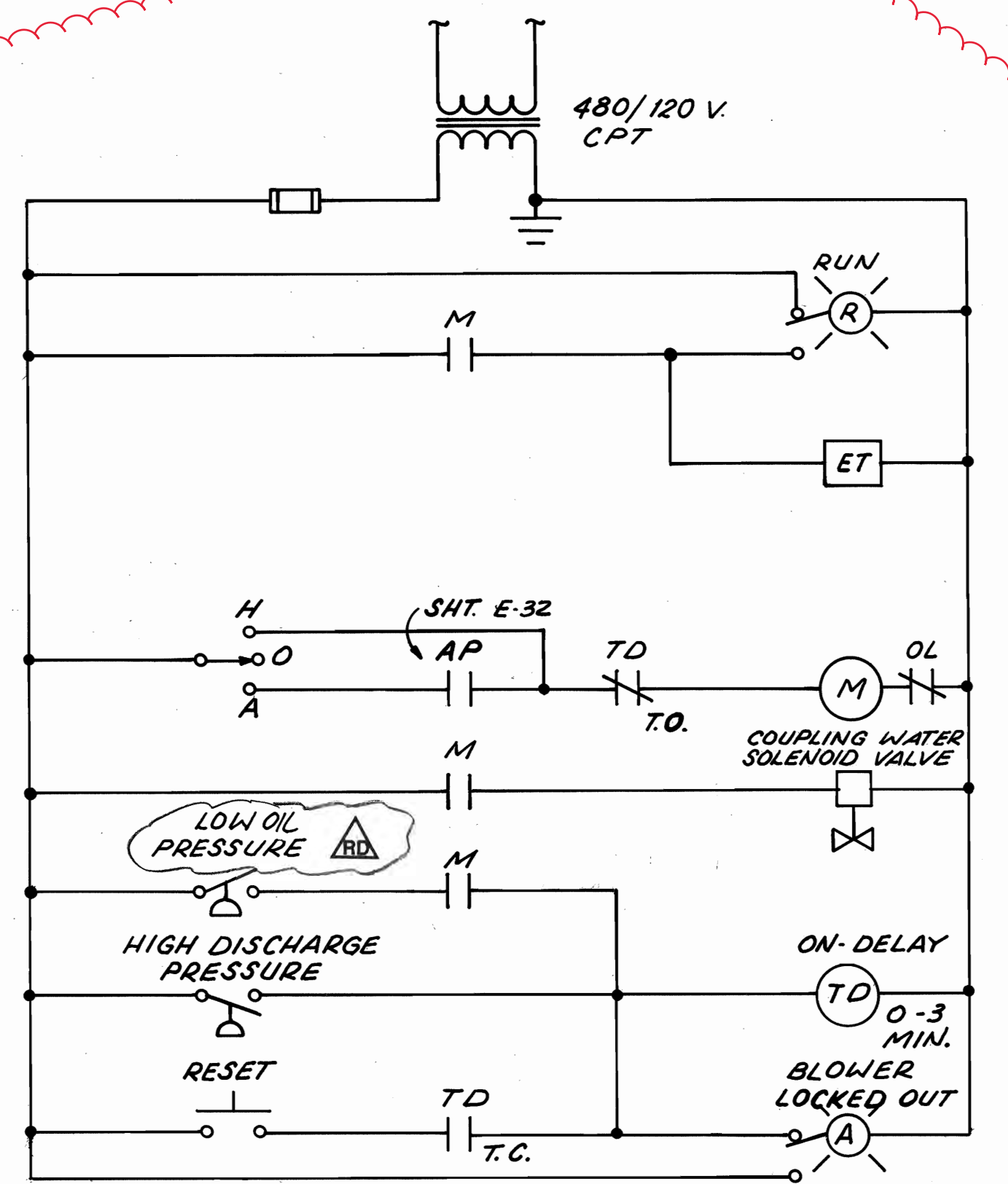
RECORD DRAWING  
This record drawing has been prepared based upon information provided by others. The Engineer has not verified the accuracy of such information and shall not be responsible for any errors or omissions which have been incorporated herein as a result.

10/85 JMM	ADDENDUMS 1-5	SCALE: AS NOTED	DESIGNED: B.L. BENCH	SUBMITTED: 7307 7-31-85	APPROVED: Don A. Christiansen 7-31-85	CENTRAL UTAH WATER CONSERVANCY DISTRICT	SHEET
1/86 mss	RECORD DRAWING		DRAWN: M.J. LYDON	R.C.E. NO. DATE	Don A. Christiansen	JORDAN VALLEY WATER PURIFICATION PLANT EXPANSION	5M-1
			CHECKED: G. WOHLGEMUTH	4960 7-31-85	Matthew R. Marshall 7-31-85	STANDBY GENERATOR AND BLOWER ROOM MODIF.	OF SHEETS
REV	DATE	BY	DESCRIPTION				

JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC.  
12200 E. ILIFF AVE., SUITE 108, AURORA, COLORADO 80014

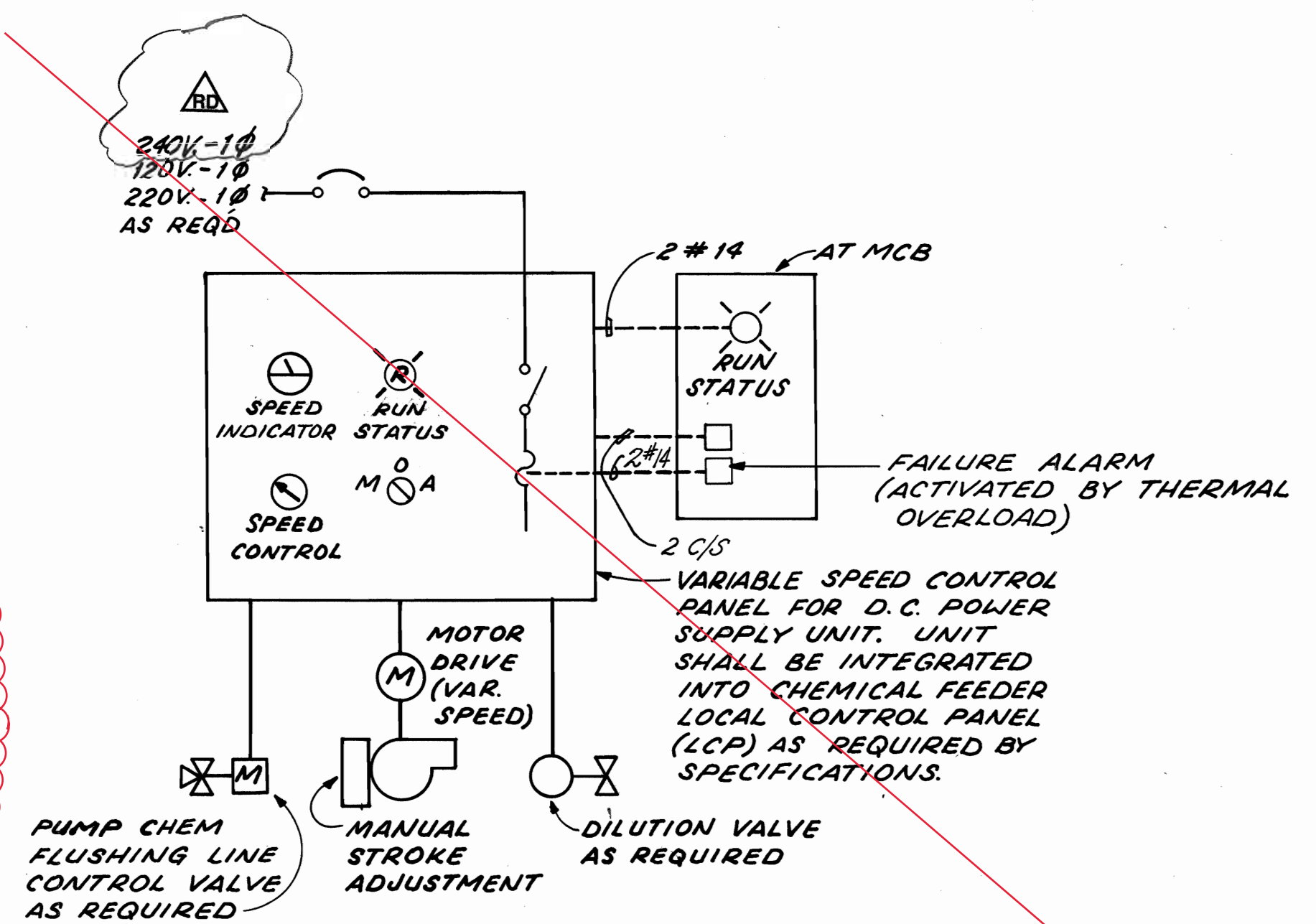
PROJECT NO: 86C196A





PROVIDE STARTER WITH:  
1. AMMETER  
2. PHASE FAILURE

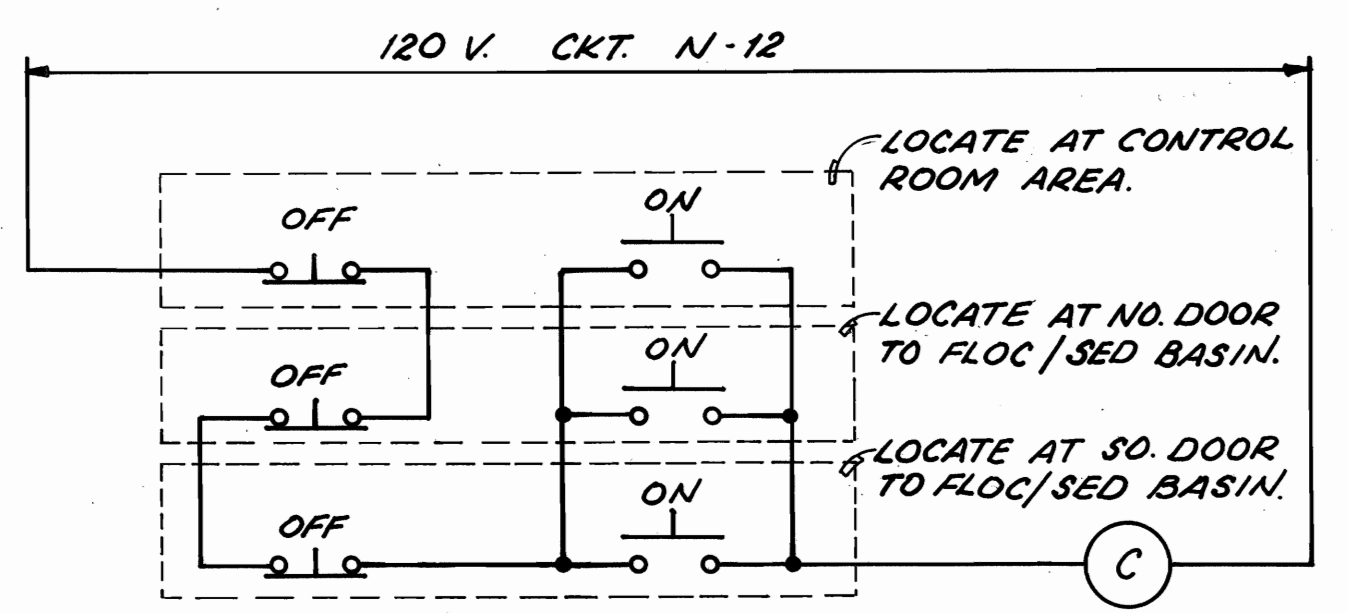
**AIR SCOUR BLOWER CONTROL**  
TYPICAL FOR ME-66 & EXISTING BLOWER



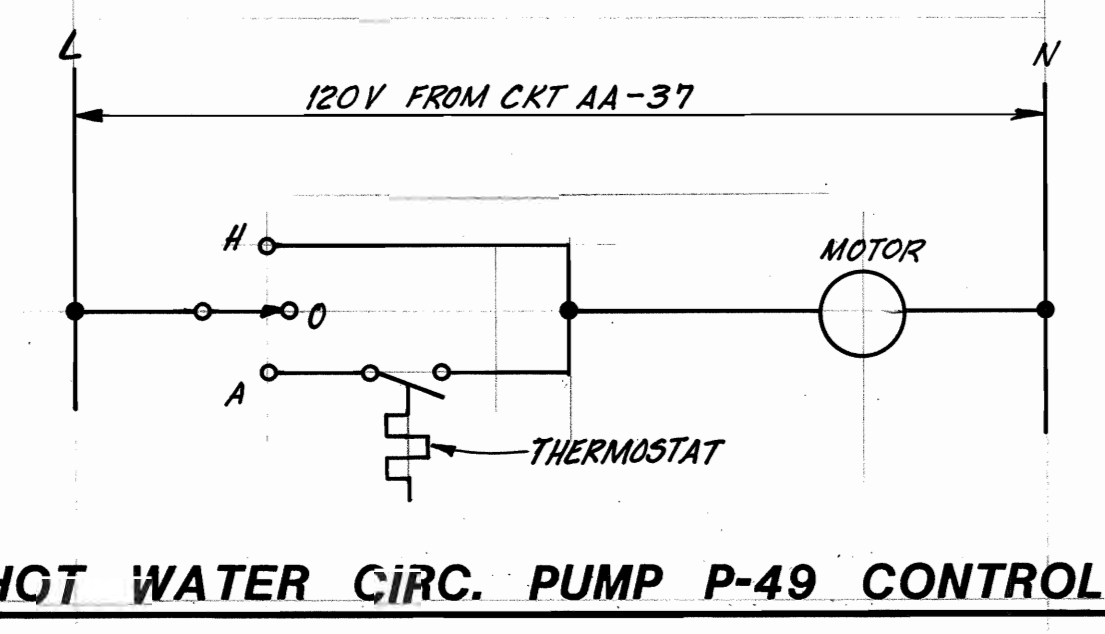
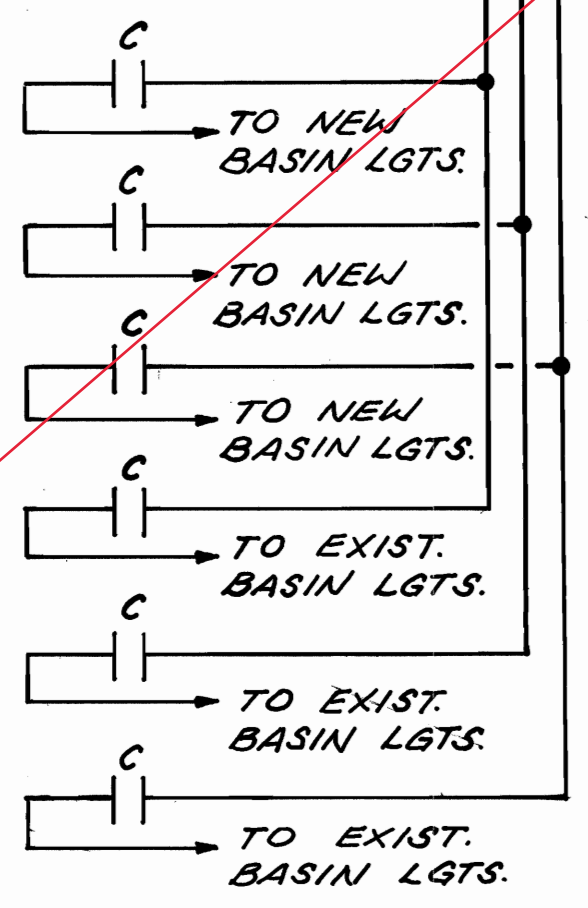
**CHEMICAL FEEDER BLOCK DIAGRAM**

TYPICAL FOR:  
LIQUID ALUM. METERING PUMPS FD-9 & FD-10  
CATIONIC POLYMER METERING PUMPS FD-11 & FD-12  
POTASSIUM PERMANGANATE FEEDER FD-13

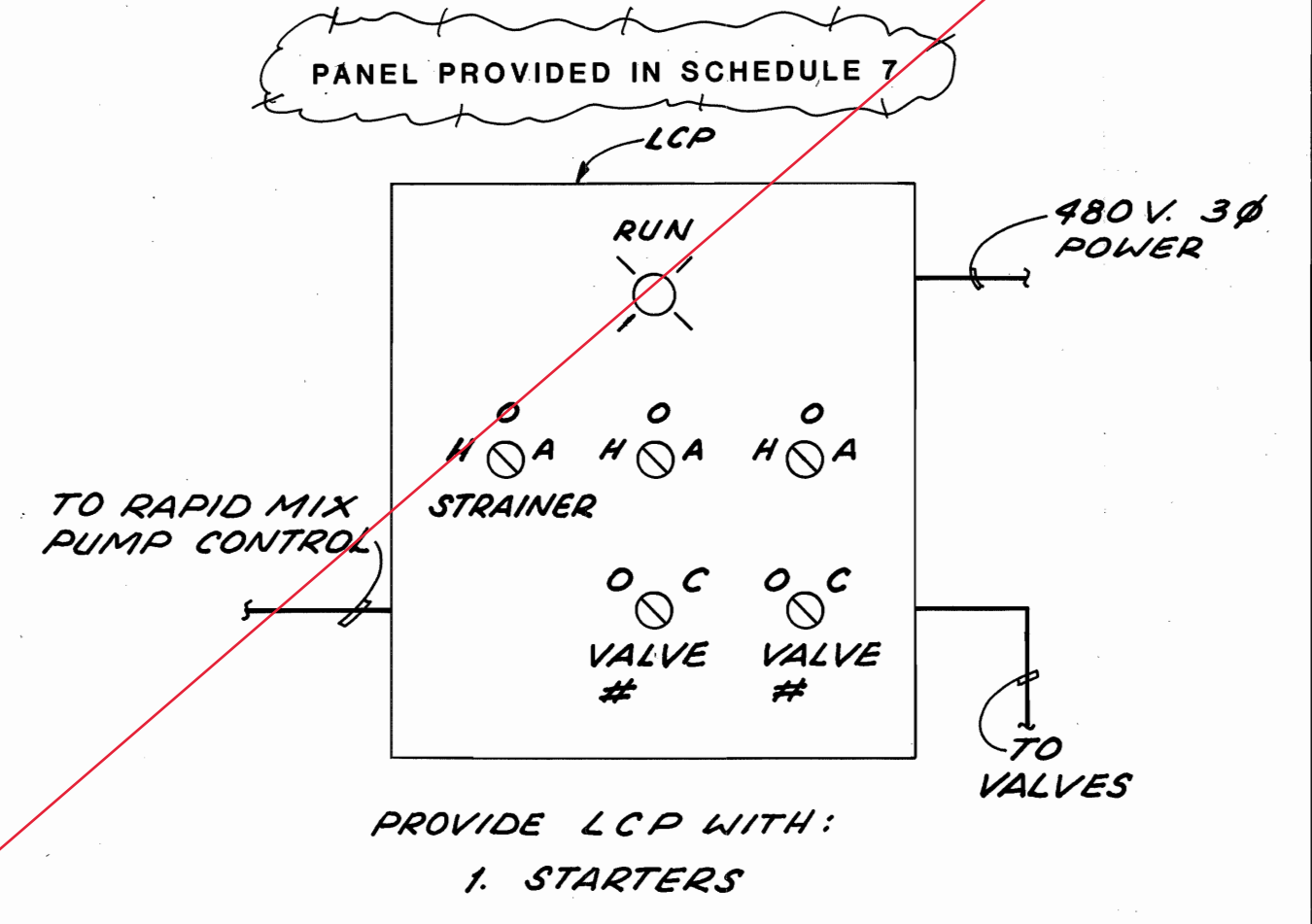
NEW PANELS PROVIDED IN SCHEDULE 15



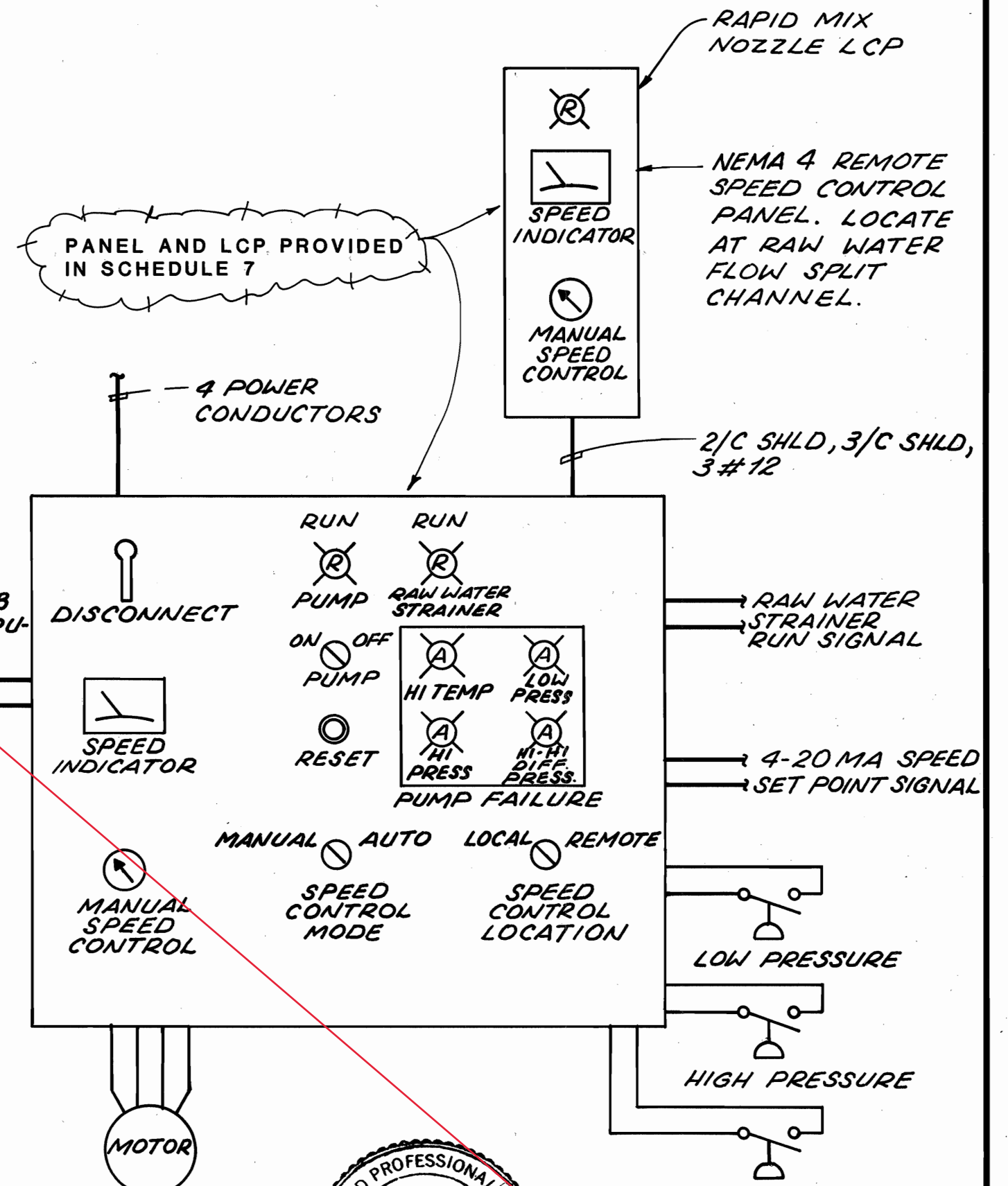
**LIGHTING CONTROL FOR FLOC SED BASIN LIGHTS**



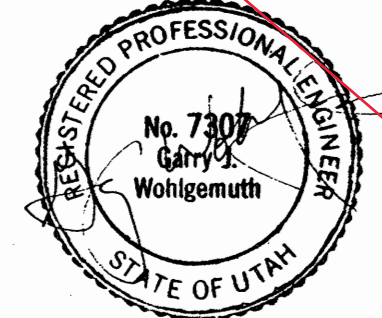
**HOT WATER CIRC. PUMP P-49 CONTROL**



**RAW WATER STRAINER CONTROL**  
ME-63



**RECORD DRAWING**  
This record drawing has been prepared based upon information provided by others. The Engineer has not verified the accuracy of such information and shall not be responsible for any errors or omissions which have been incorporated herein as a result.



**RAPID MIX PUMP P-28 VFS CONTROL**

ALL WORK THIS SHEET IS SCHEDULE 3 UNLESS NOTED OTHERWISE

JOB NO. 568-0206 FILE		SCALE: NONE		DESIGNED: S. Larsen		SUBMITTED: 7307 7-31-85		APPROVED: Don A. Christensen		CENTRAL UTAH WATER CONCERNANCY DISTRICT		SHEET E-13	
REV. DATE. BY. DESCRIPTION		DRAWN: J. Olsen		CHECKED: S. Larsen		RECOMMENDED: 4960 7-31-85		DATE: 7-31-85		JORDAN VALLEY WATER PURIFICATION PLANT EXPANSION		OF SHEETS	
<b>JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC.</b> 12200 E. ILLIFF AVE., SUITE 108, AURORA, COLORADO 80014								APPROVED: Matthew R. Marshall DATE: 7-31-85		ELECTRICAL SCHEMATICS SHEET 2			

## Exhibit B-Check Valve





# control devices, LLC

1555 Larkin Williams Road, Fenton, Missouri 63026  
t. 636-660-7100 f. 314-781-7859

## QUOTE

**Number** CDIQ7913

**Date** Nov 14, 2018

**TO:**

**Jordan Valley Water Conservancy Di**  
David McClean  
8215 1300 W,  
West Jordan, UT 84088

**Phone** (801) 565-4300

**Fax**

**E-Mail** DMcLean@jvwcd.org

**FROM:**

**Control Devices, LLC**  
Mike McGrath  
1555 Larkin Williams Road  
Fenton, MO 63026  
United States

**Phone** (636) 660-7124

**Fax**

**E-Mail** mmcgrath@cdivalve.com

**RFQ #:**

Send orders to: [order@cdivalve.com](mailto:order@cdivalve.com)

Part #	Description	Qty	Price Each	Total Price
H16-504-2330	CHK VLV, 16", FLANGED FF, SS BODY, ALUM INT, SILICONE	1	\$11,038.50	\$11,038.50

**TOTAL QUOTE \$11,038.50**

All Prices Shown Are US Dollars

Quote Expires:	1/13/2019		
Credit Terms:	Established Account: Net 30 Days From Invoice Date New Account: Credit packet to be completed and approved or pre-payment of order. Credit cards accepted MasterCard and Visa.		
Remit To Address:	Control Devices, LLC -PO Box 8862 Carol Stream, IL 60197-8862		
Minimum:	Minimum \$50.00 Order, please provide preferred small parcel and LTL carrier.	Freight Term:	FOB St. Louis, Missouri
Duties/Taxes: Recipient Pays	\$25 Expedite Fee	Lead Time:	10-12 WEEKS

Please contact me if I can be of further assistance.

# Flexi-Hinge® Valve Co., Inc.

2450 Dutch Road, Fairview, PA 16415

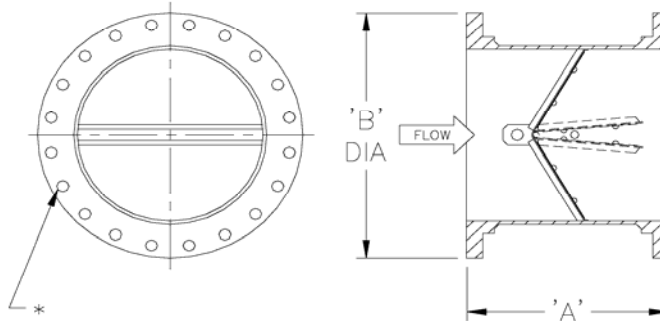
814.474.3539 • Fax 814.474.3532

www.flexi-hinge.com



## Series 504 Flexi-Hinge® Check Valve

125# FLANGED ENDS \*



\*BOLTING CONFORMS TO ANSI B16.5

### SPECIFICATIONS

SIZE [mm]	MODEL NO.	A [mm]	B [mm]	Weight -lbs. [Kg.]	Cv [l/m]
14" [356]	-504	15 [381]	21 [533]	220 [99]	13420 [50728]
16" [406]	-504	17 [432]	23.5 [597]	375 [169]	15910 [60226]
18" [457]	-504	19 [483]	25 [635]	440 [198]	18750 [70976]
20" [508]	-504	21 [533]	27.5 [699]	525 [236]	29680 [112190]
24" [610]	-504	25 [635]	32 [812]	775 [349]	40950 [154791]
30" [762]	-504	31 [787]	38.75 [984]	1100 [495]	58500 [211130]
36" [914]	-504	37 [940]	46 [1168]	1500 [675]	75000 [283500]

Note: Dimensions subject to change. Request certified drawings.

Note: Maximum Working Pressure is 200 psi at 150°F

### AVAILABLE MATERIALS

BODY		INTERNALS	
-1	Carbon Steel	2	316 S/S Steel
-2	316 S/S Steel	3	Aluminum
-3	Aluminum		
-4	Cast Iron		

Standard hardware is 316 S/S  
Standard seal material is Buna-N

### Seals

### Options

1	Buna-N	0	No Spring
2	EPDM	1	S/S Spring
3	Silicone	2	Special
4	Viton		

(1) See general catalog for temperature limitations

Consult Factory for Sizes, Materials, Pressure Ratings and Combination End Configurations Not Shown

April 2011

# Flexi-Hinge® Check Valves

## PRESSURE LOSS CHARTS WATER AND AIR APPLICATIONS

[SEE TECHNICAL SECTION FOR OTHER LIQUIDS AND GASES]

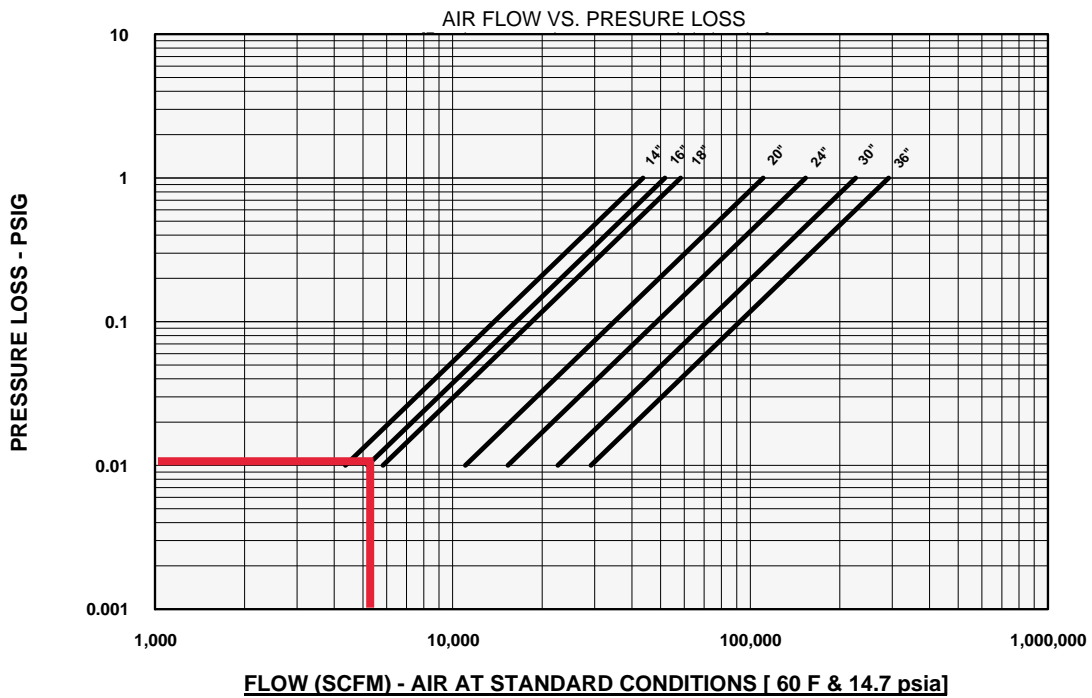
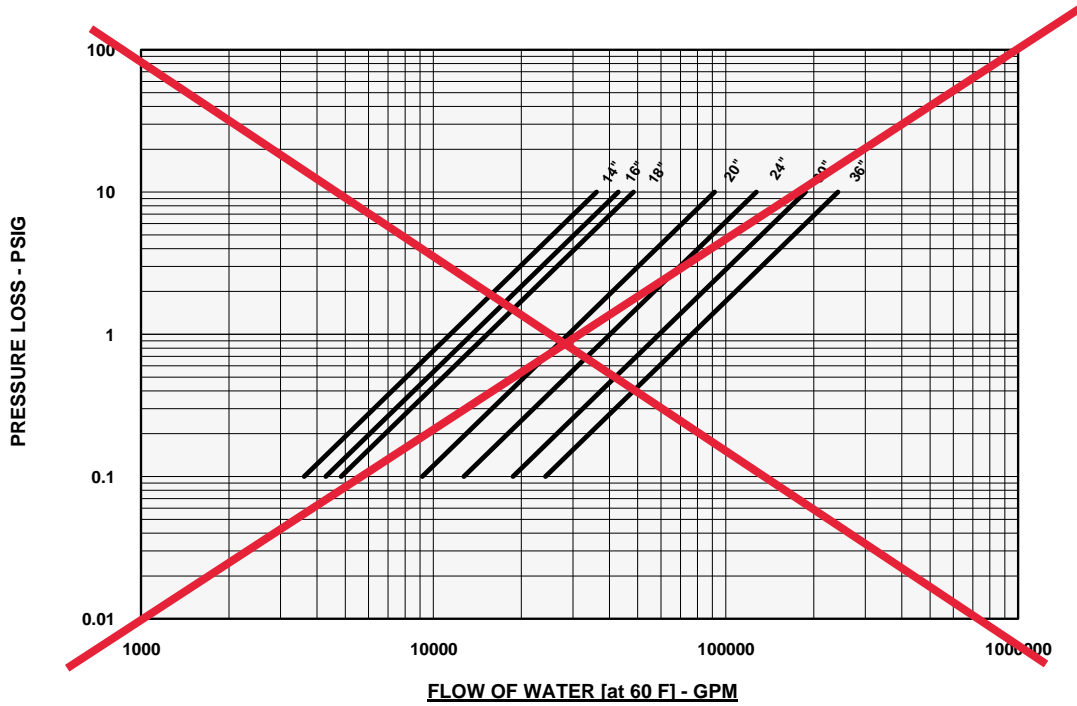


Exhibit C-Photos of west blower















Exhibit D-Photos of east blower (to be replaced)









AIR SCOUR  
ME-66  
JV-10165

CAUTION  
DANGER  
DO NOT TOUCH  
MOVING PARTS  
ELECTRICAL EQUIPMENT  
OR  
PRESSURE CONTAINERS  
UNLESS YOU ARE  
PROPERLY TRAINED  
AND AUTHORIZED  
PERSONNEL  
ELECTRICAL DIVISION  
MAYNARD PLANT & DIVISION  
MAYNARD PLANT & DIVISION

ALL TANKS SHOULD BE  
DRAINAGE DISTANCE  
NO. 1





SPIDER-UNIT  
7/16 1/4 2/1  
MAY 1976

ROOTS

LOW OIL PRESS.  
PROTECTION







Exhibit E-Photos of existing outlet silencer (to be replaced)







Exhibit F-Submittal of new west blower

## PD Plus®

### Model 1200 Heavy Duty

Bi-directional Rotation

Series Options:

Horizontal Air Service

Vertical Air Service

Horizontal Flow, Single Envelope Gas Service

Vertical Flow, Single Envelope Gas Service

Horizontal Flow, Double Envelope Gas Service

Vertical Flow, Double Envelope Gas Service

Model 1200 PD PLUS heavy duty industrial blowers are designed for high performance applications, up to 15 PSIG pressure boost or 15" Hg dry vacuum (24" Hg water injected).

#### Vertical & Horizontal Air Flow

This series has wide application in pneumatic conveying, wastewater treatment and the general process industry where high pressure, high volume air is required. Seal areas are vented to atmosphere to relieve process pressure against the internal lip seals, and to provide oil-free air.

#### Vertical & Horizontal Single Envelope Gas Service

This series is utilized in such applications as closed loop pneumatic conveying, process gas handling, or elevated pressure applications up to 100 PSIG discharge. Vent openings are tapped and plugged to prevent gas leakage. These fittings can also accept an inert gas purge for positive containment of the process gas.

#### Vertical & Horizontal Double Envelope Gas Service

This series is built to laboratory standards where virtually complete sealing is required. In addition to the features shown on series above, the drive shaft is mechanically sealed and the oil sumps are plugged to provide an even higher degree of leakage protection.

#### Special Materials

Stainless Steel\*

Carbon Steel\*\*

Ductile Iron\*\*\*

\*1224 only \*\*1224 only \*\*\*1236 & 1248 only

#### Special Coatings

Bi-Protect® (Nickel/Armoly®)



*12mo/From ICSA*

Model Size	Max. Press. PSI	Max. Vac. (in. Hg)	Nom. Min. RPM at Max. Disch. Pressure	Nom. Max. RPM at Max. Disch. Pressure	Displ. CFR
1215	15	15	840	1800	2.209
1224	15	15	800	1800	3.534
1230	14	15	700	1800	4.418
1236	9	12	450	1800	5.301
1248	6	10	400	1400	7.068

#### Material Specifications:

**Housing:** Cast iron

**End Plates:** Cast iron

**End Covers:** Cast iron

**Rotors:** Ductile iron

**Shafts:** Ductile iron cast integrally with rotor

**Bearings:** Rotor shafts - Double row ball  
Drive shaft - Spherical roller

**Drive Shaft:** SAE 4140 forged alloy steel

**Gears:** Heat treated alloy steel, helical cut

**Seals:** Standard - Lip and labyrinth type on rotor shafts; lip seal on the drive shaft

Single Envelope Gas Service - Mechanical and labyrinth type on rotor shafts; lip seal on the drive shaft

Double Envelope Gas Service - Same as Single Envelope series plus mechanical sealing on the drive shaft

**Lubrication:** Bearings are lubricated by an integral pressure system including filter and oil to water heat exchanger; gears are splash lubricated.

\* Blowers operating with a discharge pressure above 20 PSIG require mechanical rotor shaft sealing; above 25 PSIG requires hydrostatic testing and special high pressure seal leakage testing.

## Performance Tables

In conjunction with our program of continuous testing and design upgrading, all specifications are subject to change without notice. All data are approximate. Request a quotation for your specific application.

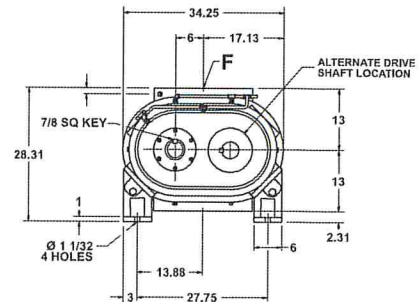
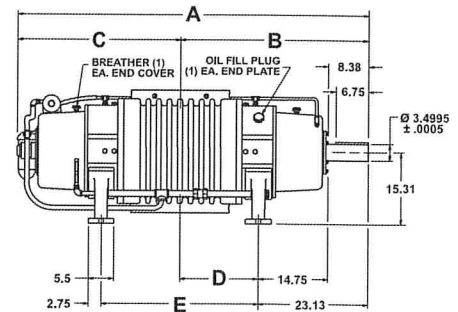
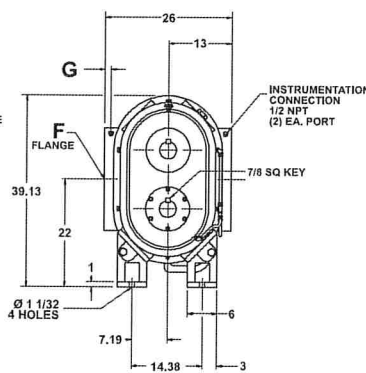
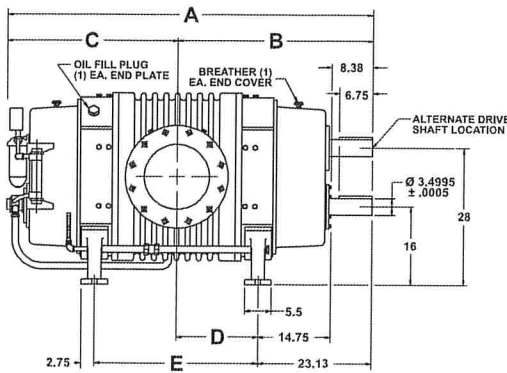
### Pressure (14.70 PSIA and 70° F Inlet)

BLOWER MODEL	SPEED (RPM)	2 PSIG		6 PSIG		9 PSIG		10 PSIG		12 PSIG		14 PSIG		15 PSIG		Max. Vacuum		
		CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	In. Hg	CFM	BHP
1215	600	1025	15	806	38	689	56	655	61							12	661	38
	1200	2351	30	2131	77	2015	111	1980	123	1916	146	1857	169	1829	181	15	1836	93
	1800	3676	46	3457	115	3340	167	3306	184	3242	219	3183	254	3155	271	15	3161	139
1224	600	1661	22	1324	59	1145	87	1092	96							13	1027	63
	1200	3781	44	3444	118	3265	174	3213	192	3115	229	3024	266	2982	285	15	2991	144
	1800	5091	66	4505	177	4395	261	4303	298	4225	344	4145	399	4102	427	15	4111	215
1230	600	2076	27	1655	73	1431	108	1365	119							13	1284	78
	1200	4727	54	4306	146	4082	215	4016	238	3894	285	3781	331	3727	354	15	3739	178
	1800	7378	80	6957	219	6733	323	6667	358	6544	427	6432	496			15	6390	267
1236	600	2506	31	2012	87	1749	129									12	1685	85
	1200	5686	63	5193	174	4930	257									12	4866	171
	1800	8867	94	8373	261	8111	385									12	8046	256
1248	600	3361	41	2717	115											10	2552	94
	1200	7602	81	6958	229											10	4524	189
	1400	9016	95	8372	267											10	8206	220

## Dimensions

Horizontal Flow, Single Envelope Gas Service

Vertical Flow, Single Envelope Gas Service



Values are approximate and should not be used for construction. Certain dimensions for Double Envelope Gas Service series may slightly differ from dimensions shown. Certified prints are available through your local Tuthill Vacuum & Blower Systems Sales Professional.

\*Approximate shipping weight.

Your Local Tuthill Vacuum Blower Systems Sales Professional:

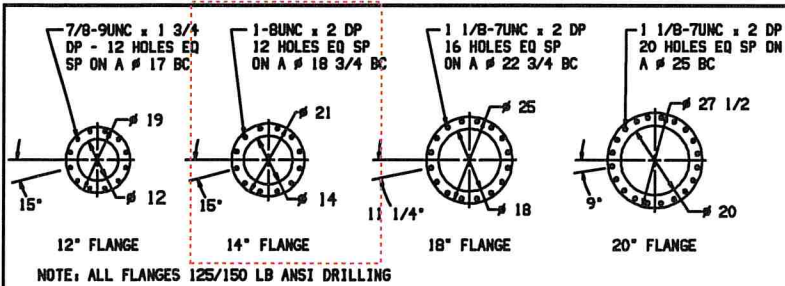


Tuthill Vacuum & Blower Systems  
 4840 West Kearney Street  
 Springfield, Missouri USA 65803-8702  
 o 417.865.8715 800.825.6937 f 417.865.2950  
 tuthillvacumblower.com



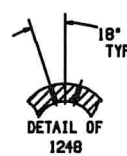
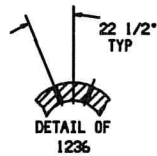
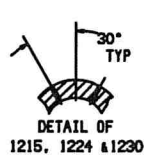
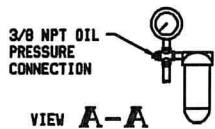
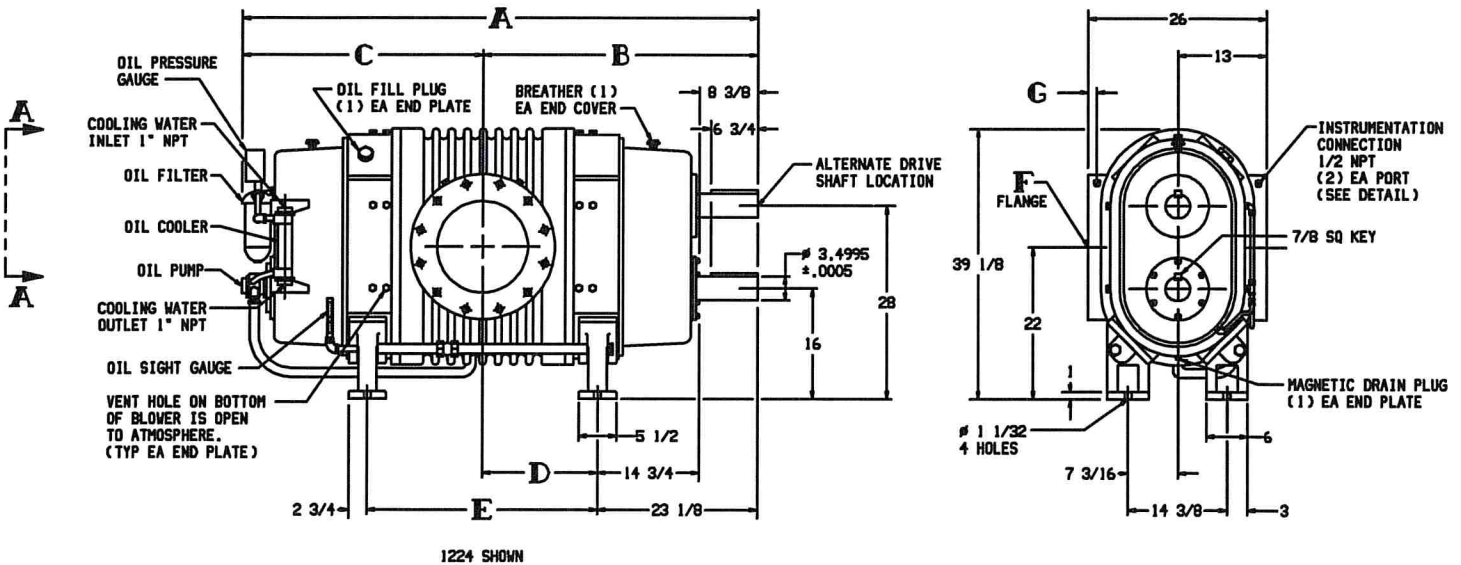
TH-047 12/16





LTR	REVISION	DATE	DR	CH
D	REDRAWN PER LATEST STD'S (ECN 1643)	5-13-91	JS	LB

MODEL	A	B	C	D	E	F	G
1215	65 3/4	36 3/8	30 3/8	12 1/4	24 1/2	12	1 1/8
1224	74 3/4	39 7/8	34 7/8	16 3/4	33 1/2	14	1 1/4
1230	80 3/4	42 7/8	37 7/8	19 3/4	39 1/2	14	1 1/4
1236	86 3/4	45 7/8	40 7/8	22 3/4	45 1/2	18	2
1248	98 3/4	51 7/8	46 7/8	28 3/4	57 1/2	20	2



**Tuthill** 800.825.6937

ROTARY BLOWER OUTLINE

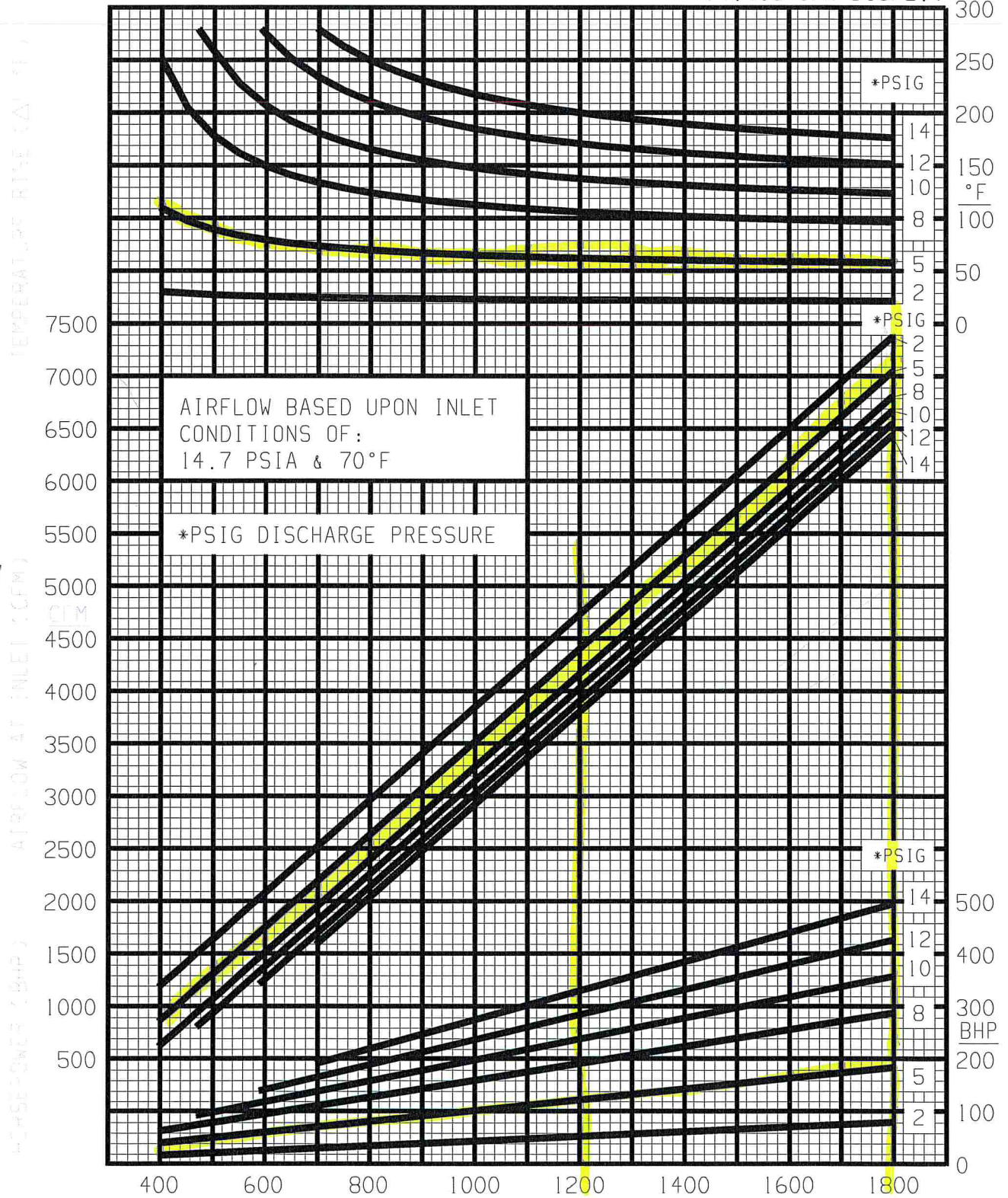
SIZE: C2	1200-19
DR JS 5-13-91	CH LB 3-24-92

REFER TO CURRENT MAINTENANCE MANUAL FOR SERVICE INSTRUCTIONS.

# 1230 PRESSURE SLIP CURVE

(4.418 CFR DISPL.)

$\frac{4500}{7000} = .64$



REV 3\98  
66%  
Grade  
100%  
4B/le

# **BALDOR® • RELIANCE®**

## **Product Information Packet**

### **EM4407T-4**

**200HP, 1785RPM, 3PH, 60HZ, 447T, TEFC**



Part Detail					
Revision:	H	Status:	PRD/A	Proprietary:	No
Type:	AC	Elec. Spec:	A44WG1462	CD Diagram:	416820-008
Mech. Spec:		Layout:	617427-002	Poles:	04
Base:		Eff. Date:	10-30-2017	Leads:	6#/10
				Created Date:	09-08-2015

Specs	
Catalog Number:	EM4407T-4
Enclosure:	TEFC
Frame:	447T
Frame Material:	Iron
Output @ Frequency:	200,000 HP @ 60 HZ
Synchronous Speed @ Frequency:	1800 RPM @ 60 HZ
Voltage @ Frequency:	460.0 V @ 60 HZ
XP Class and Group:	None
XP Division:	Not Applicable
Agency Approvals:	CCSA US
	CSA EEV
Auxiliary Box:	No Auxiliary Box
Base Indicator:	Rigid
Bearing Grease Type:	Polyrex EM (-20F +300F)
Current @ Voltage:	222,000 A @ 460.0 V
Design Code:	B
Drip Cover:	No Drip Cover
Duty Rating:	CONT
Heater Indicator:	No Heater
Insulation Class:	F
Inverter Code:	Inverter Ready
KVA Code:	G
Lifting Lugs:	Standard Lifting Lugs
Motor Lead Quantity/Wire Size:	6 @ 1/0 AWG
Motor Type:	A44120M
Mounting Arrangement:	F1
Power Factor:	87
Pulley End Bearing Type:	Ball
Pulley Face Code:	Standard
Shaft Ground Indicator:	No Shaft Grounding
Shaft Rotation:	Reversible
Shaft Slinger Indicator:	No Slinger
Speed Code:	Single Speed
Motor Standards:	NEMA
Starting Method:	Wye Start - Delta Run
Thermal Device - Bearing:	None

Product Information Packet: EM4407T-4 - 200HP, 1785RPM, 3PH, 60HZ, 447T, TEFC

<b>Feedback Device:</b>	NO FEEDBACK	<b>Thermal Device - Winding:</b>	None
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Nameplate NP2383L

CAT.NO.	EM4407T-4	SPEC NO.	A44-0002-4969	DESIGN	B
HP	200	AMPS	222	VOLTS	460
FRAME	447T	RPM	1785	AMB	40
DRIVE END BEARING	90BC03J30X	HZ	60	SF	1.15
OPP D.E. BEARING	90BC03J30X	PHASE	3	INSUL.CLASS	F
SER.NO.		TYPE	P	DUTY	CONT
		ENCL	TEFC	CODE	G
		POWER FACTOR	87	NEMA-NOM-EFFICIENCY	96.2
				MAX CORR KVAR	34
NEMA NOM/CSA QUOTED EFF				GUARANTEED EFFICIENCY	95.4
				MOTOR WEIGHT	


<b>Parts List</b>		
<b>Part Number</b>	<b>Description</b>	<b>Quantity</b>
SA306876	SA A44-0002-4969	1.000 EA
RA294150	RA A44-0002-4969	1.000 EA
000692000FF	N/P	1.000 EA
000692000VD	LABEL WARNING	1.000 EA
NP2383L	SUPER-E ,SS, CC, CSA-C US, CSA EEV	1.000 EA
421948044	LABEL, MYLAR	1.000 EA
004824015A	GREASE POLYREX EM	1.160 LB
032018008CK	HHCS 3/8-16X1L PLATED	4.000 EA
032018020FK	HHCS 3/4-10X2-1/2 PLTD.	4.000 EA
032018030DK	HHCS 1/2-13X3-3/4 PLTD.	1.000 EA
032620016LA	SOCKET SET SCREW-449	3.000 EA
034017014AB	LCKW 3/8 STD. PLATED	4.000 EA
034180014DA	KEY 1/4X1/4X1-3/4 L	1.000 EA
034530072AB	P/NIP 1/8X9"L Threaded both ends	1.000 EA
035000001A	ALFTG 1/8" 1610-BL	1.000 EA
034690002AB	PPLG 1/4" PLTD.	1.000 EA
034690005AB	PPLG 3/4 PLATED	2.000 EA
034690001AB	1/8" NPT SQHDPLG	1.000 EA
078548001R	FAN KB 234/150 (84) 400	1.000 EA
083199126RA	G28 MOLDED FAN COVER W/BAFFLE ASSEMBLY	1.000 EA
089490099A	G28 BRKT 089490098WCA KB	1.000 EA
410700004A	WSHR	1.000 EA
415072001B	CLAMP	1.000 EA
415096002A	CPLG 1/8 HEX TYPE	1.000 EA

<b>Parts List (continued)</b>		
<b>Part Number</b>	<b>Description</b>	<b>Quantity</b>
032018004BK	HHCS 5/16-18X1/2 PLATED	3.000 EA
032018020FK	HHCS 3/4-10X2-1/2 PLTD.	4.000 EA
032018030DK	HHCS 1/2-13X3-3/4 PLTD.	3.000 EA
034017013AB	LCKW 5/16 STD. PLATED	3.000 EA
0345330044AB	P/NIP 1/8X5-1/2L GALV.	1.000 EA
035000001A	ALFTG 1/8" 1610-BL	1.000 EA
034690002AB	PPLG 1/4" PLTD.	1.000 EA
034690001AB	1/8" NPT SQHDPLG	1.000 EA
0894900099A	G28 BRKT 089490098WCA KB	1.000 EA
415096002A	CPLG 1/8 HEX TYPE	1.000 EA
418151014G	RETAIN RING	1.000 EA
702623013A	THERMAL BARRIER -- G28 -- BRACKET MTD	1.000 EA
032018008DK	HHCS 1/2-13X1 PLATED	4.000 EA
415915007G	GASK, LAC	1.000 FT
033512004LB	HHTTS 1/4-20X1/2 PLTD.	1.000 EA
033512006LB	HHTTS 1/4-20X3/4 PLTD.	8.000 EA
406056008A	GASKET, TERBD 440	1.000 EA
406099000A	PLUG - FAN COVER 320-440	1.000 EA
415000103D	T/LUG #4AWG-1/0AWG W/HOLE FOR .250 BOLT	1.000 EA
418153001A	GASK 440	1.000 EA
702658001B	+C/BOX, PAINTED 440	1.000 EA
702658002A	+C/BOX CVR, PAINTED 440	1.000 EA
MG1025Y17	WILKOFAS, 789.701, SUPER E PEARL GOLD	0.375 GA
033775004EA	DRSCR #6-1/4 304 S.S.	2.000 EA

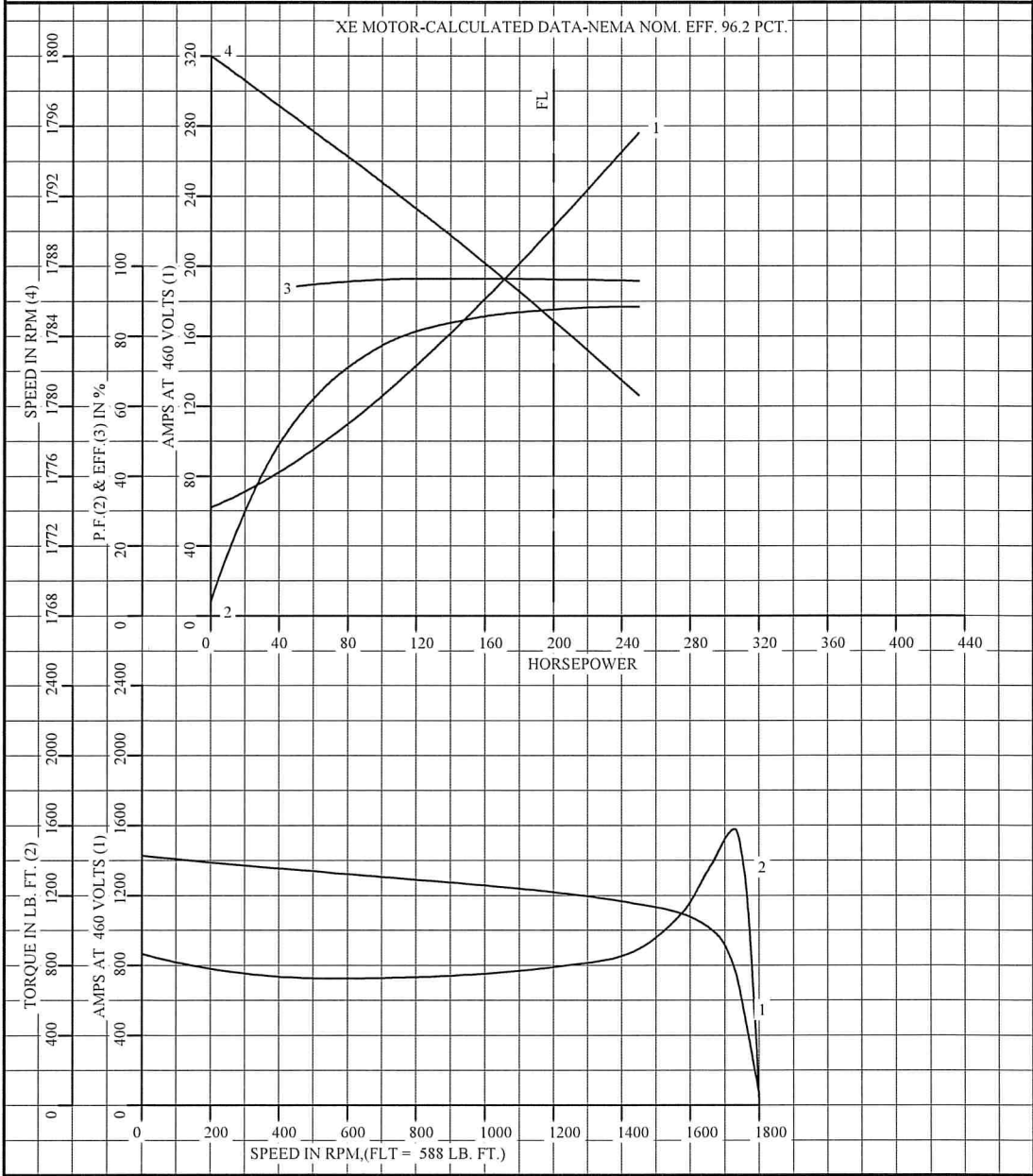
Product Information Packet: EM4407T-4 - 200HP,1785RPM,3PH,60HZ,447T,TEFC

034180054KA	KEY 7/8X7/8X6-3/4 L	1.000 EA
604797056	WOOD BASE 447 60 X 41-1/2 BLT 20 X 18	1.000 EA
000613006PU	N/P (RELEASE QTY 10,000) UL CSA LABEL	1.000 EA

<b>Accessories</b>		
<b>Part Number</b>	<b>Description</b>	<b>Multiplier</b>
089490106A	G28 C-FACE BRKT MACH-6318 089490105WCA	P1
089490110A	D-FLANGE BRKT, G28 089490109WCA	P1

REL. S.O.	FRAME	HP	TYPE	PHASE/ HERTZ	RPM	VOLTS
	447T	200	P	3/60	1785	460
AMPS	DUTY	AMB °C/ INSUL.	S.F.	NEMA DESIGN	CODE LETTER	ENCL.
222	CONT	40/F	1.15	B	G	TEFC
E/S	ROTOR	TEST S.O.	TEST DATE	STATOR RES. @25 °C OHMS (BETWEEN LINES)		
---	418143052CE	---	---	.0169		
PERFORMANCE						
LOAD	HP	AMPERES	RPM	% POWER FACTOR	% EFFICIENCY	
NO LOAD	0	62.0	1800	4.07	0	
1/4	50.0	88.3	1796	56.3	94.3	
2/4	100	126	1793	77.4	96.2	
3/4	150	172	1789	84.8	96.4	
4/4	200	222	1785	87.6	96.2	
5/4	250	276	1781	88.4	95.8	
SPEED TORQUE						
		RPM	TORQUE % FULL LOAD	TORQUE LB.-FT.	AMPERES	
LOCKED ROTOR		0	147	865	1428	
PULL UP		540	123	726	1332	
BREAKDOWN		1730	268	1579	770	
FULL LOAD		1785	100	588	222	
<p>AMPERES SHOWN FOR 460. VOLT CONNECTION. IF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE</p> <p>REMARKS: TYPICAL DATA XE MOTOR-CALCULATED DATA-NEMA NOM. EFF. 96.2 PCT.</p>						
		DR. BY	C.D.		<b>A-C MOTOR</b> <b>PERFORMANCE</b> A44WG1462-R001 <b>DATA</b> ISSUE DATE 03/19/18	
		CK. BY	E.J. CHRISTIAN			
		APP. BY	E.J. CHRISTIAN			
		DATE	07/06/17			

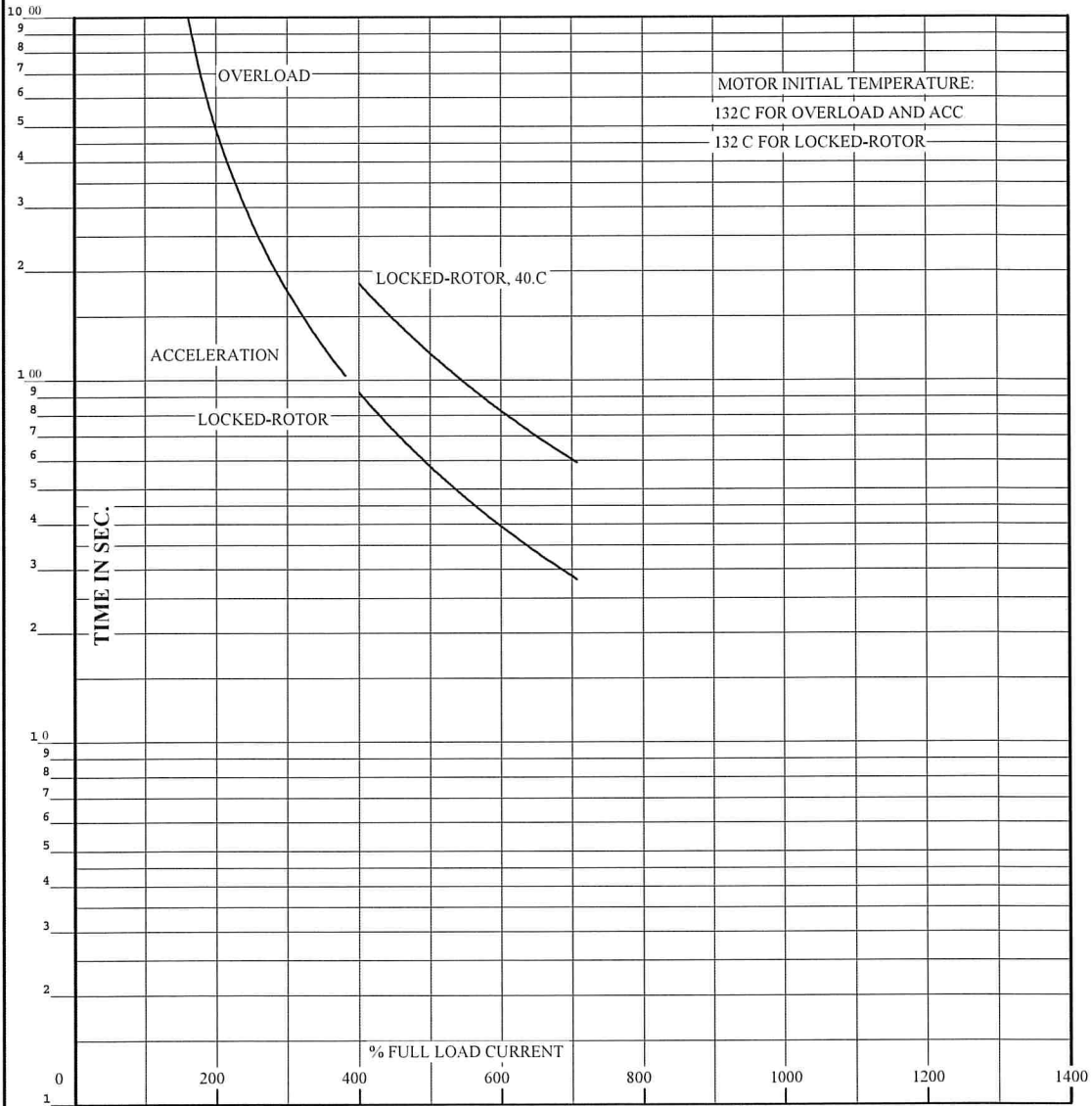
REL S.O.	RPM 1785	S.F. 1.15	ROTOR 418143052CE
FRAME 447T	VOLTS 460	NEMA DESIGN B	TEST S.O. TYPICAL DATA
HP 200	AMPS 222	CODE LETTER G	TEST DATE ---
TYPE P	DUTY CONT	ENCLOSURE TEFC	STATOR RES. @ 25 °C .0169
PHASE/HERTZ 3/60	AMB °C/INSUL 40/F	E/S ---	OHMS (BETWEEN LINES)



AMPERES SHOWN FOR 460 VOLT CONNECTION, IF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE.

<b>BALDOR</b> A MEMBER OF THE ABB GROUP	DR. BY CD	<b>A-C MOTOR</b> <b>PERFORMANCE CURVES</b>	A44WG1462-R001 ISSUE DATE 03/19/18
	CK. BY E.JCHRISTIAN		
	APP. BY E.JCHRISTIAN		
	DATE 07/06/17		

REL. S.O.	RPM 1785	S.F. 1.15	ROTOR 418143052CE
FRAME 447T	VOLTS 460	NEMA DESIGN B	TEST S.O. TYPICAL DATA
HP 200	AMPS 222	CODE LETTER G	TEST DATE ---
TYPE P	DUTY CONT	ENCLOSURE TEFC	STATOR RES. @ 25 °C .0169
PHASE/HERTZ 3/60	AMB °C/INSUL 40/F	E/S ---	OHMS (BETWEEN LINES)



THERMAL LIMIT CURVE

REMARKS: XE MOTOR-CALCULATED DATA-NEMA NOM. EFF. 96.2 PCT.

AMPERES SHOWN FOR 460 VOLT CONNECTION, IF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE.



DR. BY CD  
CK. BY E.JCHRISTIAN  
APP. BY E.JCHRISTIAN  
DATE 07/06/17

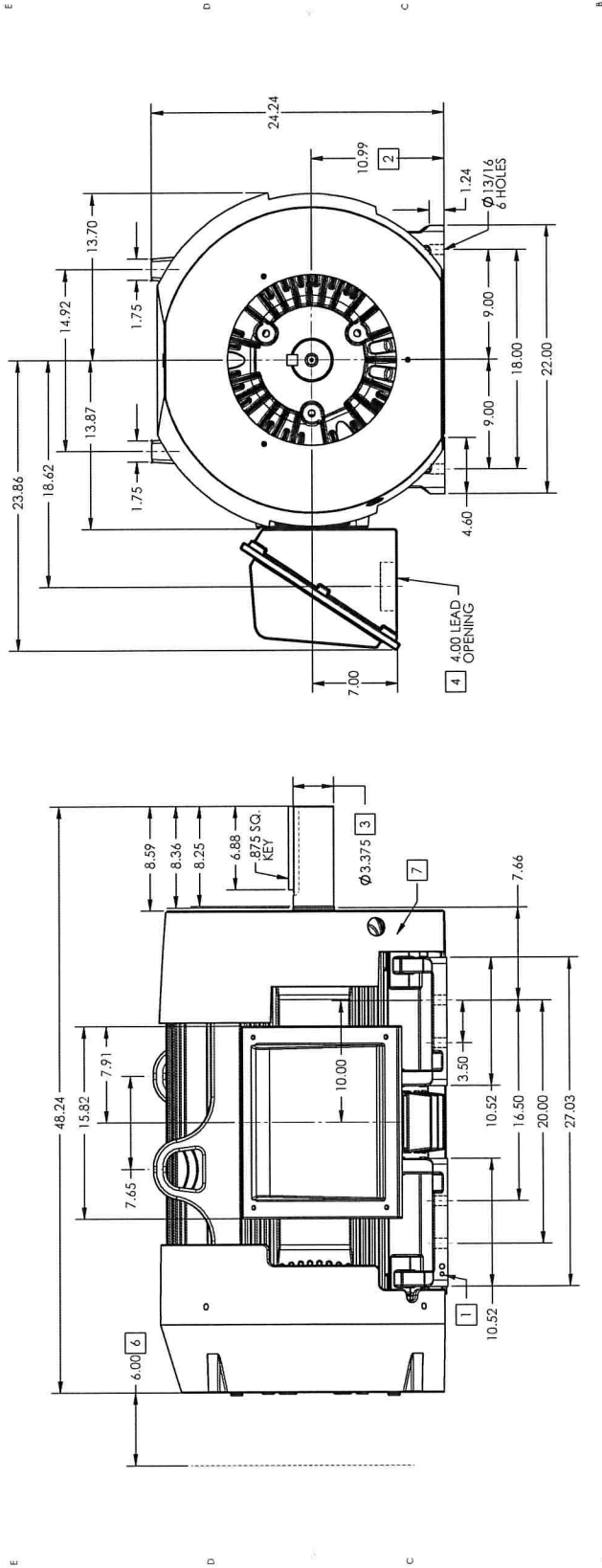
A-C MOTOR PERFORMANCE A44WG1462-R001  
CURVES ISSUE DATE 03/19/18



617427-002

**DUTY MASTER ALTERNATING CURRENT MOTORS**  
SQUIRREL-CAGE INDUCTION

ENCLOSURE: TOTALLY ENCLOSED      FRAME G447T ABOVE NEMA RATINGS      COOLING: FAN COOLED  
MOUNTING: FOOT      INCLUDES 445T FRAME MOUNTING HOLES



1. GROUND HOLES QTY 1 1/2-13 TAP. QTY 1 3/8-16 TAP
2. VARIES +00,-06
3. ON XT AND CORROSION PROOF MOTOR THIS IS PIPE TAP.
4. CORROSION PROOF MOTOR THIS IS PIPE TAP.
5. MOTOR WEIGHTS MAY VARY BY 1.5% DEPENDING ON RATING.
6. OBSTRUCTION MUST NOT ENCRUSH ON AIR INLET.
7. AIR DEFLECTOR INSTALLED WHEN REQUIRED.

CONDUIT BOX LOCATED ON OPPOSITE SIDE WHEN F-2 IF MOUNTING CLEARANCE DETAILS ARE REQUIRED. CONSULT FACTORY. MAXIMUM PERMISSIBLE SHAFT RUNOUT WHEN MEASURED AT END OF STANDARD SHAFT EXTENSION IS .003" T.I.R. TO 5 INCH DIA.

**5** WEIGHT (LBS): 251.5

DRIVE END AIR DEFLECTOR IS ONLY INCLUDED WHEN NECESSARY.

DIMENSIONS ARE IN INCHES; SEE SHEET 2 FOR DIMENSIONS IN MILLIMETERS

CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT MOTOR PERFORMANCE IS SUITABLE IN THE APPLICATION.



REV. A      VERBODEN      III      REVISED AS INDICATED      THE COMPANY'S      REV.      C      I  
BY      3000      4      3      2      1

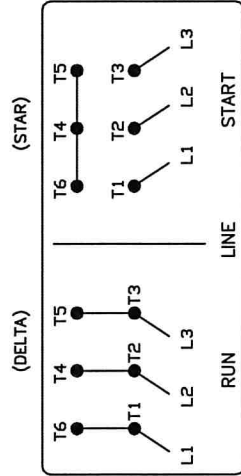
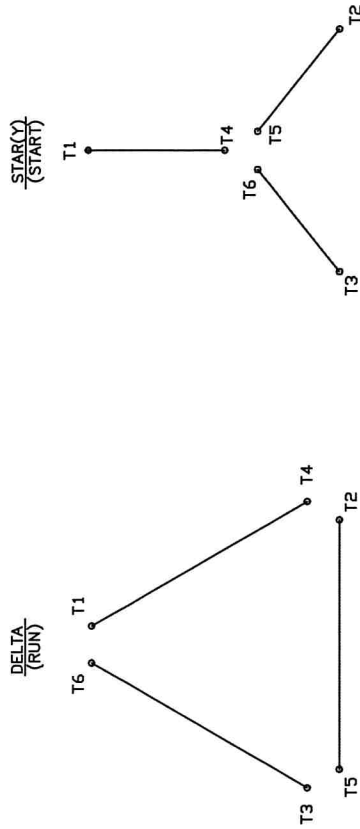
1 OF 2  
ZMPZELV



416820-008

# A-C MOTOR CONNECTION DIAGRAM

STANDARD 6 LEAD Y START - DELTA RUN



(N. P. 1767-DC)

416820-008

**BALDOR**

REV. DESC: ADDED T4 TO Y CONNECT DIAGRAM

REV. LTR: D VERSION: 04

TDR: 000000847713

FILE: \RAG\00001\808

REVISED: 10:41:26 04/08/2014

BY: RAGJSS1

CONNECT DIAGRAM STD 6 LEAD Y START DELTA RUN

SH 1 of 1

MTL: -