

Addendum No. 2

Rock River Water Reclamation District Cherry Valley Lift Station – Pump 2 and Pump 3 Replacement Capital Project No. 1911

This Addendum No. 2, dated August 30, 2019, for the above-referenced project, supersedes all contrary and conflicting information in the project specifications and contract documents, which are hereby supplemented or revised as follows:

Section I, Article 1 – Notice to Bidders

Revise the first paragraph of the Notice to Bidders as follows: The Rock River Water Reclamation District will receive signed, sealed bids for the Cherry Valley Lift Station – Pump 2 and Pump 3 Replacement, Capital Project No. 1911, at the District office located at 3501 Kishwaukee Street, Rockford, Illinois until **10:00 a.m. on Friday, September 6, 2019**, at which time and place responsive, responsible bids will be publicly opened and read aloud.

Revise the fourth paragraph of the Notice to Bidders as follows: All demolition, construction, testing and restoration shall be completed within one hundred fifty (150) calendar days of receipt of the Notice to Proceed. Liquidated damages shall be \$300.00 per calendar day.

Section I, Article 2 Part 3.10.1 – Revise deadline to submit Schedule of Values to two (2) business days after the bid opening. Revise this deadline to two (2) business days where referenced in Article 3, Section 01000 Part 1.3.A as well.

Section II, Contract Forms

1. Proposal: A revised Proposal form is attached and shall be used by Bidders.
 - a. All work related to removal of existing pumps and installation of new pumps including all piping, and appurtenances shall be Base Bid work.
 - b. All work related to wet well and suction line cleaning, including any required bypass pumping, shall be included in Bid Alternate No. 1. Reference Article 3, Section 01000, Parts 1.2.B, 1.3.C, 1.4.C, Plan Sheet 30-M-1 and bypass pumping information attached to this Addendum No. 2.
 - c. The District reserves the right to award or reject Bids on any combination of Base Bid or Base Bid and Bid Alternate No. 1.
2. Bid Bond: A revised Bid Bond form is attached and shall be used by Bidders. The required sum of the Bid Bond has been reduced from 10% to 5%.

Article 3, Technical Specifications

1. Section 01000 Summary of Work, Part 1.2.B
 - a. Under Demolition, add the following: The Contractor shall coordinate VFD demolition with the RRWRD. The RRWRD will disconnect control power at the PLC control panel and provide labeling for existing conductors that Contractor will need to terminate on new VFDs.
2. Under Electrical Instrumentation: Delete the last sentence and replace with the following: Electrical and Instrumentation work shall also include replacing the trip modules on existing breakers for both Pump No. 2 and Pump No. 3 as indicated on Sheet 30-E-1. Contractor shall terminate control wiring at

new VFDs as directed by the RRWRD. The RRWRD will make terminations in the existing PLC control panel.

3. Section 01500 Temporary Facilities and Controls

- a. Delete Part 1.7 – Field Offices and Sheds will not be required for this project.

4. Section 01640 Owner Furnished Equipment

- a. Part 1.3.B – The Contractor is NOT responsible for receiving, unloading and storing pumps, pump motors, supports, or suction elbows. These items will be received and stored by the RRWRD at 3333 Kishwaukee Street. The Contractor IS responsible for loading and transporting these items to the site once the site is prepared for installation of the pump assemblies. Contractor shall coordinate with the Project Engineer to schedule loading and transporting pump equipment. Variable frequency drives will be delivered to the site (refer to Section 01641, Part 2.1.A.2)
- b. Part 1.4.B.1 – Furnished pump assemblies will also include suction elbows.

5. Section 01641 Owner Furnished Equipment Installation

- a. Reminder: Contractor may use the RRWRD's existing hoist as per Part 2.1.B.

6. Section 15100 Process Piping Accessories

- a. Part 2.5.A: Revise minimum expansion to 0.375".
- b. Part 2.5.B: Add Unisource Manufacturing to approved manufacturers.

7. Section 16011 – Electrical Studies: Add this section (attached) in its entirety.

8. Section 16111 Conduits

- a. Part 2 Products:
 - i. Replace 2.1 with the following:
2.1 Electrical Metallic Tubing (EMT)
 - 1. Standard lengths and sizes.
 - 2. Minimum conduit size shall be ¾ inch.
- b. Part 2.3 General
 - i. Add A.3: Conduits below the upper level may be EMT.
 - ii. Add B: Interior conduits for wiring systems rated 0-50 volts shall be EMT. Exceptions are as follows:
 - 1. Flexible conduit where required by other paragraphs in this section.
 - 2. Conduits in hazardous locations or corrosive areas.

9. Section 16120 Low Voltage Wires, Cables, and Connectors

- a. 2.1.C: Minimum size wiring for instrumentation shall be 16 AWG.

10. Section 16960 Testing Electrical System

- a. Clarification: Primary injection testing is not required.
- b. Replace Part 1.5.A with the following: One (1) electronic copy and one (1) hard copy of testing report is required.

Plans

1. Sheet 10-G-2, General Note 1: Revise the Engineering Contact Phone Number to (815) 387-7684.
2. Sheet 30-MR-1: Revised Sheet 30-MR-1 is attached.
3. Sheet 30-M-1: Revised Sheet 30-M-1 is attached.
4. Sheet 30-ER-1: Revised Sheet 30-ER-1 is attached.
 - a. Key Note #1 Clarification: The only item the RRWRD will salvage during demolition work is the existing pneumatic plug valve and actuator from Pump No. 3. All other items removed in demolition shall be removed and disposed of by the Contractor. Upon removal, the plug valve and actuator may be stored on the main floor level for RRWRD pick up.
5. Sheet 30-E-1: Revised Sheet 30-E-1 is attached.
6. Sheet 30-E-2: Revised Sheet 30-E-2 is attached.
7. APPENDIX B - Variable Frequency Drive Information
 - a. Additional drawings and information are attached to this Addendum No. 2.
8. Bypass Pumping: Record drawings of the Pump Station and yard piping are attached with notes indicating the locations available for installation of bypass pumps and connection to existing force main piping. All work related to bypass pumping, wet well and suction line cleaning shall be included in the lump sum bid for Bid Alternate No. 1. Bypass pumping requirements are as follows:
 - a. Two (2) electric submersible pumps shall be provided. Each pump shall be capable of pumping 2,400 gallons per minute (GPM) at 128 feet of total dynamic head (TDH) plus additional headloss through temporary bypass piping.
 - b. Contractor shall be responsible for providing electricity to power pumps and controls.
 - c. Contractor shall provide levels and/or transducers to control pumps and include one (1) float for high-level alarm. Elevations of control set points shall be coordinated with RRWRD.
 - d. Only RRWRD Operations personnel may operate existing valves and gates.
 - e. Permanent pumps shall be put back-into service at the end of each work day. Should the conditions arise that require bypass pumping during non-working hours, Contractor shall man the bypass pumping operation 24 hours a day, 7 days a week as necessary.
 - f. Contractor shall submit a bypass pumping plan that includes the following:
 - i. Submersible pump data sheets, including performance curves.
 - ii. Generator and control equipment specifications.
 - iii. Proposed temporary pipe and fitting specifications.

This information shall be taken into consideration when preparing your bid. This addendum will be E-mailed to all plan holders as well as posted on the District's website at www.rrwrddst.il.us.

End of Addendum No. 2

Issued August 30, 2019

Rock River Water Reclamation District



Christopher T. Baer
Engineering Manager

Proposal

Project: Cherry Valley Lift Station – Pump 2 and Pump 3
Replacement, Capital Project No. 1911

Location: Cherry Valley Lift Station
4020 Barley Ridge Trail
Cherry Valley, IL 61016

Completion Date: 150 Days from Receipt of the Notice to Proceed

Liquidated Damages: \$300/calendar day beyond completion date deadline

To: Board of Trustees
Rock River Water Reclamation District
3501 Kishwaukee Street
Rockford, IL 61109

From: _____
(Individual, Partnership or Corporation, as case may be)

(Address of Individual, Partnership or Corporation)

Gentlemen:

I (We), the undersigned, hereby propose to furnish all materials, equipment, tools, services, labor, and whatever else may be required to construct and place in service the above subject Sanitary Sewer for the Rock River Water Reclamation District all in accordance with the plans and specifications, provided by the Rock River Water Reclamation District. The undersigned also affirms and declares:

1. That I (we), have, examined and am (are) familiar with all the related contract documents and found that they are accurate and complete and are approved by the undersigned.
2. That I (we), have carefully examined the site of the work, and that, from my (our) investigation, has satisfied myself (ourselves) as to the nature and location of the work, the character, quality, and quantity of materials and the kind and extent of equipment and other facilities needed for the performance of the work, the general and local conditions and all difficulties to be encountered, and all other items which may, in any way, effect the work or its performance.
3. That this bid is made without any understanding, agreement or connection with any other person, firm, or corporation making a bid for the same purposes, and is in all respects fair

and without collusion or fraud; and that I (we) are not barred from bidding as a result of a bid-rigging or bid-rotating conviction.

4. That accompanying the Proposal is a Bidder's Bond in the amount specified in Article 1, Notice to Bidders, payable to the Board of Trustees of the Rock River Water Reclamation District, which it is agreed, shall be retained as liquidated damages by said Rock River Water Reclamation District if the undersigned fails to execute the Contract in conformity with the contract documents incorporated in the contract documents and furnish bond as specified, within ten (10) days after notification of the award of the contract to the undersigned.
5. The Bidder is of lawful age and that no other person, firm or corporation has any interest in this Proposal or in the Contract proposed to be entered into.
6. The Bidder is not in arrears to the Rock River Water Reclamation District, upon debt or contract, and is not a defaulter, as surety or otherwise, upon any obligation to the Rock River Water Reclamation District.
7. No officer or employee or person whose salary is payable in whole or in part by the District is, shall be or become interested, directly or indirectly as a contracting party, partner, stockholder, surety or otherwise, in this Proposal, or in the performance of the Contract, or in the work to which it is relates, or in any portion of the profits thereof.
8. The Bidder which I represent complies with all applicable requirements of the Americans with Disabilities Act (ADA) and the Occupational Safety and Health Act (OSHA) and that if said bidder is awarded a contract, it will complete all OSHA-required or ADA-required employee and customer training, will make available all required information, and will hold harmless and indemnify the District and the District's representatives.

In regard to participation in an approved Apprenticeship program, upon request, Contractor will be required to provide written proof of participation.

9. The undersigned, as Bidder, declares that he has adopted and promulgated written sexual harassment policies in accordance with Public Act 99-093 and will make this information available upon request.
10. The undersigned, as Bidder, declares he will comply with prevailing wages in accordance with the Illinois Department of Labor Standards. The State of Illinois requires contractors and subcontractors on public works projects (including the Rock River Water Reclamation District) to submit certified payroll records on a monthly basis, along with a statement affirming that such records are true and accurate, that the wages paid to each worker are not less than the required prevailing rate and that the contractor is aware that filing false records is a Class B Misdemeanor. The successful Bidder shall be responsible for verifying the prevailing wages each month and notifying all subcontractors of the appropriate monthly rates. Prevailing wage rates may be found on the Illinois Department of Labor website at www.illinois.gov/idol/Laws-Rules/CONMED/Pages/Rates.aspx .

The certified payroll records must include the name, address, telephone number, social security number, job classification, hourly wages paid in each pay period, the number of hours worked each day, and the starting and ending time of work each day, for every worker employed on the project. Any contractor who fails to submit a certified payroll or knowingly files a false certified payroll is guilty of a Class B Misdemeanor. Certified

payroll reports shall be submitted on industry standard forms such as IDOT Statement of Compliance (SBE 348) or other approved equal.

11. The undersigned, as Bidder, declares he will comply with the Federal Drug Free Workplace Act.
12. The undersigned, as Bidder, declares he will comply with Public Act 83-1030 entitled "Steel Products Procurement Act".
13. The undersigned, as Bidder, declares he will comply with Public Act 96-929 (30 ILCS 570) regarding Illinois residents' employment.
14. The undersigned, as Bidder, declares he will comply with non-discrimination in employment in accordance with the Illinois Fair Employment Practices Commissions Rules & Regulations.
15. The undersigned, as Bidder, declares that he currently participates in an apprenticeship or training program that is registered with the United States Department of Labor's Bureau of Apprenticeship and Training or other acceptable State of Illinois Department of Labor monitored program.

In submitting this bid, it is understood that the right is reserved by the Rock River Water Reclamation District to reject any and all bids. It is agreed that this bid may not be withdrawn for a period of sixty (60) days from the opening thereof.

The undersigned further declares that he (they) has (have) carefully examined the following items of work and that the cost of all the work to complete this project is given in this Proposal.

Lump Sum Bid Amount

Base Bid: Pump installation including all piping, electric and appurtenances. Total Amount of Lump Sum Bid, expressed in figures, for providing all materials, equipment, warranty, and labor to complete this project in conformity with all specifications in this Invitation to Bid.

Base Bid: \$ _____

Bid Alternate No. 1: Bypass Pumping, Wet well and suction line cleaning.

Bid Alternate No. 1: \$ _____

Total Bid (Base Bid + Bid Alternate No. 1): \$ _____

The District reserves the right to reject / award Bid based on any combination of Base Bid / Base Bid + Alternate.

The undersigned acknowledges that he has received Addendum numbers _____, _____, _____, and realizes that all Addenda are considered part of the Contract.

Date: _____

Bidder: _____
(Printed Name of Firm)

By: _____
(Authorized Rep's Signature)

(Printed Street Address)

By: _____
(Printed Authorized Rep's Name)

(Printed City, State, Zip)

By: _____
(Printed Authorized Rep's Title)

(Area Code and Phone Number)

By: _____
(Fax Number)

(Authorized Rep's Email Address)

Bid Bond

KNOW ALL MEN BY THESE PRESENTS, that we:

_____ (hereinafter called the Principal) and

_____ (hereinafter called the Surety)

a Corporation chartered and existing under the laws of the State of _____ with its principal offices in the City of _____ and authorized to do business in the State of Illinois are held and firmly bound onto the Rock River Water Reclamation District of Winnebago County, Illinois (District), in the full and just sum of: FIVE PERCENT (5%) OF THE TOTAL BID PRICE good lawful money of the United States of America, to be paid upon demand of the District, to which payment will and truly to be made we bind ourselves, our heirs, executors, administrators, and assigns, jointly and severally and firmly by these presents.

WHEREAS, the Principal is about to submit, or has submitted to the District, a proposal for constructing Sanitary Sewers and Appurtenances.

WHEREAS, the Principal desires to file this bond, in accordance with law, to accompany this Proposal.

NOW THEREFORE, The conditions of this obligation are such that if the Proposal be accepted, the Principal shall, within ten days after the date of receipt of a written notice of award of Contract, execute a Contract in accordance with the Proposal and upon the terms, conditions, and prices set forth therein, in the form and manner required by the District, and execute a sufficient and satisfactory Contract Performance Bond payable to said District in an amount of one hundred percent (100%) of the Contract price (including alternates) in form and with security satisfactory to said District, then this obligation to be void, otherwise to be and remain in full force and virtue in law; and the Surety shall, upon failure of the Principal to comply with any or all of the foregoing requirements within the time specified above, immediately pay to the aforesaid District, upon demand, the amount hereof in good and lawful money of the United States of America, not as a penalty, but as liquidated damages.

IN TESTIMONY THEREOF, the Principal and Surety have caused these presents to be duly signed and sealed this _____ day of _____, 20_____.

Principal

(Seal)

By _____

Name: _____

Title: _____

Date: _____

Attest:

Secretary

Surety

(Seal)

By _____

Name: _____

Title: _____

Date: _____

SECTION 16011

ELECTRICAL STUDIES

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- A. Applicable requirements of Division 0 and Division 1 shall govern work in this Section.

1.2 SCOPE

- A. The contractor shall retain the services of an independent third party firm to perform a short circuit, study, a protective device coordination study, and arc flash study.
- B. The studies shall include all portions of the electrical distribution system from the normal power source or sources down to and including the smallest adjustable trip circuit breaker in the distribution system. Normal system connections and those which result in maximum fault conditions shall be adequately covered in the study.
- C. The firm should be experienced in low, and medium voltage power system evaluations. The studies shall be performed, stamped and signed by a registered professional engineer in the State of Illinois or Wisconsin. Credentials of the individual(s) performing the study and background of the firm shall be submitted to the Engineer for approval prior to start of the work. A minimum of five (5) years experience in power system analysis is required for the individual in charge of the project.
- D. The firm performing the study should demonstrate capability and experience to provide assistance during start up as required.

1.3 DATA COLLECTION FOR THE STUDIES

- A. The contractor shall collect and provide the required data for preparation of the studies. The Engineer performing the system studies shall furnish the Contractor with a listing of the required data immediately after award of the contract.
- B. The Contractor shall expedite collection of the data to assure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to release of the equipment for manufacture.
- C. The Contractor is warned against the use of default generic device/equipment values that are available from the analysis software. Instead, the Contractor's study shall use project-specific device data.

1.4 SUBMITTALS

- A. Third party qualifications. Submit qualifications of individual(s) who will perform the work for approval prior to commencement of the studies.

- B. Draft report. Submit a draft of the study to Engineer for review prior to delivery of the study to the Owner.
- C. Final study report.
 - 1. Make all additions or changes as required by the reviewer.
 - 2. Provide studies in conjunction with equipment submittals to verify equipment ratings required.
 - 3. The results of the power system study shall be summarized in final reports. Six (6) bound sets of the final report shall be submitted.
- D. The report shall include the following sections:
 - 1. Field study findings.
 - 2. Descriptions, purpose, and scope of the study.
 - 3. Tabulations of circuit breaker, fuse and other protective device ratings versus calculated short circuit duties, and commentary regarding same.
 - 4. Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.
 - 5. Fault current calculations including a definition of terms and guide for interpretation of computer printout.
 - 6. Print-out of the Arc-Flash labels to be applied to all equipment identified by NFPA-70E.

1.5 UTILITY APPROVAL

- A. Where required, copies of the final report shall be submitted to the utility for their review, and approved copies of the report shall be submitted to the Engineer.

1.6 QUALITY ASSURANCE

- A. Reference standards listed in the IEEE Standard 242 "Buff Book", latest edition.
- B. Reference the equipment requiring Arc-Flash labeling in Article 400 of NFPA-70E.
- C. The short circuit study shall be performed with the aid of a computer program and shall be In accordance with the latest applicable IEEE and ANSI standards.

PART 2 PRODUCTS

- A. Not used.

PART 3 EXECUTION

3.1 SHORT CIRCUIT STUDY AND PROTECTIVE DEVICE COORDINATION STUDY

- A. In the short circuit study, provide calculation methods and assumptions, the base per unit quantities selected, one-line diagrams, source impedance data including power company system characteristics, typical calculations, the available fault current from the Utility, and recommendations. Calculate short circuit interrupting and momentary (when applicable) duties for an assumed 3-phase bolted fault at each supply switchgear lineup,

low voltage switchgear lineup, distribution panelboard, pertinent branch circuit panelboard, and other significant locations throughout the system. Provide a ground fault current study for the same system areas, including the associated zero sequence impedance data. Include in tabulations fault impedance, X to R ratios, asymmetry factors, motor contribution, short circuit KVA, and symmetrical and asymmetrical fault currents.

- B. In the protective device coordination study, provide time-current curves graphically indicating the coordination proposed for the system, centered on conventional, full-size, log-log forms. Include with each curve sheet a complete title and one-line diagram with legend identifying the specific portion of the system covered by that particular curve sheet. Include a detailed description of each protective device identifying its type, function, manufacturer, and time-current characteristics. Tabulate recommended device tap, time dial, pickup, instantaneous, and time delay settings.
- C. Include on the curve sheets Utility relay and fuse characteristics, system medium-voltage equipment relay and fuse characteristics, low-voltage equipment circuit breaker trip device characteristics, pertinent transformer characteristics, pertinent transformer characteristics, pertinent motor and generator characteristics, and characteristics of other system load protective devices. Include at least all devices down to largest branch circuit and largest feeder circuit breaker in each motor control center, and main breaker in branch panelboards.
- D. Include all adjustable settings for ground fault protective devices. Include manufacturing tolerance and damage bands in plotted fuse characteristics. Show transformer full load and 150, 400, or 600 percent currents, transformer magnetizing inrush, ANSI transformer withstand parameters, and significant symmetrical and asymmetrical fault currents. Terminate device characteristic curves at a point reflecting the maximum symmetrical or asymmetrical fault current to which the device is exposed.
- E. Select each primary protective device required for a delta-wye connected transformer so that its characteristic or operating band is within the transformer characteristics, including a point equal to 58 percent of the ANSI withstand point to provide secondary line-to-ground fault protection. Where the primary device characteristic is not within the transformer characteristics, show a transformer damage curve. Separate transformer primary protective device characteristic curves from associated secondary device characteristics by a 16 percent current margin to provide proper coordination and protection in the event of secondary line-to-line faults. Separate medium-voltage relay characteristic curves from curves for other devices by at least a 0.4-second time margin.
- F. Include complete fault calculations as specified herein for each proposed and ultimate source combination. Note that source combinations may include present and future supply circuits, large motors, or generators as noted on Drawing one-lines.
- G. Utilize equipment load data for the study obtained by the Contractor from Contract Documents, including Contract Addendums issued prior to bid openings.

- H. Include fault contribution of all motors in the study. Notify the Engineer in writing of circuit protective devices not properly rated for fault conditions.
- I. Include phase and ground coordination of the standby generator protective devices. Show the generator decrement curve and damage curve along with the operating characteristic of the protective devices. Obtain the information from the generator manufacturer and include the generator actual impedance value, time constants and current boost data in the study. Do not use typical values for the generator.
- J. Evaluate proper operation of the ground relays in 4-wire distributions with more than one main service circuit breaker, or when generators are provided, and discuss the neutral grounds and ground fault current flows during a neutral to ground fault.
- K. For motor control circuits, show the switchboard full-load current plus symmetrical and asymmetrical of the largest motor starting current to ensure protective devices will not trip major or group operation.

3.2 ARC FLASH HAZARD ANALYSIS/STUDY

- A. The arc flash hazard analysis shall be performed to the IEEE 1584 equations that are presented in NFPA70E-2012, Annex D.
- B. The flash protection boundary and the incident energy shall be calculated at all significant locations in the electrical distribution system (switchgear, panelboards, busway and splitters) where work could be performed on energized parts.
- C. Safe working distances shall be based upon the calculated arc flash boundary considering an incident energy of 1.2 cal/cm².
- D. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Ground overcurrent relays should not be taken into consideration when determining the clearing time when performing incident energy calculations.
- E. The short-circuit calculations and the corresponding incident energy calculations for multiple system scenarios must be compared and the greatest incident energy must be uniquely reported for each equipment location. Calculations must be performed to represent the maximum and minimum contributions of fault current magnitude for all normal and emergency operating conditions. The minimum calculation will assume that the utility contribution is at a minimum and will assume a minimum motor contribution (all motors off). Conversely, the maximum calculation will assume a maximum contribution from the utility and will assume the maximum amount of motors to be operating.
- F. The incident energy calculations must consider the accumulation of energy over time when performing arc flash calculations on buses with multiple sources. Iterative calculations must take into account the changing current contributions, as the sources are

interrupted or decremented with time. Fault contribution from motors and generators should be decremented as follows:

1. Fault contribution from induction motors should not be considered beyond 3-5 cycles.
 2. Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible (e.g. contributions from permanent magnet generators will typically decay from 10 per unit to 3 per unit after 10 cycles).
- G. For each equipment location with a separately enclosed main device (where there is adequate separation between the line side terminals of the main protective device and the work location), calculations for incident energy and flash protection boundary shall include both the line and load side of the main breaker.
- H. When performing incident energy calculations on the line side of a main breaker (as required per above), the line side and load side contributions must be included in the fault calculation.
- I. Mis-coordination should be checked amongst all devices within the branch containing the immediate protective device upstream of the calculation location and the calculation should utilize the fastest device to compute the incident energy to the corresponding location.
- J. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. Maximum clearing time will be capped at 2 seconds based on IEEE 1584-2002 section B.1.2. Where it is not physically possible to move outside of the flash protection boundary in less than 2 seconds during an arc flash event, a maximum clearing time based on the specific location shall be utilized.
- K. The Contractor shall affix each Arc-Flash label to the appropriate equipment, following approval of the ELECTRICAL STUDIES submittal.

3.3 ELECTRICAL STUDIES OUTLINE:

Table of Contents for Pump Station Facility:

- I. Overview
- II. Short Circuit Study
 - SC-1. Purpose
 - SC-2. Explanation of Data
 - SC-3. Assumption(s)
 - SC-4. Analysis of Results
 - SC-5. Recommendations
 - SC-6. Fault Analysis Input Report
 - SC-7. Fault contribution Complete Report
 - Pump Station Normal Operation (Generator Off)
 - Pump Station Emergency Operation (Generator On)

- III. Protective Device Coordination Study
 - PDC-1. Purpose
 - PDC-2. Explanation of Data
 - PDC-3. Assumption(s)
 - PDC-4. Analysis of Results
 - PDC-5. Recommendations
 - PDC-6. Coordination Results – Existing
 - PDC-7. Coordination Results – With All Recommendations
 - PDC-8. Example Station
- IV. Arc Flash Hazard Study
 - ARC-1. Purpose
 - ARC-2. Explanation of Data
 - ARC-3. Assumption(s)
 - ARC-4. Analysis of Results
 - ARC-5. Recommendations
 - ARC-6. Arc Flash Evaluation Report – Existing
 - Pump Station Normal Operation (Generator Off)
 - Pump Station Emergency Operation (Generator On)
 - ARC-7. Arc Flash Evaluation Report – With All Recommendations
 - ARC-8. Print-out of all Arc-Flash Labels
- V. Prioritized Recommendations and Calculations
- VI. Appendices
 - APP-1 Input Data (collected from devices and equipment)
 - APP-2. One-Line Diagram – Existing
 - APP-3. One-Line Diagram – With All Recommendations
 - APP-4. AutoCAD One-Line Diagram
 - APP-5. Protective Device Summaries – Existing
 - APP-6. Protective Device Summaries – With All Recommendations

3.4 FIELD SETTINGS AND IMPLEMENTATION OF APPROVED REPORT

- A. The Contractor shall perform field adjustments of the protective devices as required to place the equipment in final operating condition. The settings shall be in accordance with the approved short circuit study, protective device evaluation study, and protective device coordination study.
- B. Necessary field settings of devices and adjustments and minor modifications to equipment to accomplish conformance with the approved short circuit and protective device coordination study shall be carried out by the Contractor at no additional cost to the owner.
- C. The Arc-Flash labels shall be applied to each piece of equipment.

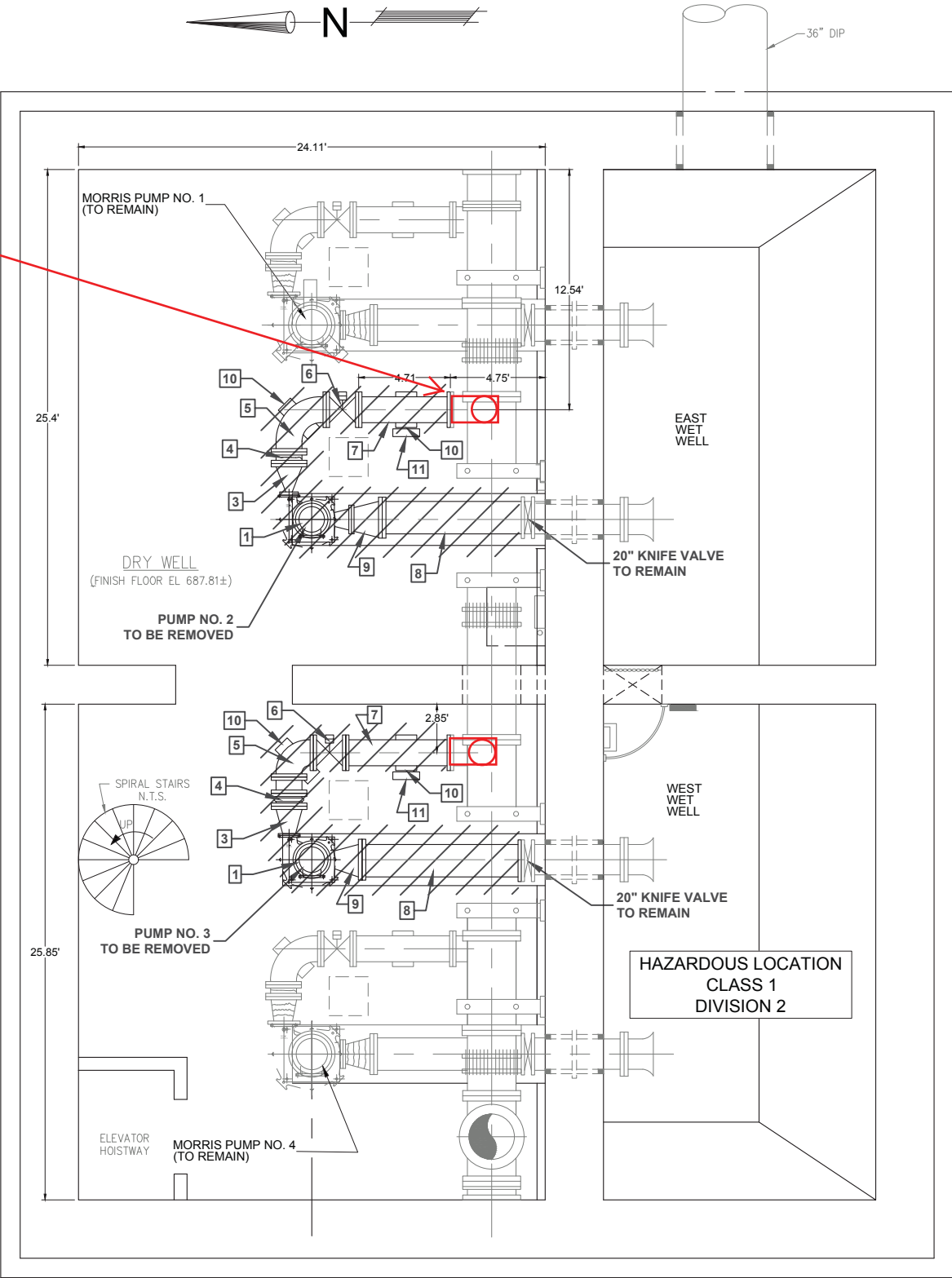
END OF SECTION

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Remove existing 16" elbow, concrete support, and stand pipe, connecting to existing plug valve on discharge manifold. (Both Pump No.2 and No.3)

NOTE: STATION SHALL REMAIN IN CONTINUOUS OPERATION DURING CONSTRUCTION.

- REMOVAL NOTES
1. REMOVE EXISTING PUMP NO. 2, PUMP NO. 3 AND MOTORS.
 2. REMOVE EXISTING PUMP BASES
 3. REMOVE EXISTING 16" x 10" INCREASER
 4. REMOVE EXISTING 16" FLEXIBLE JOINT
 5. REMOVE EXISTING 16" PIPE ELBOW
 6. REMOVE EXISTING 16" ECCENTRIC PLUG VALVE
 7. REMOVE EXISTING 16" DUCTILE IRON PIPE
 8. REMOVE EXISTING 20" DUCTILE IRON PIPE
 9. REMOVE EXISTING 20" x 10" REDUCER
 10. REMOVE EXISTING CONCRETE PIPE SUPPORTS
 11. REMOVE EXISTING CONTROL PANEL AND SUPPORTS.
 12. SEE SHEETS 30-ER-1 AND 30-ER-2 FOR ELECTRICAL DEMOLITION REQUIREMENTS.



LOWER LEVEL DEMOLITION PLAN

SCALE: 1"=4'



PUMP NO. 2 AND PIPING



PUMP NO. 3 AND PIPING



Addendum No. 2 8/30/19 revisions in red.



ROCK RIVER WATER
RECLAMATION DISTRICT
3501 KISHWAUKEE STREET
ROCKFORD, ILLINOIS 61109
(815) 387-7660

No.	DATE	REVISION	INT.
	8/02/19		BD

CHERRY VALLEY PUMP STATION PUMP REPLACEMENT
CAPITAL IMPROVEMENT PROJECT #1911

MECHANICAL/REMOVAL PLAN

Sheet No.
30-MR- 1

Date
8/6/2019

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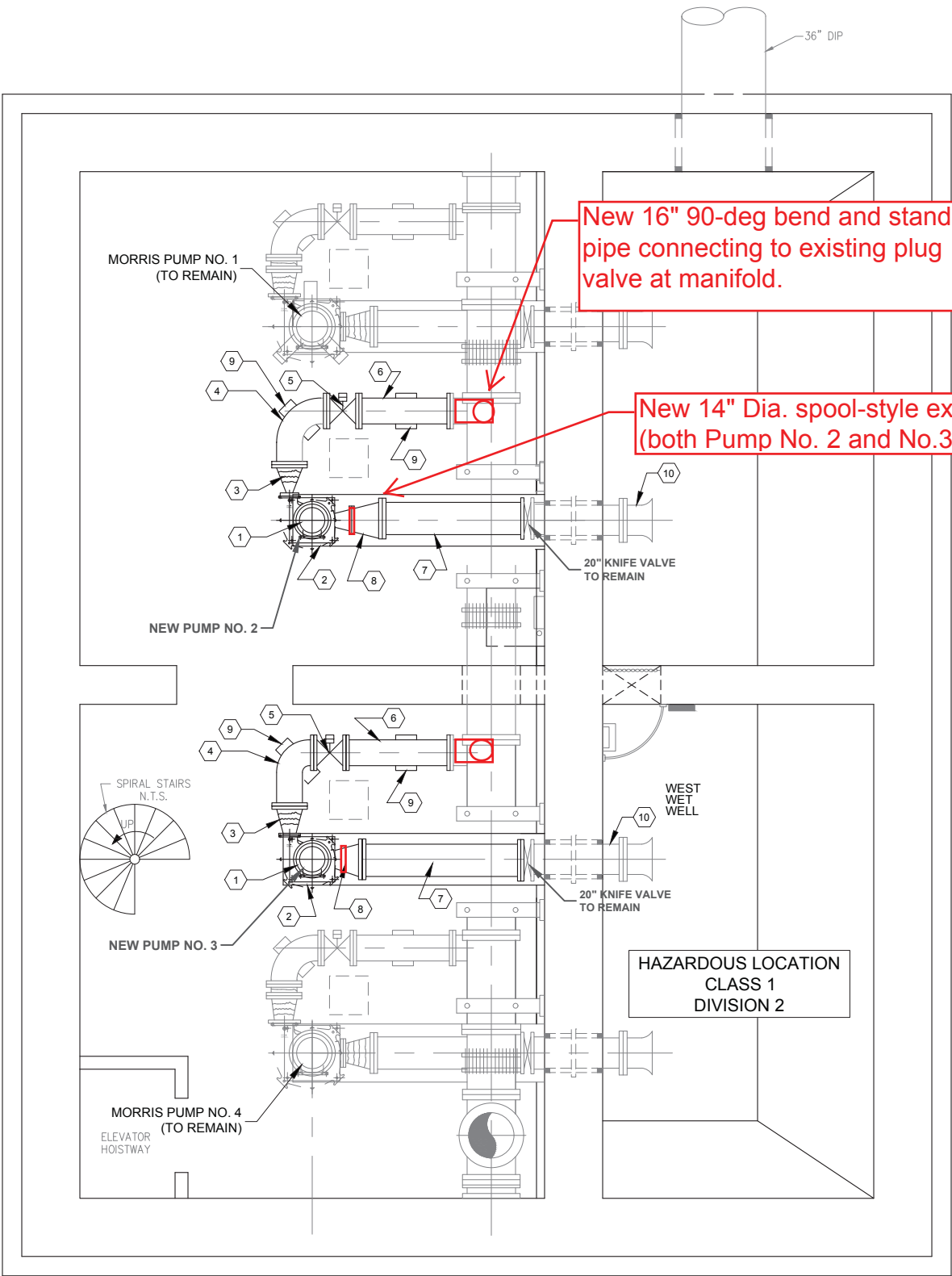
ROCK RIVER WATER
RECLAMATION DISTRICT
3501 KISHWAUKEE STREET
ROCKFORD, ILLINOIS 61109
(815) 387-7660

No.	DATE	REVISION	INT.
	8/02/19		BD

CHERRY VALLEY PUMP STATION PUMP REPLACEMENT
CAPITAL IMPROVEMENT PROJECT #1911

MECHANICAL
REPLACEMENT PLAN

Sheet No.
30-M- 1
Date
8/6/2019



GENERAL NOTES

- EXISTING PROCESS PIPING IN THE LOWER LEVEL IS BELIEVED TO BE DUCTILE IRON. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING.
- ALL NEW PROCESS PIPING FROM THE EXISTING PIPING TO THE PROPOSED PUMPS (INCLUDING PIPES, FITTINGS, ETC.) SHALL BE PAINTED ANSI 70 GRAY.

KEY NOTES

- NEW MORRIS 7100NC PUMP, TYPICAL OF 2, PUMP ASSEMBLY INCLUDING PUMP, MOTOR, SUCTION BASE, ELBOW, SOLE PLATE, AND SHAFTING WILL BE FURNISHED BY RRWRD. SEE APPENDIX A OF THE SPECIFICATIONS FOR APPROVED PUMP SUBMITTAL. NEW PUMP NO. 2 SHALL BE THE FIRST PUMP INSTALLED.
- NEW PUMP BASES (SEE STRUCTURAL SHEET 99-S-1)
- NEW 16"x12" FLEXIBLE ~~ECCENTRIC~~ REDUCER
- NEW 16" PIPE ELBOW
- NEW 16" OPERATED CYLINDER ECCENTRIC PLUG VALVE
- NEW 16" DUCTILE IRON PIPE
- NEW 20" DUCTILE IRON PIPE
- NEW 20"x14" ECCENTRIC REDUCER
- NEW CONCRETE PIPE SUPPORTS (SEE STRUCTURAL SHEET 99-S-1)
- REMOVE DEBRIS FROM EXISTING 20" KNIFE VALVE TO END OF SUCTION LINE IN WET WELL. COORDINATE WITH OWNER, ACCESS TO THE WET WELL TO CLEAN THE 20" SUCTION LINE BY JETTING THE LINE. THE DEBRIS MAY BE LEFT IN THE WET WELL. EXCESS DEBRIS NEAR SUCTION LINE SHALL BE DISPERSED TO PREVENT INFLUX OF CONCENTRATED SOLIDS INTO PUMP DURING START-UP.

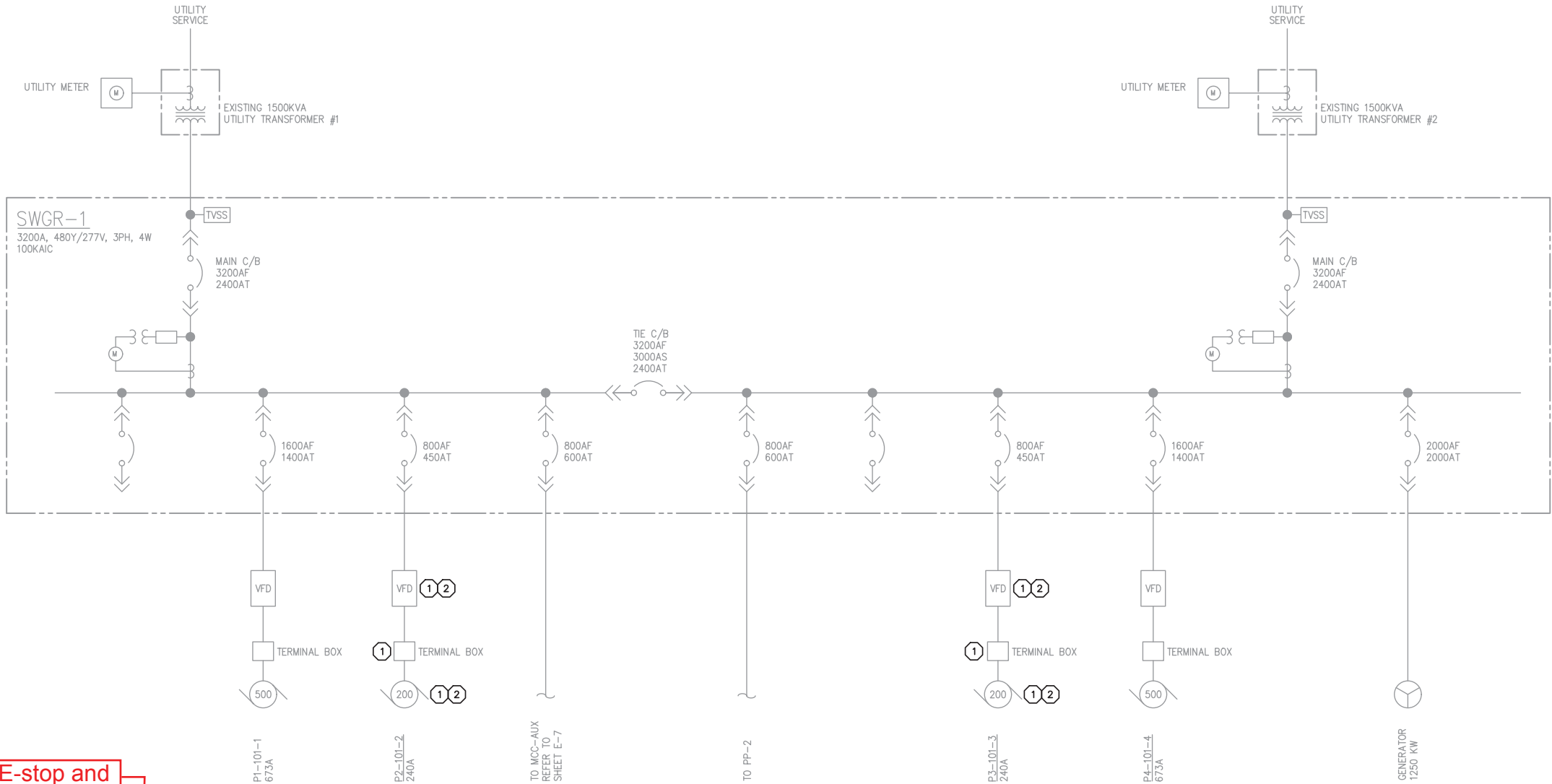
Total pipe supports - 3 per pump.
1- on 20" suction piping.
1- on 16" discharge piping (horizontal)
1- on 16" discharge (90-deg bend to vertical piping)
See Sheet 99-S-1 for concrete and reinforcement requirements.

Addendum No. 2, 8/30/2019 revisions in red.

LOWER LEVEL REPLACEMENT PLAN

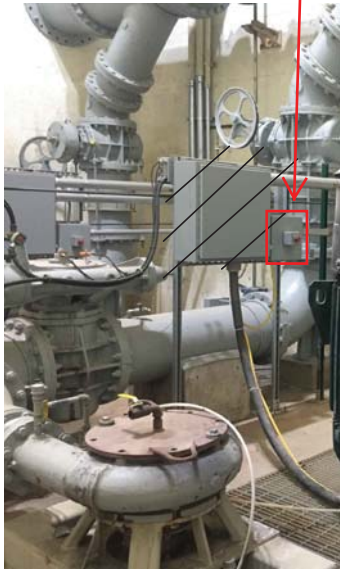
SCALE: 1"=4'

PSLTS/SCALE: 1 LTSCALE: 1
P:\Shared Folders\Projects\6357 - Rock River\1.0 Graphics\1.3 Drawings\30-ER-1 ONE-LINE DIAGRAM.dwg
Last Modified: 6 August 2019 Plotted On: 8/6/2019 12:53 PM by JEFF HARNER
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SWGR-1 ONE-LINE DIAGRAM - REMOVALS

NTS



PUMP NO. 2
TERMINAL BOX

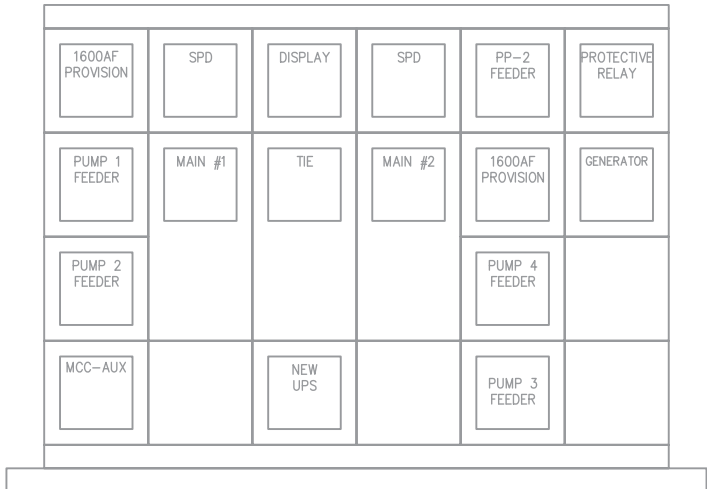


PUMP NO. 3
TERMINAL BOX

KEYED NOTES:

- 1 REMOVE EACH ITEM REFERENCING THIS NOTE. OWNER SHALL HAVE FIRST RIGHT OF SALVAGE.
- 2 LABEL ALL LOW-VOLTAGE SIGNAL AND MONITORING WIRING PRIOR TO DISCONNECTION (FOR RE-USE BY REPLACEMENT EQUIPMENT).

Addendum No. 2,
8/30/2019 revisions in red.



SWGR-1 ELEVATION

NTS



Applied Technologies
Engineers-Architects



ROCK RIVER WATER RECLAMATION DISTRICT
CHERRY VALLEY PUMP STATION
UPGRADE (CAPITAL PROJECT 1911)
ROCKFORD, ILLINOIS 61109

CHERRY VALLEY PUMP STATION
ELECTRICAL/REMOVAL
ONE-LINE DIAGRAM

VERIFY SCALES
LENGTH OF BAR IS 1" ON ORIGINAL DRAWING

1:1
PLOT SCALE, ADJUST SCALE(S) ACCORDINGLY

DESIGNED BY: G.A.G.

DRAWN BY: J.T.H.

CHECKED BY: J.J.S.

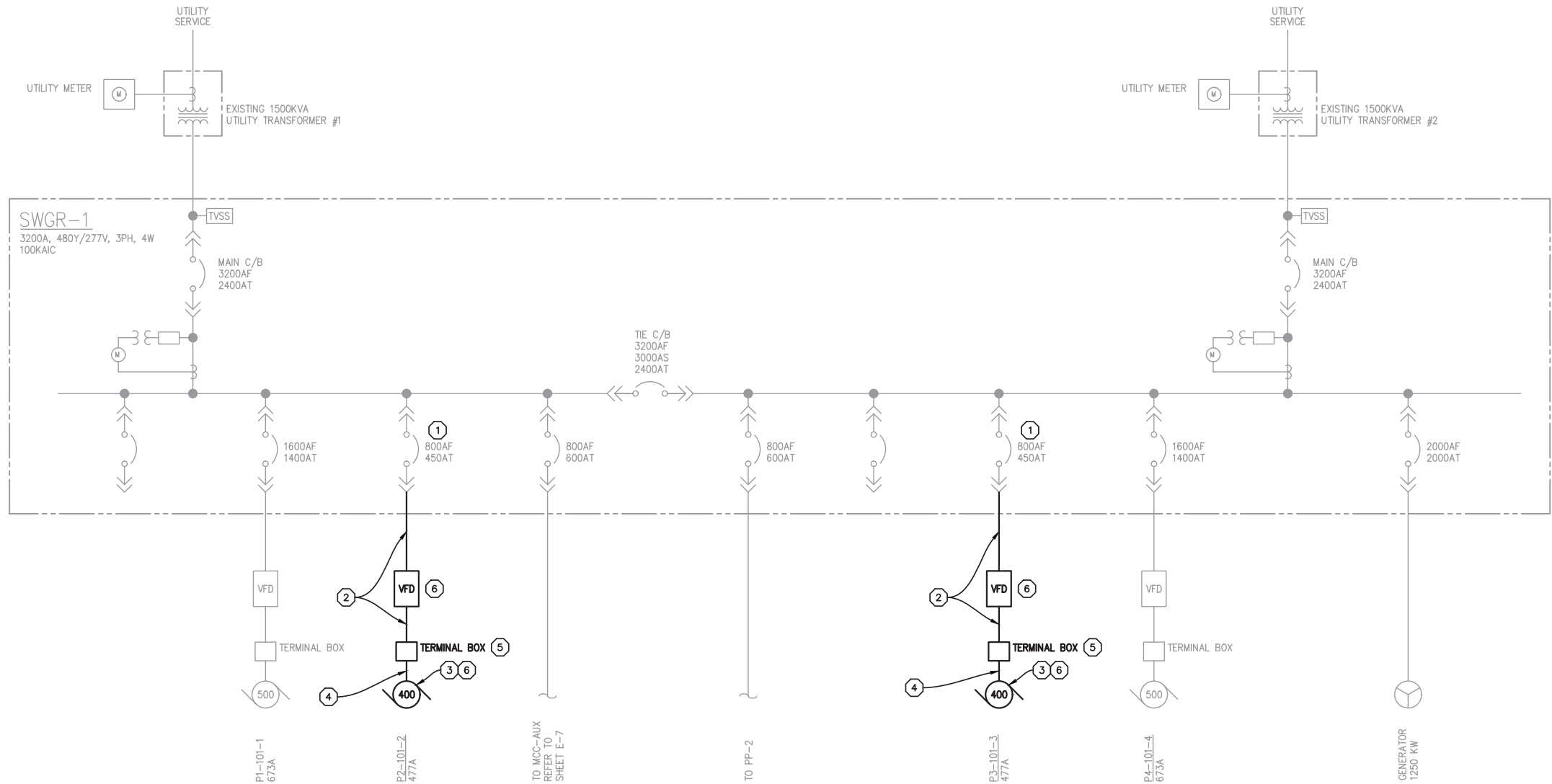
APPROVED BY: J.J.S.

PROJECT NO.
6357

DATE
8-5-19

DRAWING NO.

30-ER-1



SWGR-1 ONE-LINE DIAGRAM - NEW WORK
NTS

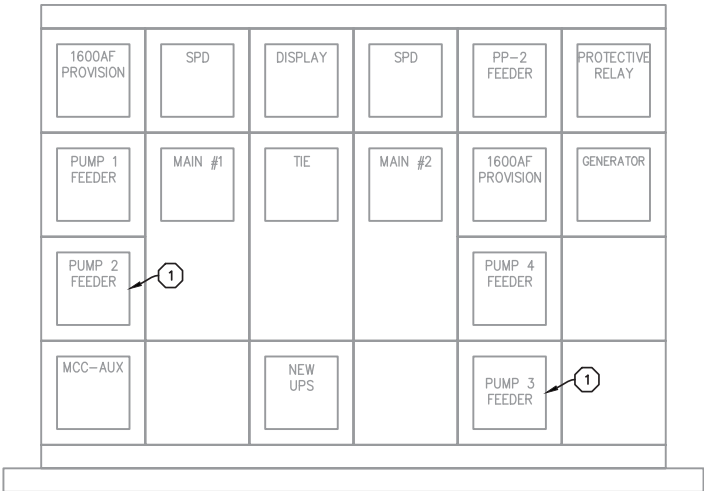
Revise to 3" conduit to EMT.
Contractor may re-use existing
350KCMIL Conductors (1 set of
3 per existing pump).

- A. Pump & Motor Vibration
B. Motor Thermistors, See Appendix A of Specifications.
C. E-Stop push button.
D. RRWRD will make terminations in the PLC Panel.


Addendum No. 2, 8/30/2019 revisions in red.

KEYED NOTES:


- 1 REPLACE EXISTING TRIP MODULE WITH NEW 700 AMP UNIT FOR THIS SQUARE-D MASTERPACT BREAKER.
- 2 PROVIDE 2[(3)350KCMIL, #1/0G, 3" ~~ORS~~ CONDUIT]. AN EMPTY 3" CONDUIT RUNS PART WAY BETWEEN EACH VFD AND THE EXISTING TERMINAL BOX. CONTRACTOR TO FIELD-VERIFY EXTENT.
- 3 RECONNECT THE FOLLOWING SIGNALS FROM THE NEW PUMP/MOTOR ASSEMBLIES TO THE PLC PANEL:
A. ~~HIGH VIBRATION~~
B. ~~PUMP BEARING HIGH TEMPERATURE~~
C. ~~MOTOR WINDING HIGH TEMPERATURE~~
EXTEND EXISTING CIRCUITS AND CONDUIT, IF NECESSARY.
- 4 PROVIDE 2[(3)350KCMIL, #1/0G, 3" LIQUID-TIGHT CONDUIT].
- 5 SIZE OF REPLACEMENT TERMINAL BOX SHALL MEET N.E.C. REQUIREMENTS.
- 6 RECONNECT EXISTING LOW VOLTAGE SIGNAL AND MONITORING CIRCUITS. REFER TO P&ID SHEET NO. 10 DATED JAN 2011 (CAPITAL PROJECT NO. 1032)



SWGR-1 ELEVATION
NTS



Rock River Water Reclamation District

 Applied Technologies Engineers-Architects	NO.	DATE	REVISIONS AND RECORD OF ISSUE	BY	APVD

ROCK RIVER WATER RECLAMATION DISTRICT
CHERRY VALLEY PUMP STATION
UPGRADE (CAPITAL PROJECT 1911)
ROCKFORD, ILLINOIS 61109

CHERRY VALLEY PUMP STATION
ELECTRICAL
ONE-LINE DIAGRAM

VERIFY SCALES
LENGTH OF BAR IS 1" ON ORIGINAL DRAWING

1:1
PLOT SCALE, ADJUST SCALE(S) ACCORDINGLY

DESIGNED BY: G.A.G.

DRAWN BY: J.T.H.

CHECKED BY: J.J.S.

APPROVED BY: J.J.S.

PROJECT NO.
6357

DATE
8-5-19

DRAWING NO.
30-E-1


$$\overline{1/4'' = 1'-0''}$$

Addendum No. 2 , 8/30/29
revisions in red.



CHERRY VALLEY PUMP STATION
UPGRADE (CAPITAL PROJECT 19)

VALLEY POWER ELECTRIC PLAN

30-F-2

50-E-2



GASVODA & ASSOCIATES, INC.
An Employee Owned Company
"Helping people use water efficiently"

VFD PROCURMENT CHERRY VALLEY LIFT STATION
Capital Project No. 1911

Project # 19-JTG-60

Submittal #2

8/12/2019

Customer: Rock River Water Reclamation District
Supplier: Gasvoda & Associates, Inc.
Sales Engineer: John VOGreaney

This book contains submittal data for review and approval by the proper authorities, for equipment proposed by Gasvoda & Associates, Inc., for the above named project.

Please distribute to all appropriate reviewing parties and return one (1) complete set of data with written authorization to proceed.

Please direct any questions, comments, or requirements to the sales engineer named above. Note: No equipment will be released to manufacturing without proper written authorization.



FC202 AQUA Series

Custom Panel Submittal

Package - Revision 2

**RRWRD Cherry Valley - Pump Station Improvements
Danfoss Quote #30195693 - Rev 1**

August 12, 2019



Danfoss Drives
Division of Danfoss Inc
Danfoss Water and Wastewater

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Milwaukee, WI 53224-9541, USA
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Index Page

- **Cover Sheet**
- **Index Page**
- **Section 1 – Project Scope**
- **Section 2 – FC202 AQUA Specifications**
- **Section 3 – Drawings and Major Components**
- **Section 4 – Warranty Information**
- **Section 5– Terms and Conditions**

Section 1 - Project Scope

- **FC-202 AQUA Series PHD Drive Panel – Qty. 2 – 450 HP**

FC-202 AQUA PHD Panel / NEMA 1 / 450 HP / 480 Volt / 3-Phase / 60Hz

Output Current: 515.0 Amps

Input Current : 517.2 Amps

100kA Short Circuit Current Rating

PHD Panel consisting of:

Three- Contactor Bypass

Main Fused Disconnect

NEC Table 430 Motor

Class A2 Filter (Std)

Conformally Coated Circuit Boards

Relay Card (105),

24VDC Backup

Frame Size: D4H

PHD202450T4E013CMXXXXX2CXXPX0XX

Mechanical Drawing: 174N9333-04

Electrical Drawing: 174N9983

Danfoss Packaged Drive Solutions

VLT® PHD-202 Preferred Harmonic Design

The VLT® PHD-202 Preferred Harmonic Design (PHD) is a full-featured, AQUA dedicated drive solution when conformance to IEEE-519 is required, even at the drive terminals. The PHD-202 has a number of features developed specifically to meet the diverse needs of water and wastewater applications and is the most practical solution to address growing harmonic concerns within the industry.

- Meets the most stringent IEEE-519 levels down to 60% load at panel terminals
 - Delivers enhanced THiD and Power Factor performance across the typical operating range.
 - Exceeds IEEE-519 THvD requirements
- Includes generator friendly features
- Improves performance versus existing harmonic solutions
 - Delivers greater unit efficiency
 - Produces less heat
 - Provides better harmonic performance in a smaller package

Product range:

3 x 480 V 1.5 – 600 HP
 3 x 600 V 1.5 – 650 HP

With 110% overload torque

Larger power sizes and alternate enclosure ratings are available upon request. Please consult factory.

Available enclosure ratings:

- NEMA 1
- NEMA 12
- NEMA 3R

Wall mount units to 75 HP
 Floor mount above 75 HP

Preferred

Harmonic Design.*

- THiD <5% above 60% load
- THvD <1.6% with <5% voltage line imbalance
- Cos Phi Power Factor = Near Unity
- Distortion Power Factor >.98% at loads > 50%



Features

Capacitor Disconnect

Better overall harmonic performance.

Robust single enclosure

Modular design utilizing standard VFDs.

Dedicated AQUA functionality

Utilizes Danfoss VLT AQUA drive

Units available with the following options:

- Fused or CB disconnect
- Bypass or non bypass
- Softstart bypass
- dV/dt output filter

Benefits

- reduces leading Power factor at low speed and insures better generator operation at low speed.

- Meets most stringent IEEE-519 specifications down to 60% load.

- 3 wire in / 3 wire out design; no field wiring of separate components

- Simplified long-term maintenance (18 pulse solutions require non standard VFD).

- integrates into existing facilities easily

- Full featured AQUA drive. Consult the VLT AQUA data sheet for a list of water/ wastewater dedicated features

- Unit configuration matches practically all AQUA panel specifications

OSHDP Pre-Approval

All units available with Special Seismic Certification and OSHDP Pre-Approval for ease of review by Authorities Having Jurisdiction.

Application Options

A wide range of integrated AQUA options come standard in the AQUA PHD panel, common start/stop, auto bypass, and dv/dt output filter.

Fieldbus Communication

Unit comes standard with built-in fieldbus protocols and with optional communication protocols.

External 24 VDC supply (MCB 107)

24 VDC external supply can be added to facilitate drive communication when main power is disconnected.

Power Options

A wide range of external power options are available for the VLT® PHD-102 Preferred Harmonic Design solution:

- Fused or Circuit Breaker Disconnect
- Non Bypass
- 3 Contactor Bypass
- Softstarter Bypass
- dv/dt output filters for motor insulation protection

Harmonic Performance*

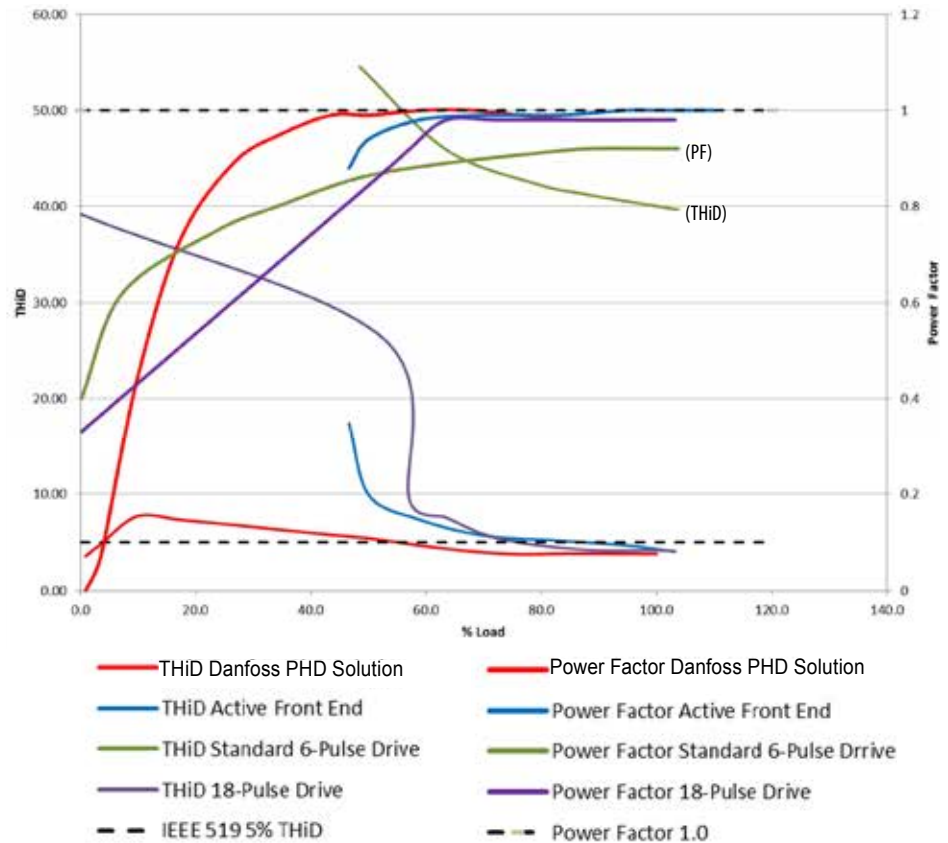
- THiD <5% above 60% load
- THVD <1.6% with <5% voltage line imbalance
- Cos Phi power factor = unity
- Distortion power factor >.98 at loads >50%

AQUA PC Software Tools

- **MCT 10** Ideal for commissioning and servicing the drive
- **VLT® Energy Box** Comprehensive energy analysis tool, shows the drive payback time
- **MCT 31** Harmonic analysis tool

* Performance can be dependent upon supply transformer and power conductors.

Harmonic Solution Comparison



Power supply (L1, L2, L3)

Supply voltage	- 480 V ±10%
Supply voltage	- 600 V ±10%
Supply frequency	- 60 Hz
Displacement Power Factor (cos φ) near unity	- (> 0.98)
Switching on input supply L1, L2, L3	- 1–2 times/min

Output data (U, V, W)

Output voltage	- 0 – 100% of supply voltage
Switching on output	- Unlimited
Ramp times	- 1-3600 sec.
Open/Closed loop	- 0–1000 Hz

OSHDP Special Seismic Certification

Pre-Approval	- Certification expedites seismic authorization by regulatory agencies.
--------------	---

Danfoss VLT Drives

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Phone: 800.621.8806

414.355.8800

Fax: 414.355.6117

www.danfossdrives.com

PHD-202 PERFORMANCE GUARANTEE

Install appropriate PHD-202 drives with Matrix Harmonic Filters in in variable torque AC variable frequency drive applications, within our published system limits and we guarantee that the input current distortion will be less than or equal to 5% THID for PHD-202 Matrix AP filters at full load, and less than 8% at 30% load. If a properly sized and installed filter fails to meet its specified THID level, MTE/Danfoss will provide the necessary modifications or replacement filter at no charge. TDD will typically be even lower than THID.

MINIMUM SYSTEM REQUIREMENTS

The guaranteed performance levels of this filter will be achieved when the following system conditions are met:

Frequency:	Nominal Frequency $\pm 0.75\text{Hz}$
System Voltage:	Nominal System Voltage (line to line $\pm 10\%$
Balanced Line Voltage:	Within 1%
Background Voltage Distortion:	0% THVD

NOTE: The presence of background voltage distortion will cause motors and other linear loads to draw harmonic currents.

Additional harmonic currents may flow into the Matrix Filter if there is harmonic voltage distortion already on the system.



Danfoss Drives

Division of Danfoss Inc

Danfoss Water and Wastewater

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- **Section 2 – FC202 AQUA Specifications**



DRIVE FEATURES – OPERATOR INTERFACE

The VLT® AQUA Drive

The VLT AQUA Drive Series is a microprocessor-based, high frequency IGBT-based, PWM AC drive with control functions and software designed solely for the unique needs of AQUA systems. The VLT AQUA Drive uses state-of-the-art Voltage Vector Control to supply full rated motor voltage at rated load and frequency, full motor performance without derating, high efficiency for both drive and motor, and a nearly perfect output sine wave. The diode-bridge rectifier and DC-link reactor provide a high displacement power factor at all speeds and loads and minimize power line harmonics. The VLT AQUA Drive utilizes a common user interface for all units.

Fully Graphic, Multilingual Display

The VLT AQUA Drive uses a large, bright, backlit graphic display to provide complete drive information at a glance. The logical arrangement of all elements simplifies the setup, operation and monitoring of the drive. Choose from 25 different items to display, including input reference, motor current, hours run, output frequency, horsepower, kW or kWh. Or select from custom units, such as GPM or HP and calibrate the maximum value to the maximum frequency of the unit. After programming one drive, the keypad can be used to transfer the same settings to all other drives. Drive can run without the keypad in place to assure tamper-proof operation. Drive status is shown even with the keypad removed.

LED Indication

Three LED's (light emitting diodes) are provided on the VLT AQUA Drive for indication of power applied, warning and fault. Upon power up, all LED's will briefly light as a lamp test.

Alarm – Will flash red when the drive has registered a fault condition which has caused the drive to shut down.

Warning – Will flash yellow to indicate a situation exists which exceeds the normal drive/system parameters, and if that condition continues, a trip may be imminent.

On – Will glow green to indicate that the VFD is connected to AC power (line voltage is present).

Operating Keys

Hand On – Starts the drive regardless of remote start/stop contact (assuming safety interlock is closed). The speed of the drive will generally be controlled manually via the keypad "+" and "-" buttons.

Off – Shuts the drive down regardless of other commands.

Auto/On – The drive will start and stop via the external contact closure (building automation time clock). The speed is generally controlled via the building automation signal (4 to 20mA, 0 to 10VDC, etc.).

Reset – Will reset any trip level fault (not trip lock) if the drive is not set for infinite automatic fault resets.

Directional Keys

Right / Left / Up / Down arrows – Used as the electronic potentiometer to manually control the speed in the Hand/Start mode. All four keys are active during operation as well as programming. They provide the ability to move the cursor around the display, or sequence through display values.

Programming Keys

Status – Used to display operational data and status.





Cancel – Used to cancel the last programming command so the change is not carried out.

OK – Used to confirm that the last programming change should be saved to memory.

Back – Used to exit present display or menu to the previous display or menu.

Quick Menu – Used for programming the VLT HVAC Drive for the most typical applications.

Main Menu – Used to access all parameters for programming. It can switch directly from this mode to quick menu.

Alarm Menu – Used to access all fault and warning data.

Info Key – Accesses an on-board manual that gives detailed explanation of a parameter.

PROGRAM OPTIONS

Application-Specific Software

The VLT AQUA Drive was designed specifically for the Water/Wastewater market. These specializations have allowed Danfoss to factory program and configure the VLT AQUA Drive to make it ready to use, out of the box. This eliminates the time-consuming and often confusing job of selecting the correct parameters in the field. For the advanced user, the parameters are logically grouped, making modifications simple. Customized text fields are available to show user-specific data. Four independent setups are available for unmatched flexibility.

Menu Structure

Quick Setup Menu – Contains the 14 required setup parameters to easily start the application.

Application Menu – Provides easy access to the most relevant parameters for each of the most common AQUA applications.

Personal Menu – Contains up to 20 user-selectable parameters for customized access.

Changes Made Menu – Provides easy access to previously modified parameters

Keypad Features

- Hot-pluggable with upload and download capabilities
- On-screen scroll bars and graphs
- Up to five separate meters displayed simultaneously
- Two-level password protection
- Plain language alarms and warnings
- Remote keypad mounting kits available

USB Connectivity

The VLT AQUA Drive can be remotely commissioned and monitored through a standard USB connection and MCT 10 PC software.

Agency listing:

All drives and option packages are factory built and carry UL and cUL listings.

All drives and option packages are built in ISO 9000 and 14001 certified facilities.



DRIVE FEATURES – MOTOR AND DRIVE INTERACTION

Constant-Torque Start

The VLT AQUA Drive's constant-torque start mode provides full torque to accelerate different loads until the drive reaches the setpoint. Breakaway current can be set up to 160% for up to 0.5 seconds for starting high friction loads.

Current Limit Circuit

Adjustable from 0 to 110% of the VLT AQUA Drive's rated current (factory set at 110%). If during acceleration the current required to accelerate the load exceeds the current limit, the VLT AQUA Drive will stop accelerating until the motor current is reduced to normal levels, at which time the load will continue to accelerate at the rate set by the acceleration time.

Three-Phase Output Current Measurement

The VLT AQUA Drive's software measures output current on all three phases. Phase grounding is detected instantly. Output contactors may be repeatedly used with no damage to the drive. Multiple motors may be run from one drive.

Advanced Motor Protection

The VLT AQUA Drive features integrated electronic, thermal motor protection. The VFD calculates the motor temperature based on current, frequency, and time. This system allows for changing cooling conditions as speed and load vary. The drive can predict motor overheating and reports a % of thermal load.

Motor Preheat Circuit

This preheat function can be activated to avoid condensation on the motor windings when it is stopped.

Stall Protection

The VLT AQUA Drive provides protection against a stalled motor. When activated, this function can provide a warning or a fault condition caused by excessive motor current at low speeds.

DRIVE FEATURES

DC-Link Reactor

A dual, 5% DC-link reactor on the positive and negative rails of the DC bus is standard equipment on the VLT AQUA Drive. This reactor reduces the level of harmonics reflected back into the power system without causing a voltage loss at the drive's input and reducing efficiency as an external AC line reactor would. This reactor also improves input power factor. The reactor is non-saturating (linear) to provide full harmonic filtering throughout the entire load range. In performance, the DC-link reactor is equivalent to a 5% AC line reactor.

Power Line Protection

Power line voltage surge protection is provided by means of input Metal Oxide Varistors (MOVs) and Zener diodes. This protects the diodes in the VLT AQUA Drive's 3-phase full wave diode bridge. The DC-link reactor also acts to reduce input current caused by power line disturbances.

Sleep Mode

Automatically stops the drive when speed drops below set "sleep" level for specified time. Automatically restarts when speed command exceeds set "wake" level. Saves energy and reduces wear on driven equipment.

Run Permissive Circuit

Ability to accept a "system ready" signal assures that valves or other auxiliary equipment are in the proper position for drive operation. This feature also provides the ability for the drive to send a "start signal applied" signal to the system to notify the auxiliary equipment of the drive's request to start.



Acceleration / Deceleration Rates

The VLT AQUA Drive can provide four individually controlled sets of acceleration/deceleration rates each from 1 to 3600 seconds. The shape of these curves may be automatically contoured to prevent tripping.

Auto Restarts

The VLT AQUA Drive can be automatically restarted up to 20 times or infinitely at 0 to 600 second intervals. If the application causes the drive to trip more than the number of trials set, the drive will stop operating and display the fault on the display screen. A manual reset will be required by means of the reset key, a digital input, or RS-485 command. In cases of severe trips, as a safety feature, the drive's input power may have to be cycled to restart a fault.

Carrier Frequency

By using IGBT's, the VLT AQUA Drive can employ high switching frequencies, so the motor current is practically sinusoidal. Audible motor noise can also be minimized by adjusting the switching frequency. These frequencies can be set or adjust themselves automatically to fit the application.

Input Power

The VLT AQUA Drive is equipped with an automatic sustained power or phase loss circuit. The VLT AQUA Drive will provide a full rated output with an input voltage as low as 90% of the nominal. The drive will continue to operate with reduced output with an input voltage as low as 164 volts for 208 - 240 volt units, 313 volts for 480 volt units, and 394 volts for 575/600 volt units.

Automatic Motor Adaptation (AMA)

Knowing motor stator resistance, the drive automatically optimizes performance and efficiency. AMA also analyzes the motor cable to insure proper voltage to the motor. The motor does not have to be run or decoupled from the load for the AMA setup to be performed.

Automated Frequency Avoidance / Critical Frequency Lockouts

For applications where it may be necessary to avoid specific frequencies due to mechanical resonance problems in the driven equipment, the VLT AQUA Drive, with its Critical Frequency Lockout Function, makes it possible to set up to four different frequency ranges which will be avoided during operation of the drive. This feature can be programmed by simply activating the feature and pushing OK at the top and bottom points that you wish to avoid.

- Each critical frequency setting can avoid a frequency band which is from 1 to 100 Hz wide. If the reference signal defines that the VLT AQUA Drive is to operate within this critical frequency range, the critical frequency lockout function will keep the drive operating continuously within this range.
- When the frequency reference signal rises above the critical frequency maximum limit, the VLT AQUA Drive will allow the motor to accelerate through the critical frequency at the rate set by the acceleration rate.

Automatic Energy Optimization Circuitry

The Automatic Energy Optimization (AEO) function adapts the output of the drive to the specific motor and load connected. This circuit optimizes the system efficiency as system loads change. The AEO function regulates the output voltage on the basis of the reactive current and the effective current. A savings of 3 to 10% in power consumption can be obtained with this function.

Preset Speeds

The VLT AQUA Drive allows for a maximum of 16 programmable preset speeds to be selected from the digital inputs.

Energy Monitoring

Real energy savings are always available without the additional expense of external equipment.



Real-Time Clock

Feature adds sophisticated performance to basic control schemes for increased comfort and energy savings.

Automatic High Ambient Derate

If the ambient temperature exceeds the normal limit, the drive can be set to warn of its over-temperature and continue to run, keeping the AQUA system functional. To control its temperature, the drive will reduce the output carrier frequency and then, if necessary, reduce the output current.

Preventive Maintenance Scheduling

The VLT AQUA Drive can monitor system usage and notify the operator when preventive maintenance is required.

Intelligent PID Controller

Four auto-tuning PID functions are available to control the drive and up to three other devices, eliminating external controllers and reducing cost.

- **Proportional:** The proportional gain dictates the rate at which the deviation between actual and desired feedback signal is corrected. The higher the gain, the faster the response, but too high a gain can cause hunting and a large overshoot.
- **Integral Time:** The integral time continually compares the feedback value with the desired setpoint over time to make sure the setpoint is reached. The greater the integral time, the longer it takes to actually achieve the setpoint, but improves the system stability.
- **Derivative:** The derivative function monitors the rate at which the feedback is closing on the desired setpoint and slows the rate of approach to prevent overshooting. This function allows rapid accurate system control.

Built-in Communications

The VLT AQUA Drive is fully equipped for serial communication (RS-485). Up to 31 drives can be connected to one serial bus up to 5,000 feet long.

Communicates directly with *Modbus RTU* systems with no hardware changes or additional costs.

Optional communications include *DeviceNet*, *Profibus*, *Modbus TCP/IP*, *ProfiNET* and *Ethernet IP* with the addition of an Option A card.

Broken Belt, Loss of Load

A minimum motor current value can be set to indicate the motor is not using any more current than to run at idle. This can be used to indicate a broken belt or coupler. This feature can also be used to detect when a motor is disconnected from the drive.

Conformal Coated Circuit Boards

Printed Circuit boards are conformal coated to reduce the corrosion effect from environmental gases and other conditions. The conformal coating meets IEC 61721-3-3, Class 3C2 as standard and as an option the VFD will meet 61721-3-3, Class 3C3.



Drive Specifications

Drive Input Power

Input voltage, 3 phase	200–240, or 380–480, or 525–600 VAC
Input voltage range for full output.....	Nominal $\pm 10\%$
Undervoltage trip point	164, 313, or 394 VAC
Overvoltage trip point.....	299, 538, or 690 (792 for 100 HP and above) VAC
Input frequency	50 or 60 Hz, ± 2 Hz
Displacement Power factor.....	0.98 or greater at all speeds and loads
Total Power factor.....	0.90 or greater at full load and nominal motor speed

Drive Output Power

Output frequency	Selectable 0 to 120 Hz
Motor voltages	200 – 240; 380 – 480; 525 – 600 VAC
Continuous output current	100% rated current
Output current limit setting.....	Adjustable to 110% of drive rating
Current limit timer	0 to 60 seconds or infinite
Adjustable maximum speed	from minimum speed setting to 120 Hz
Adjustable minimum speed	from maximum speed setting to 0 Hz
Acceleration time	to 3,600 seconds to base speed
Deceleration time.....	to 3,600 seconds from base speed
Breakaway torque time.....	0.0 to 0.5 seconds (1.6 times motor nameplate current)
Start voltage.....	0 to 10%
DC braking time	0 to 60 seconds
DC braking start.....	0 to maximum frequency
DC braking current.....	0 to 50% of rated motor current

Environmental limits:

Efficiency	97% or greater at full load and nominal motor speed
Ambient operating temperature	14°F to 122°F (–10°C to 50°C) frames A2–C2; 14°F to 104°F (–10°C to 40°C) frames D1–F1
Humidity	< 95%, non-condensing
Altitude: maximum without derating.....	3,300 ft. (1,000 m)
Drive and options enclosure(s).....	NEMA/UL Types 1 and 12; as noted



Software

Lost speed reference action	Selectable to go to a preset speed, go to maximum speed, stay at last speed, stop, turn off, or stop and trip
Time delay for lost speed reference action.....	1 to 99 seconds
Adjustable auto restart time delay	0 to 600 seconds
Automatic restart attempts.....	0 to 20 or infinite
Automatic restart time delay	0 to 600 seconds between each attempt
Relay ON delay and relay OFF delay.....	0 to 600 seconds
Maximum number of preset speeds	16
Maximum number of frequency avoidance steps....	4
Maximum avoidance step width	100 Hz
Maximum number of acceleration rates	4
Maximum number of deceleration rates	4
Delayed Start	0 to 120 seconds

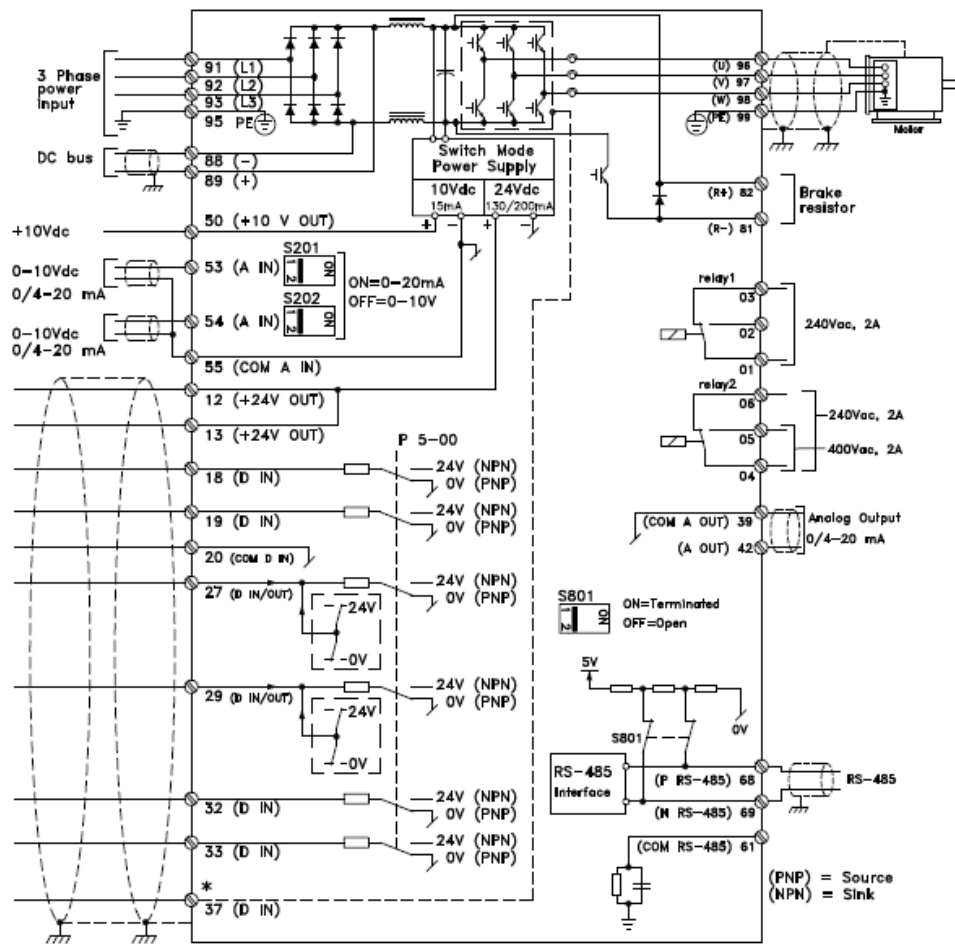
Protections:

Low frequency and high frequency warnings	0 to 120 Hz
Low current and high current warnings	0 to maximum current
Low reference and high reference warnings	-999,999 to 999,999
Low feedback and high feedback warnings	-999,999 to 999,999
Ground fault	Protected
Motor stall	Protected
Motor over-temperature	Protected (Predictive motor temperature)
Motor Condensation	Protected (Motor pre-heat circuit)
Pump No-Flow	Protected
Pump end-of-curve	Protected
Dry pump	Protected
Short-cycle	Protected
Motor overload	Protected (Programmable action)
Vibration protection.....	Protected (Programming automated)

Control Connections

Follower signal, analog input	2: Selectable voltage or current, direct and inverse acting
Programmable digital inputs	6 (2 can be used as digital outputs)
Programmable analog outputs	1; 0/4 to 20mA
Programmable relay outputs	2 standard Form C; 240VAC, 2A; 1 or 3 additional optional
Auxiliary voltage.....	+24VDC, maximum 200mA

Typical Control Connections



Terminal number	Terminal description	Parameter number	Factory default
1+2+3	Terminal 1+2+3-Relay1	5-40	No operation
4+5+6	Terminal 4+5+6-Relay2	5-40	No operation
12	Terminal 12 Supply	-	+24 V DC
13	Terminal 13 Supply	-	+24 V DC
18	Terminal 18 Digital Input	5-10	Start
19	Terminal 19 Digital Input	5-11	No operation
20	Terminal 20	-	Common
27	Terminal 27 Digital Input/Output	5-12/5-30	Coast inverse
29	Terminal 29 Digital Input/Output	5-13/5-31	Jog
32	Terminal 32 Digital Input	5-14	No operation
33	Terminal 33 Digital Input	5-15	No operation
37	Terminal 37 Digital Input	-	Safe Stop
42	Terminal 42 Analog Output	6-50	Speed 0-HighLim
53	Terminal 53 Analog Input	3-15/6-1*/20-0*	Reference
54	Terminal 54 Analog Input	3-15/6-2*/20-0*	Feedback



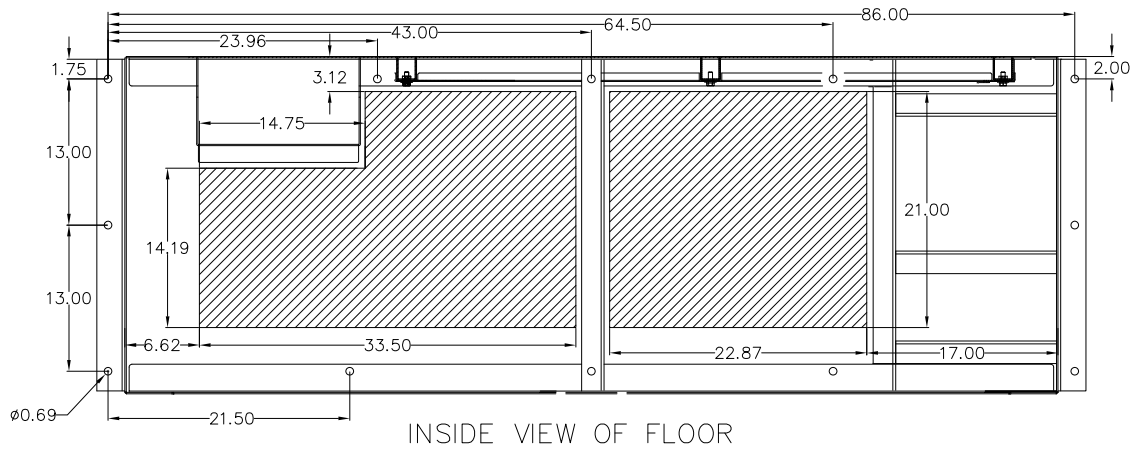
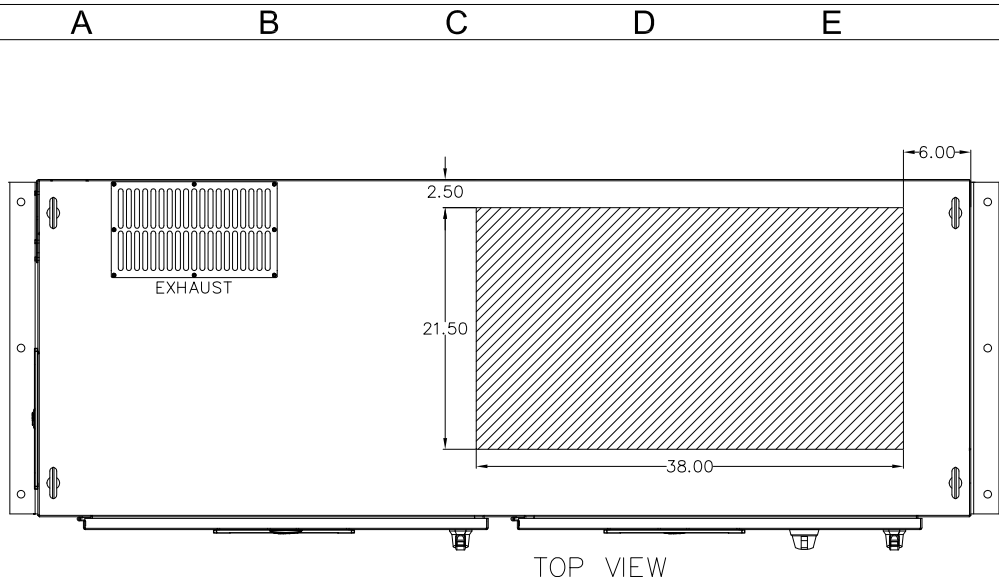
Danfoss Drives

Division of Danfoss Inc

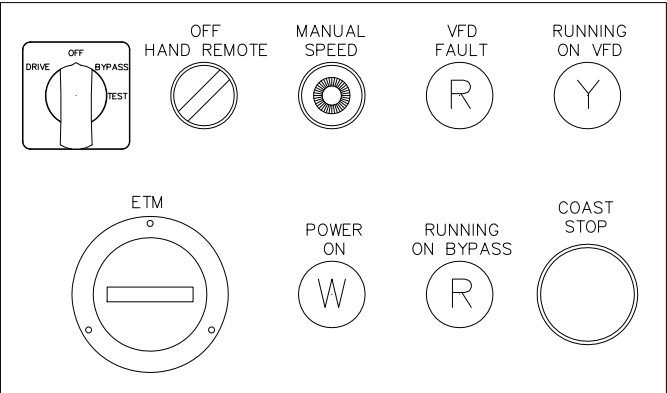
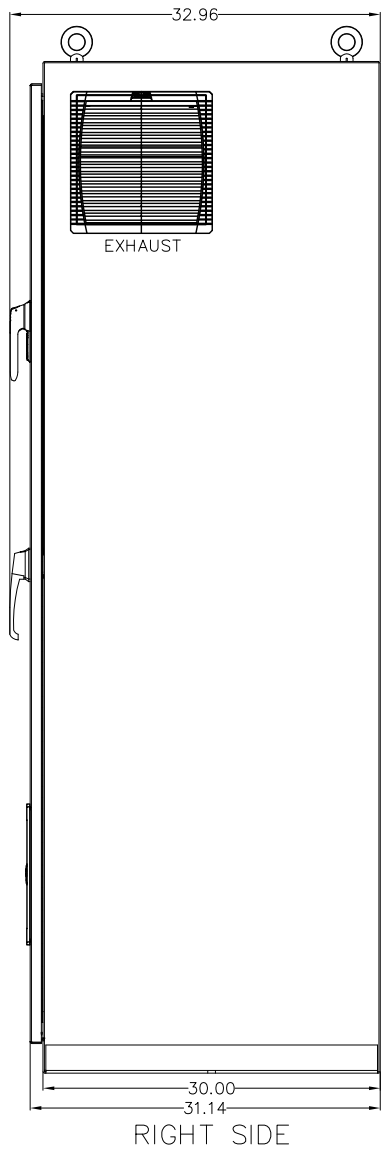
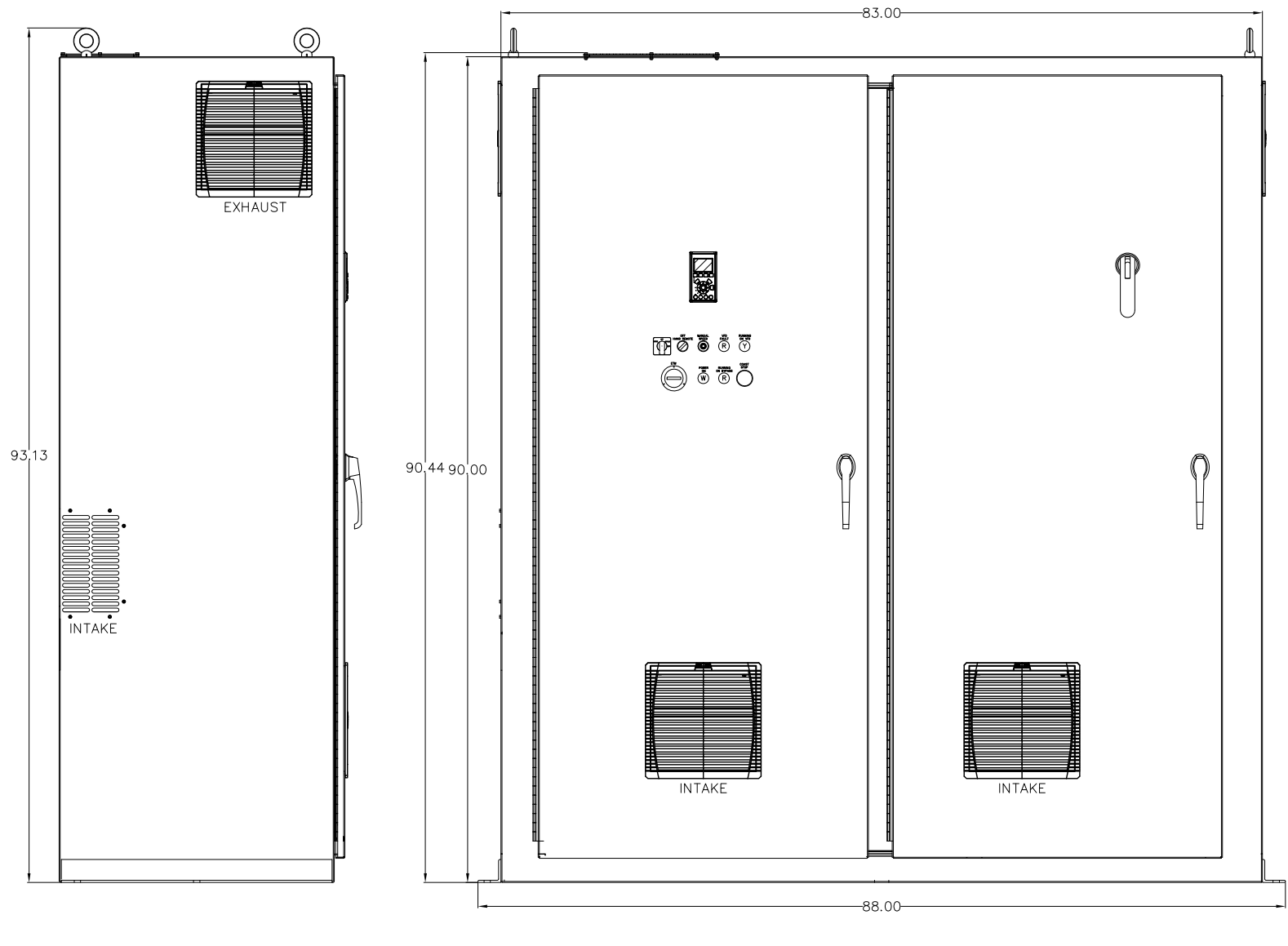
Danfoss Water and Wastewater


P.O. Box 245041
8800 W. Bradley Road
Milwaukee, WI 53224-9541, USA
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Telefax: +1 414-355-6117

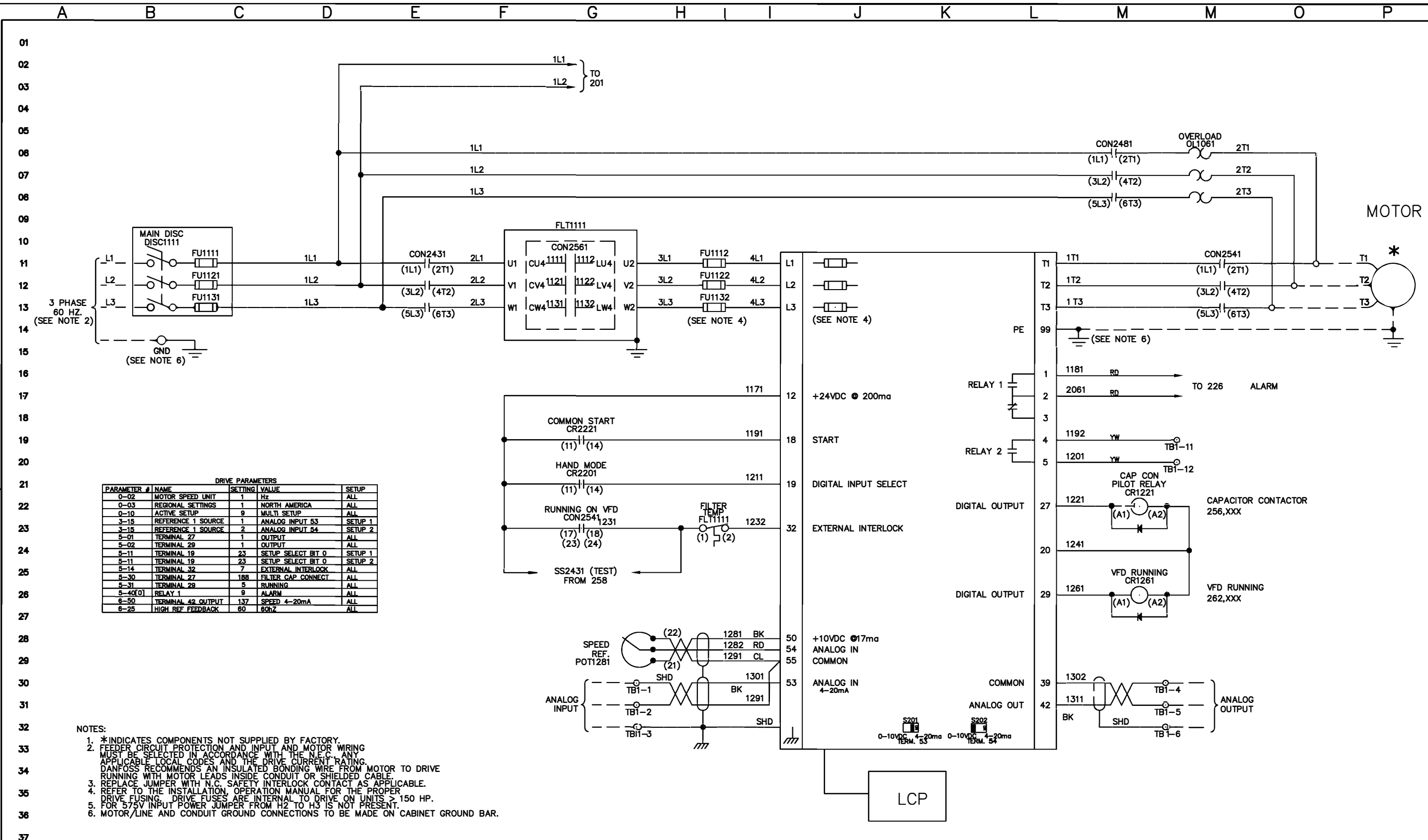
Section 3 - Drawings and Major Components




- NOTES:
1. ALLOW 20" MINIMUM CLEARANCE ON INTAKE SIDE OF ENCLOSURE.
 2. HATCHED AREA IS AVAILABLE FOR CONDUIT.
 3. ALLOW 12" MINIMUM CLEARANCE BETWEEN CABINET ROOF AND OBJECTS AND CEILING DIRECTLY ABOVE ENCLOSURE.
 4. ALLOW 12" MINIMUM CLEARANCE ON RIGHT SIDE OF ENCLOSURE.
 5. IF ADJACENT TO OTHER ENCLOSURES WITH AIR INTAKES OR EXHAUSTS ON SIDES, ALLOW 24", OR 18" IF A HORIZONTAL BARRIER IS BUILT TO ISOLATE INTAKE AIR FROM EXHAUST AIR.

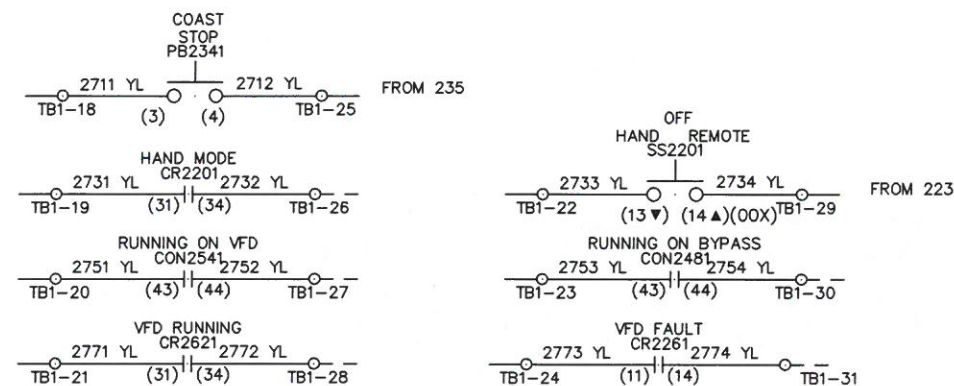


7			3			<p>– NOTICE –</p> <p>THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION OF DANFOSS DRIVES. IT IS LOANED BY DANFOSS DRIVES SUBJECT TO THE CONDITIONS THAT IT AND THE INFORMATION EMBODIED THEREIN SHALL BE USED ONLY FOR RECORD AND REFERENCE PURPOSES, SHALL NOT BE USED OR CAUSED TO BE USED IN ANY WAY PREJUDICIAL TO THE INTERESTS OF DANFOSS DRIVES, SHALL NOT BE REPRODUCED OR COPIED IN WHOLE OR IN PART, OR DISCLOSED TO ANYONE WITHOUT THE DIRECT WRITTEN PERMISSION OF DANFOSS DRIVES AND SHALL BE RETURNED UPON REQUEST.</p>	DRN	TOLERANCE		NAME AQUA PHD PANEL, 3 CONTACTOR OR SOFTSTART BYPASS, 300 - 450 HP / 480 VAC, OR 250 - 400 HP / 600 VAC, NEMA 1, 12, DIMENSIONAL DWG.				 Milwaukee, Wi.	
6			2				JJH	Unless Otherwise Specified		MODEL	FC-202	SHEET <u>1</u> OF <u>1</u>	SIZE D	DWG. NO.	174N9333-04
5			1				APR								
4			0		9/26/15		SJG	2 PLC. ±.02 3 PLC. ±.005							
REV	ECN	DATE	REV	ECN	DATE			SCALE 1.0							



NOTE: ALL WIRES #16 AWG BLUE UNLESS OTHERWISE NOTED
NOTE: ANALOG PAIRS ARE 18 AWG BELDEN #9460

				- NOTICE -	DRN	TOLERANCE	NAME POWER DISTRIBUTION WIRING DIAGRAM						
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Add pilot lights/devices	02	SP19005	1/15/19		APR	PT	2 PLC. ±.02 3 PLC. ±.005	MODEL	FC202	SHEET 1 OF 2	SIZE	DWG. NO.	174N9983
	DR		6/12/14										
DESCRIPTION	REV	ECN	DATE				SCALE 1.0						



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DRN AS	TOLERANCE Unless Otherwise Specified	NAME POWER DISTRIBUTION WIRING DIAGRAM PHD PANEL AQUA 3-CONTACTOR BYPASS 460/575 VAC FUSED DISCONNECT, TYPE 1 & 12				<i>Danfoss</i>
APR PT	2 PLC. $\pm .02$ 3 PLC. $\pm .005$	MODEL FC202	SHEET <u>2</u> OF <u>2</u>	SIZE D	DWG. NO. 174N9983	
	SCALE 1.0					

Low-Peak™ KRP-C Class L 600Vac/300Vdc, 601-2000A, time-delay fuses

RoHS



Catalog symbol:

- KRP-C-(amp)SP

Description:

Bussmann® series Ultimate protection KRP-C Class L current-limiting, time-delay fuses. Time-delay – 4 seconds (minimum) at 500% of rated current.

Specifications:

Ratings

- Volts
 - 600Vac
 - 300Vdc
- Amps 601-2000A*
- IR
 - 300kA Vac RMS Sym.
 - 100kA Vdc

* Use KRP-CL fuses for ratings from 225 to 600 amps.

Agency information

- UL® Listed, Guide JDDZ, File E4273
- CSA® Certified, Class 1422-02, File 53787, Class L per CSA C22.2, No. 248.10
- CE
- RoHS compliant



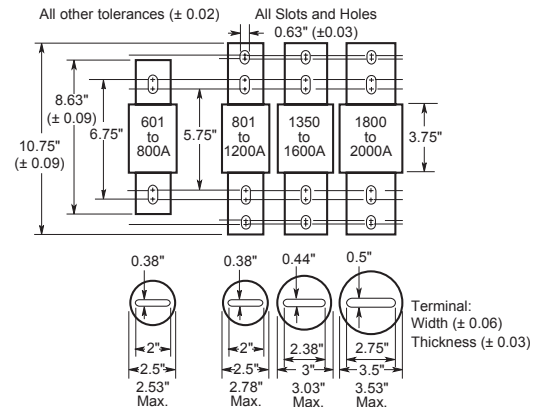
Catalog numbers (amps)

KRP-C-601SP	KRP-C-900SP	KRP-C-1500SP
KRP-C-650SP	KRP-C-1000SP	KRP-C-1600SP
KRP-C-700SP	KRP-C-1100SP	KRP-C-1800SP
KRP-C-750SP	KRP-C-1200SP	KRP-C-1900SP
KRP-C-800SP	KRP-C-1350SP	KRP-C-2000SP
KRP-C-801SP	KRP-C-1400SP	

Carton quantity:

Amp rating	Carton qty.
601-2000	1

Dimensions - in:



Features:

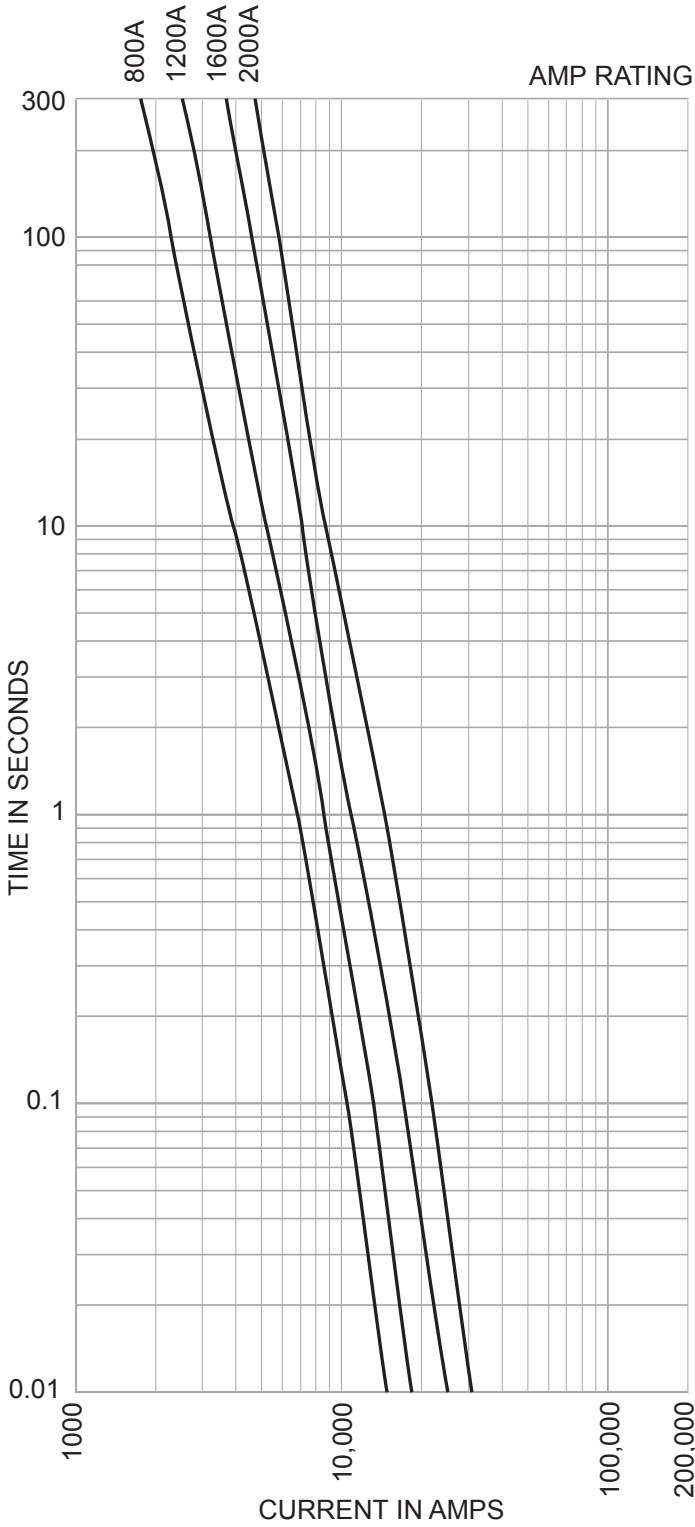
- Industry's only UL Listed and CSA Certified fuse with a 300kA interrupting rating that allows for simple, worry-free installation in virtually any application.
- Fast short-circuit protection with time-delay performance provide ultimate protection.
- Consistent 2:1 ampacity ratios for all Low-Peak fuses make selective coordination easy.
- Time-delay for close sizing load.
- Current-limiting action of the fuse generally affords considerable reduction in bus bracing.
- All-purpose silver-linked fuse for both overload and short-circuit protection for high capacity systems (mains and large feeders).
- O-ring seals maximize pressure build-up during current-limiting action and ensure filter retention.
- High-grade silica sand filler accelerates response of fuse to short-circuits by having quenching effect on the fuse arc.
- 99.9% pure silver links provide low watt loss with low operating temperature on normal current levels and minimizes total clearing I²t fault energy left-through.

Recommended fuse blocks — 601 to 1200 amp†

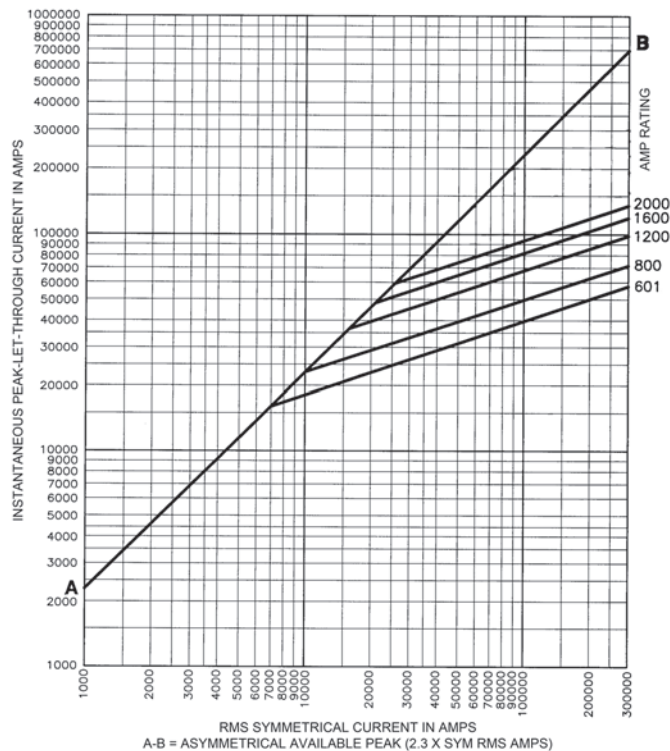
Catalog numbers	Poles
51215	1
51235	3

† No Agency listings available.
No reducers available.

Time-current curves - average melt



Current-limitation curves:



Current-limiting effects:

Prospective S.C.C.	Let-through current (apparent RMS symmetrical vs. fuse rating)				
	601A	800A	1200A	1600A	2000A
5000	5000	5000	5000	5000	5000
10,000	8000	10,000	10,000	10,000	10,000
15,000	9000	12,000	15,000	15,000	15,000
20,000	10,000	13,000	17,000	20,000	20,000
25,000	11,000	14,000	19,000	22,000	25,000
30,000	11,000	14,000	20,000	24,000	27,000
35,000	12,000	15,000	21,000	25,000	29,000
40,000	13,000	16,000	22,000	26,000	30,000
50,000	14,000	17,000	23,000	28,000	32,000
60,000	15,000	18,000	25,000	30,000	34,000
70,000	15,000	19,000	26,000	32,000	36,000
80,000	16,000	20,000	27,000	33,000	38,000
90,000	17,000	21,000	29,000	34,000	39,000
100,000	17,000	22,000	30,000	36,000	41,000
150,000	20,000	25,000	34,000	41,000	47,000
200,000	22,000	27,000	37,000	45,000	51,000
250,000	24,000	29,000	40,000	49,000	55,000
300,000	25,000	31,000	43,000	52,000	59,000

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Item # T50B212 with NEMA 4x12 Gasket

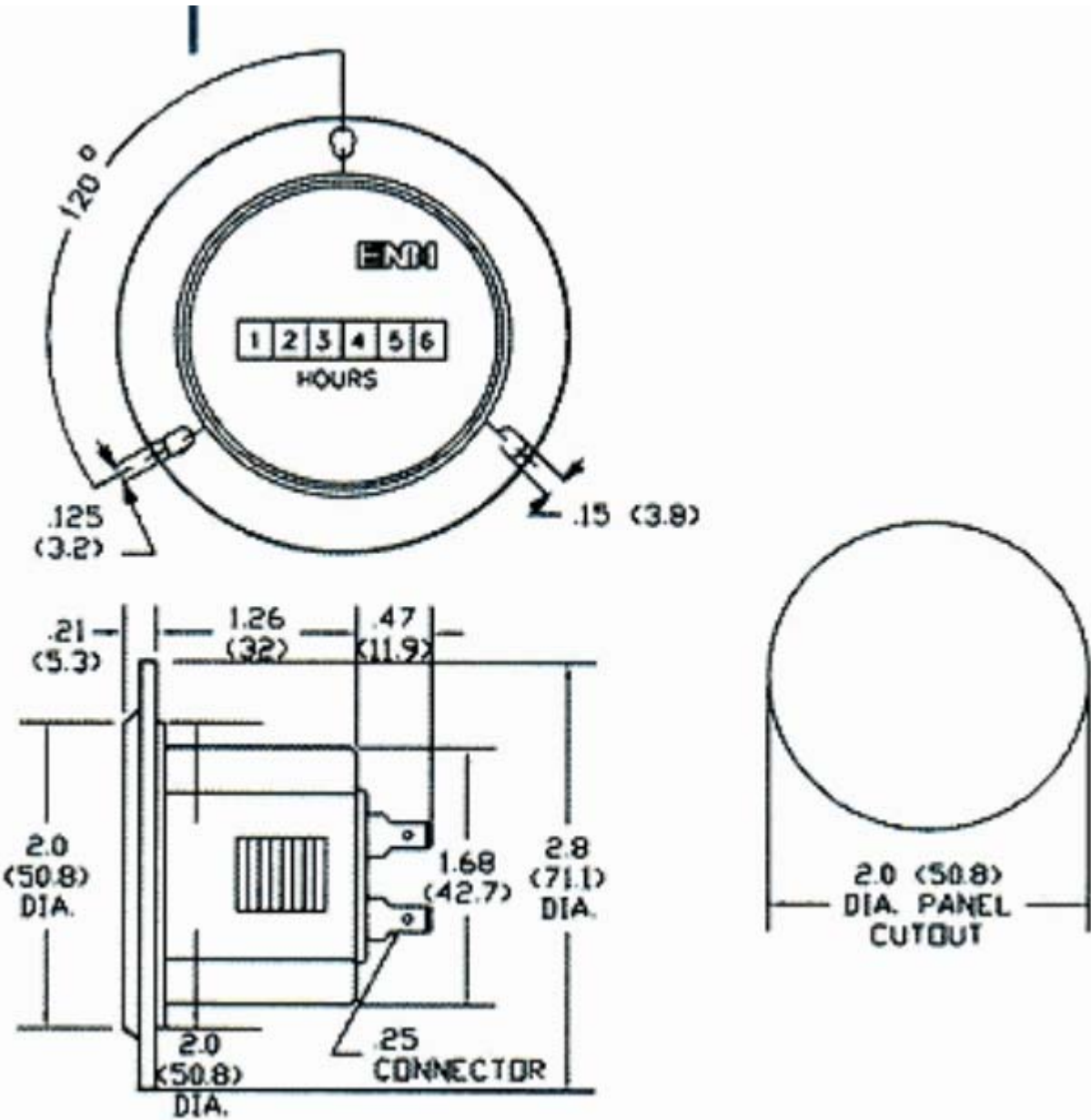


with NEMA 4x12 Gasket
ENM's series T50 AC hour meter in a large 3-hole flange. Includes NEMA 4X. 12 rated panel gasket for water and corrosion resistant panel mounting (see accessories). A quartz crystal time base insures accurate time keeping. This model is also frequency insensitive.

Specifications

Series	T50
Display	6-Digit
Voltage	115 V AC
Reset	None
Size	1.68W x 1.68H x 1.26D Inch
Face Dia - Flange	2.8 Inch
Face Dia - Cutout	2 Inch
Weight	2 oz.
Mounting Style	3-Hole Panel
Power	Less than 0.4 W

Dimensional Drawing



STANDARD MOUNTING TYPES

PANEL

Panel Mounting is obtained by cutting a circular or rectangular cut-out in the desired panel and the instrument is inserted with the flange resting on the top of the panel. The instrument is held in place by compressing a plastic or steel spring clip from behind the panel. This type of mounting is very popular because it requires no additional fasteners. Models are also considered panel mounted when they are inserted into a panel cut-out and mounted from the front using a two or more hole flange and fastened with screws from the front of the panel (pictured to the right).



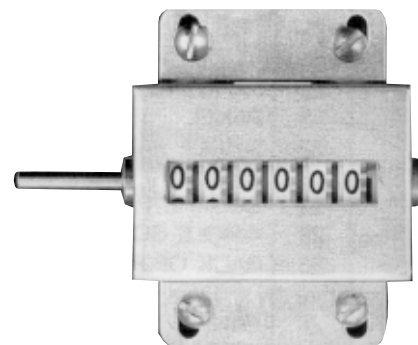
BACK OF PANEL

Back of panel mounting is usually achieved by cutting an opening in a thin panel large enough to read the display. Two or more holes are drilled in the panel and screws are inserted from the front to secure the instrument against the back of the panel wall.



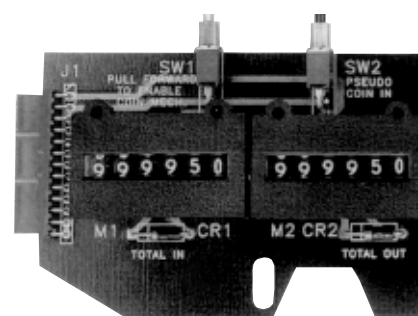
BASE

Base mounting is usually a free standing mount and connections are made with a two or more hole flange at the bottom of the unit. This is a standard mount for most mechanical counters and is sometimes used for hour meters when a panel is not available.



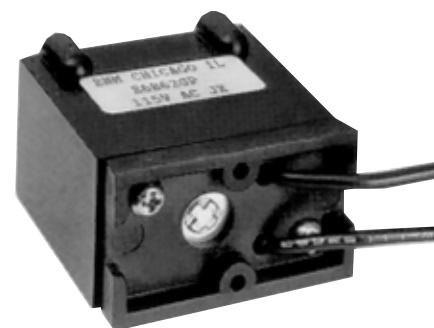
PCB

PC board mounting is common for using counters in add-on PCB modules to electronic machinery. This type of mounting eliminates the need for any wires and multiple counters can be assembled as one unit. The counters are attached by soldering the protruding pins into the PCB and two or more fasteners are also screwed into the bottom of the unit for additional support onto the PC board.



REAR

Rear mounting is similar to PCB mounting except there are no pins for soldering, only two or more holes on the bottom for threaded or self-tapping screws. This is an optional type of mounting used mainly when a suitable panel is not available.

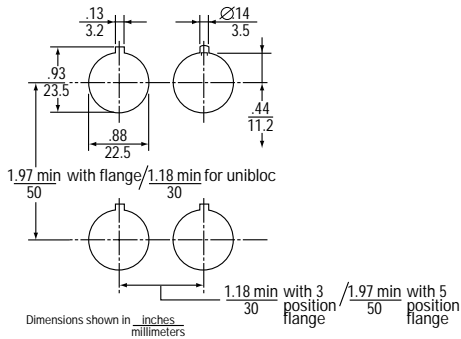




Technical Data

General Specifications																																																																																																			
Conformity to standards	UL 508 (USA) NEMA ICS-2 (USA) VDE 0660 (Germany) BSI (Great Britain) CEI EN60947.5.1 (Italy) CENELEC EN 5000 7 (Europe)				CSA C22.2 No. 14-M91 (Canada) IEC 947.5.1 (International) UTE (France) NFC 63140 (France) JIS (Japan)																																																																																														
Approvals	UL Listed - File Number E66677 CSA Certified - File Number 16661-63 Manufacturing facility is registered to ISO 9000				CE																																																																																														
Finger protection at terminals	IP2X according to IEC 529 Terminal identification per CENELEC EN 50013																																																																																																		
Enclosure ratings	Suitable for use in NEMA Types 1, 3, 3R, 3S, 4, 4X,12 and 13 enclosures. (Multi-function push buttons are suitable for NEMA Type 1 enclosures only unless used with protective rubber cap accessory.) IP66 per IEC 529, when mounted in enclosures with equal or superior seal.																																																																																																		
Ambient temperature	Operating -13° to +158° F -25° to +70° C		Storage -40° to 158° F -40° to +70° C																																																																																																
Climate suitability/humidity	Climate Type Temperate Wet Hot Wet Variable Wet		Temperature 74°F (23° C) 74°F (23° C) 104°F (40° C) 74° to 104° F (23° to 40° C)		Relative Humidity 50% 83% 92% 83% to 92%																																																																																														
Resistance to vibration	Per IEC 68-2-6. 16g with a frequency from 40-500 Hz and maximum peak-to-peak amplitude of 0.75mm.																																																																																																		
Resistance to shock	According to MIL 202B, method 202A. Test was performed for 1/2 sinusoid for 11ms, 38g max for all operators with transformers and 100g for all other operators.																																																																																																		
Operating force	Standard push button operator: 2.5 lb (11 N) Each contact block: 1.3 lb (6 N) Selector switch operator : 2.4 in-lb (0.27 N-m)																																																																																																		
Wire Terminals																																																																																																			
Wire capacity and terminal torque requirements (for all power supplies and contact blocks)	Suitable for #22-#12 AWG stranded or solid copper wires, single or parallel conductors of same size. Terminal torque: 7-12 in-lbs. Parallel conductor size combinations (stranded or solid wire): <table><tr><th colspan="5">Parallel Conductor Size Combinations (Stranded Or Solid Wire)</th><th colspan="5">Terminal Torque</th></tr><tr><td>#12 with #14</td><td></td><td></td><td></td><td></td><td>12 in-lbs</td><td></td><td></td><td></td><td></td></tr><tr><td>#14 with #16</td><td></td><td></td><td></td><td></td><td>12 in-lbs</td><td></td><td></td><td></td><td></td></tr><tr><td>#16 with #18</td><td></td><td></td><td></td><td></td><td>12 in-lbs</td><td></td><td></td><td></td><td></td></tr><tr><td>#16 with #20</td><td></td><td></td><td></td><td></td><td>12 in-lbs</td><td></td><td></td><td></td><td></td></tr><tr><td>#16 with #22</td><td></td><td></td><td></td><td></td><td>12 in-lbs</td><td></td><td></td><td></td><td></td></tr><tr><td>#18 with #22</td><td></td><td></td><td></td><td></td><td>10-12 in-lbs</td><td></td><td></td><td></td><td></td></tr><tr><td>#18 with #20</td><td></td><td></td><td></td><td></td><td>10-12 in-lbs</td><td></td><td></td><td></td><td></td></tr><tr><td>#20 with #22</td><td></td><td></td><td></td><td></td><td>7-12 in-lbs</td><td></td><td></td><td></td><td></td></tr></table>									Parallel Conductor Size Combinations (Stranded Or Solid Wire)					Terminal Torque					#12 with #14					12 in-lbs					#14 with #16					12 in-lbs					#16 with #18					12 in-lbs					#16 with #20					12 in-lbs					#16 with #22					12 in-lbs					#18 with #22					10-12 in-lbs					#18 with #20					10-12 in-lbs					#20 with #22					7-12 in-lbs				
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#20 with #22					7-12 in-lbs																																																																																														
Quick connect terminals	Suitable for one female tab connector measuring 0.25 x 0.03 inches (6.35 x 0.8 mm) or two female tab connectors measuring 0.11 x 0.03 inches (2.8 x 0.8 mm).																																																																																																		
Contact Data																																																																																																			
Electrical reliability data	Electrical life and reliability in low level current: 80 million operations at 12V, 5mA, resistive load. (32 contacts tested successfully for 2.5 million operations.)																																																																																																		
Dust resistance	In extremely dusty environments, electrical life at low level current is 250,000 operations at 12V, 5mA, resistive load. In a clean environment, electrical life at low level current is 10 million operations at 12V, 5mA, resistive load.																																																																																																		
Thermal current	Ith = 10A per IEC 947-5-1																																																																																																		
Insulation voltage	Ui = 660 Volts AC/DC (opposite polarity) except 2NO & 2NC blocks 300V AC/DC																																																																																																		
Protection from electrical shock	Class I per IEC 536 for metal operators Class II (double insulation) per IEC 536 for plastic operators																																																																																																		
Insulation category	Group "C" per VDE 0110																																																																																																		
Dielectric strength	2500 Volts																																																																																																		
Short circuit protection	10A type gG fuse, per IEC 269.1 & 269.3																																																																																																		
Pilot duty ratings	A600 (maximum make volt-amperes = 7200; maximum break volt-amperes = 720; PF = .25) <table><tr><td>Volts (V)</td><td>12</td><td>24</td><td>48</td><td>60</td><td>120</td><td>240</td><td>480</td><td>600</td></tr><tr><td>Continuous (A)</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td></tr><tr><td>Making (A)</td><td>100</td><td>100</td><td>100</td><td>100</td><td>60</td><td>30</td><td>15</td><td>12</td></tr><tr><td>Breaking (A)</td><td>10</td><td>10</td><td>10</td><td>10</td><td>6</td><td>3</td><td>1.5</td><td>1.2</td></tr></table> Q300 (maximum make or break volt-amperes = 69) <table><tr><td>Volts (V)</td><td>12</td><td>24</td><td>48</td><td>60</td><td>125</td><td>250</td><td>300</td></tr><tr><td>Continuous (A)</td><td>2.5</td><td>2.5</td><td>2.5</td><td>2.5</td><td>2.5</td><td>2.5</td><td>2.5</td></tr><tr><td>Making (A)</td><td>2.5</td><td>2.5</td><td>1.4</td><td>1.1</td><td>0.55</td><td>0.27</td><td>0.23</td></tr><tr><td>Breaking (A)</td><td>2.5</td><td>2.5</td><td>1.4</td><td>1.1</td><td>0.55</td><td>0.27</td><td>0.23</td></tr></table>									Volts (V)	12	24	48	60	120	240	480	600	Continuous (A)	10	10	10	10	10	10	10	10	Making (A)	100	100	100	100	60	30	15	12	Breaking (A)	10	10	10	10	6	3	1.5	1.2	Volts (V)	12	24	48	60	125	250	300	Continuous (A)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	Making (A)	2.5	2.5	1.4	1.1	0.55	0.27	0.23	Breaking (A)	2.5	2.5	1.4	1.1	0.55	0.27	0.23																						
Volts (V)	12	24	48	60	120	240	480	600																																																																																											
Continuous (A)	10	10	10	10	10	10	10	10																																																																																											
Making (A)	100	100	100	100	60	30	15	12																																																																																											
Breaking (A)	10	10	10	10	6	3	1.5	1.2																																																																																											
Volts (V)	12	24	48	60	125	250	300																																																																																												
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Breaking (A)	2.5	2.5	1.4	1.1	0.55	0.27	0.23																																																																																												

Technical Data

Contact Data										
IEC utilization categories	AC15 Control Of AC Electromagnetic Loads Rated operational voltage and current									
	Ue (V)	12	24	48	60	110	220	380	500	600
	Ie (A)	10	10	10	10	6	3	2	1.5	1.2
	DC13 Control Of DC Electromagnets Rated operational voltage and current									
	Ue (V)	12	24	48	60	110	220	300		
	Ie (A)	2.5	2.5	1.4	1.0	0.55	0.27	0.2		
Contact characteristics	NC: slow make, double break (positive opening) NO: slow make, double break Self-cleaning (wiping action) contact Double-bridge contacts with four points of contact									
Contact resistance	≤25mOhm per IEC 255.7 category 3									
Contact fidelity	Minimum current: 5 mA Minimum voltage: 12 V AC/DC									
Logic reed contact data	NC: Single break NO: Single break 120V AC maximum, 0.15A maximum, 8VA maximum 30V DC maximum, .15A maximum, 4.5W maximum									
Mounting										
Acceptable panel thickness	.040-.236 inches (1-6mm)									
Operator locking ring torque	26 in-lbs (3 N-m)									
Force required to forcibly remove contact blocks and flange	Contact block or power supply from flange: 27 lb (118 N) 3- or 5-block flange from metal operator: 88 lb (392 N) 3- or 5-block flange from plastic operator: 66 lb (294 N)									
Mounting dimensions										
Mechanical Life Ratings For Operators										
Operators					Number Of Operations					
Standard push buttons					3,000,000					
Illuminated push buttons					1,000,000-3,000,000 ¹					
Momentary mushroom-head push buttons					3,000,000					
Maintained mushroom-head push buttons					500,000					
Push to latch, turn to release mushroom-head push buttons					300,000					
3 position mushroom-head push buttons					300,000					
Non-illuminated selector switches					1,000,000					
Illuminated selector switches					500,000					
Joysticks					500,000					
Toggle switches					500,000					
Wobble sticks					1,000,000					
Key operated push buttons					500,000					
Selector push buttons					1,000,000					
¹ Number of operations dependent on the operating duration of the lamp. If the lamp is left on for long periods of time, its heat can reduce mechanical life. All illuminated push buttons meet at least 1,000,000 operations.										



2-Position Knob- & Lever-Operated Selector Switches



Selection Process

Select operator below	+	Select contact block(s) from back cover fold-out	+	Select nameplate, if required, from pages 36-38	=	Complete unit

Operators

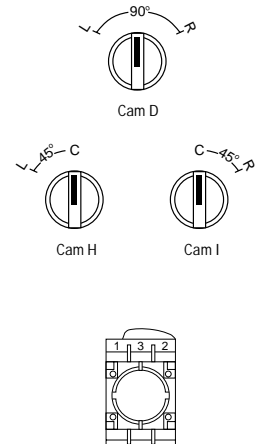
Replace **asterisk (*)** in maintained catalog number with cam code from cams table below.
Replace **dagger (†)** in catalog number with color code from colors table below.

Style	Handle	Maintained Catalog No.	List Price, GO-10GC	Spring Return L⇒C (Cam H) Catalog No.	Spring Return L⇐R (Cam D) Catalog No.	Spring Return C⇐R (Cam I) Catalog No.	List Price, GO-10GC
● Polished Chrome	Knob	P9CSM*0†	\$14.50	P9CSMH1†	P9CSMD5†	P9CSMI5†	\$16.50
	Black Lever	P9CSV*0N	14.50	P9CSVH1N	P9CSV5N	P9CSVI5N	16.50
○ Satin Chrome	Knob	P9MSM*0†	14.50	P9MSMH1†	P9MSMD5†	P9MSMI5†	16.50
	Black Lever	P9MSV*0N	14.50	P9MSVH1N	P9MSV5N	P9MSVI5N	16.50
● Round Engineered Plastic	Knob	P9XSM*0†	14.50	P9XSMH1†	P9XSMD5†	P9XSMI5†	16.50
	Black Lever	P9XSV*0N	14.50	P9XSVH1N	P9XSVD5N	P9XSVI5N	16.50
□ Square Engineered Plastic	Knob	P9SSM*0†	14.50	P9SSMH1†	P9SSMD5†	P9SSMI5†	16.50

* Cams

Choose desired cam. Note selection and position of contact block(s).

*Cam Code				Screw Terminal Contact Block		Quick Connect Terminal Contact Block	
				Position 1	Position 2	Position 1	Position 2
D	O	—	X	—	P9B10VN	—	P9B10FN
	X	—	O	P9B01VN	—	P9B01FN	—
	O	—	X	P9B11VN	—	—	—
	X	—	O	—	—	—	—
I	—	O	X	—	P9B10VN	—	P9B10FN
	—	X	O	P9B01VN	—	P9B01FN	—
	—	O	X	P9B11VN	—	—	—
	—	X	O	—	—	—	—
H	X	O	—	—	P9B10VN	—	P9B10FN
	O	X	—	P9B01VN	—	P9B01FN	—
	X	O	—	P9B11VN	—	—	—
	O	X	—	—	—	—	—

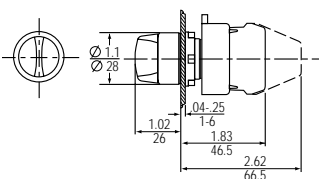


† Colors

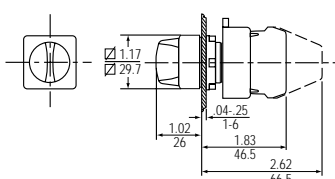
Color	Black	Red	Green	Yellow	Blue	No Knob ¹
†Color Code	N	R	V	G	L	0

¹ Subtract \$3.00 from list price, GO-10GC, for selector switches ordered without knobs.

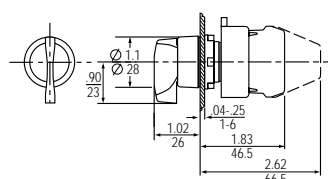
Dimensions shown in
Inches
millimeters



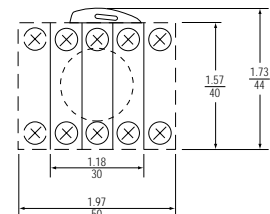
Round Knob Selector Switch



Square Knob Selector Switch



Round Lever Selector Switch



Typical Back Side View

Selection & drawing data: pages 4-5. Accessories: pages 46-47. Technical data: pages 6-11.
Color caps, heads, lenses and handles are also stocked separately: page 41.

3-Position Knob- & Lever-Operated Selector Switches



Selection Process

Select operator below	+	Select contact block(s) from back cover fold-out	+	Select nameplate, if required, from pages 36-38	=	Complete unit

Operators

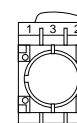
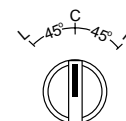
Replace **asterisk (*)** in catalog number with cam code from cams table below.
 Replace **dagger (†)** in catalog number with color code from colors table below.

Style	Handle	Maintained Catalog No.	List Price, GO-10GC	Spring Return L⇒C Catalog No.	Spring Return C⇐R Catalog No.	Spring Return L⇒C⇐R Catalog No.	List Price, GO-10GC
Polished Chrome	Knob	P9CSM*0†	\$14.50	P9CSM*1†	P9CSM*5†	P9CSM*3†	\$16.50
	Black Lever	P9CSV*0N	14.50	P9CSV*1N	P9CSV*5N	P9CSV*3N	16.50
Satin Chrome	Knob	P9MSM*0†	14.50	P9MSM*1†	P9MSM*5†	P9MSM*3†	16.50
	Black Lever	P9MSV*0N	14.50	P9MSV*1N	P9MSV*5N	P9MSV*3N	16.50
Round Engineered Plastic	Knob	P9XSM*0†	14.50	P9XSM*1†	P9XSM*5†	P9XSM*3†	16.50
	Black Lever	P9XSV*0N	14.50	P9XSV*1N	P9XSV*5N	P9XSV*3N	16.50
Square Engineered Plastic	Knob	P9SSM*0†	14.50	P9SSM*1†	P9SSM*5†	P9SSM*3†	16.50

*Cams

Choose desired cam. Note selection and position of contact block(s).

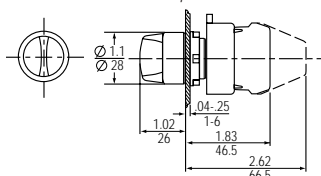
*Cam Code				Screw Terminal Contact Block		Quick Connect Terminal Contact Block	
				Position 1	Position 2	Position 1	Position 2
Z	O	O	X	P9B10VN	—	P9B10FN	—
	X	O	O	—	P9B10VN	—	P9B10FN
	X	X	O	P9B01VN	—	P9B01FN	—
	O	X	X	—	P9B01VN	—	P9B01FN
	X	O	X	P9B11VN	—	—	—
	X	O	O	—	P9B11VN	—	—
E	O	O	X	—	P9B01VN	—	P9B01FN
	O	X	O	P9B10VN	—	P9B10FN	—
	O	O	X	P9B11VN	—	—	—
L	X	O	O	—	P9B10VN	—	P9B10FN
	O	X	O	P9B01VN	—	P9B01FN	—
	X	O	O	P9B11VN	—	—	—
U	O	O	X	P9B11VN	—	—	—
	O	X	O	—	P9B11VN	—	—
	X	O	O	—	P9B11VN	—	—



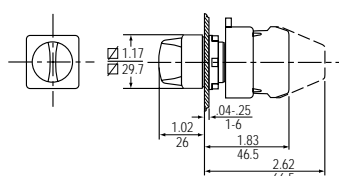
†Colors

Color	Black	Red	Green	Yellow	Blue	No Knob ¹
†Color Code	N	R	V	G	L	O

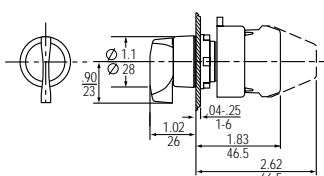
¹ Subtract \$3.00 from list price, GO-10GC, for selector switches ordered without knobs.



Round Knob Selector Switch

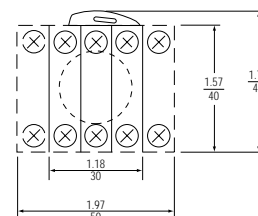


Square Knob Selector Switch



Round Lever Selector Switch

Dimensions shown in inches
millimeters







Typical Back Side View

Selection & drawing data: pages 4-5. Accessories: pages 46-47. Technical data: pages 6-11.
 Color caps, heads, lenses and handles are also stocked separately: page 41.

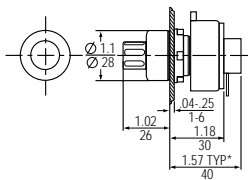


Special Operators

Potentiometer Operators

Style	Catalog No.	List Price, GO-10GC
 Polished Chrome	P9CZ	\$65.00
 Satin Chrome	P9MZ	65.00
 Round Engineered Plastic	P9XZ	65.00
 Square Engineered Plastic	P9SZ	65.00

Special Operators



*Potentiometer supplied by customer

Round Potentiometer Operator



MTE
AN SL INDUSTRIES COMPANY

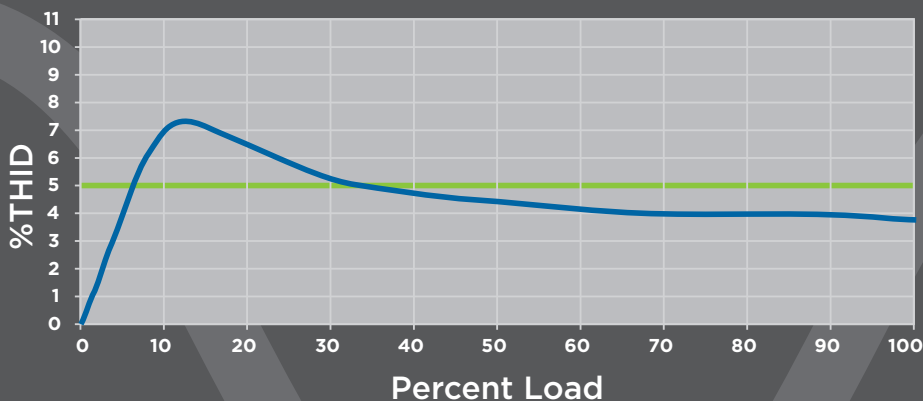
IMPROVE YOUR POWER
QUALITY & ENERGY
EFFICIENCY...WITH MTE'S
PATENTED* **ADAPTIVE PASSIVE
TECHNOLOGY** TO ACHIEVE
BETTER THID PERFORMANCE
OVER A WIDER LOAD RANGE.

*PATENT PENDING



HELPS MEET IEEE-519 REQUIREMENTS (5% THID)
WHEN USED AT LIGHTER LOADS

Percent THID for Series AP (165A)



Guaranteed THID performance:
8% MAX at 30% load
5% MAX at full load

**MTE MATRIX
FILTERS HAVE
EVOLVED AGAIN
INTO A BETTER
SOLUTION**

AP FEATURES:

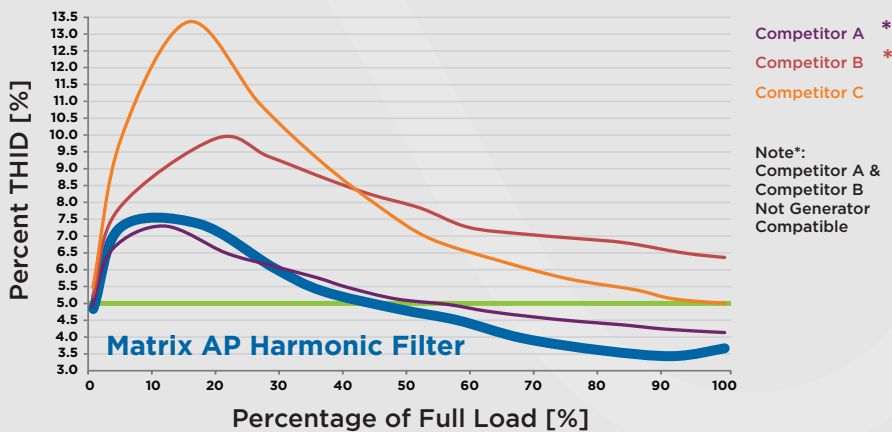
- Foil Wound Coils
- No Fans or Resistors
- Fewer Capacitors
- Modular Components
- Standardized Wiring
- Top Lifting Provisions
- 3 Year Warranty

**DESIGNED TO BE
CONVECTION-COOLED &
COMPATIBLE WITH
GENERATOR SYSTEMS**

WITH MTE'S NEW, INNOVATIVE ADAPTIVE PASSIVE TECHNOLOGY,
THE MATRIX® AP FILTER IS THE MOST ADVANCED HARMONIC FILTER DESIGN
THAT PROVIDES IMPROVED POWER FACTOR AND ENERGY EFFICIENCY.

ADAPTIVE PASSIVE PERFORMANCE

The Matrix AP achieves superior harmonic mitigation compared to other harmonic filter designs.



Our “Adaptive” patented technology allows the Matrix AP to adapt to various loads while still providing optimized THD performance. The superior design integrates the magnetic core and the shunt core into the same lamination stack. Not only is this unit more efficient with six pulse drives than a stand-alone 18 pulse rectifier, it’s more economical and performs better during phase imbalance.

THE MATRIX AP ADVANTAGE

- Reduces energy costs by improving system efficiency and reliability.
- Extends service life of electrical equipment, especially transformers and motors, due to the virtual elimination of CEMF and the skin effect. Uses high current capacitors with threaded connections for a more reliable, robust connection.
- Lowers capacitance resulting in reduced leading power factor under light loads.
- Reduces the possibility of resonance between the drive and filter with improved C/L ratio—eliminating the need to add another reactor and the requirement to change certain parameters in the drive.

SPECIFICATIONS

Load	6 pulse rectifier
Input Voltage	Nominal voltage VAC +/- 10%, 3 Phase
Frequency	Nominal Frequency + .75 Hz
Input Voltage Line Imbalance	1% maximum, to meet performance guarantee
Service Factor	1.00
Capacitive Reactive Power (KVAR)	128A and Above: 15% MAX Below 128A: 20% MAX
Ambient Temperature (Operating)	
Enclosed Filters: 480V	320A and Above: -40 to +45 degrees C Below 320A: -40 to +40 degrees C
Open Panel Filters: 400V, 480V	-40 to +50 degrees C
Storage Temperature	-40 to +90 degrees C
Altitude	0 to 3300 Feet above sea level without derating
Relative Humidity	0 to 95% non-condensing
Agency Approvals: UL and cUL Listed	UL508 and CSA-C22.2 No 14-95 File E180243 (3HP to 1000HP, 120VAC to 600VAC, 50Hz, 50/60Hz, & 60Hz Three Phase)
Guaranteed Performance:	8% MAX at 30% LOAD
Total Harmonic Current Distortion	5% MAX at FULL LOAD
Enclosure Color	NEMA 1/2 - ANSI 61 Gray NEMA 3R - RAL 9003 White



APPLICATIONS

- AC variable frequency drives
- DC adjustable speed drives
- Battery chargers
- Elevator drives
- Fans and pumps
- HVAC systems
- Induction heating equipment
- Welding operations
- Any 6 pulse diode power supply
- Uninterrupted Power Systems (UPS)

INDUSTRIES

- Oil and Gas
- Utilities
- Water & Wastewater Treatment
- Printing, Pulp & Paper
- Steel/Chemical/Automotive
- Mining
- Facility/Elevator/HVAC

CAPACITOR PANEL

FIGURE 1A

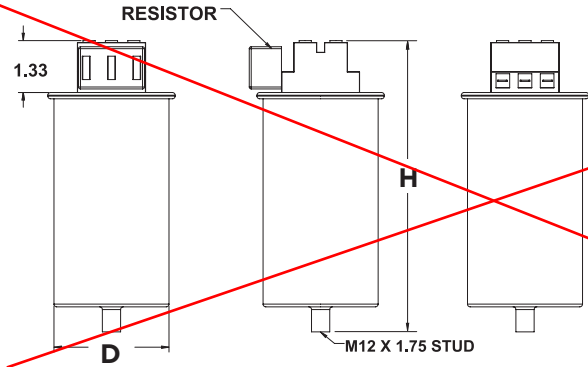
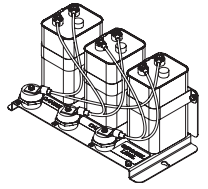
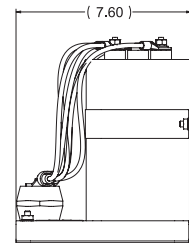
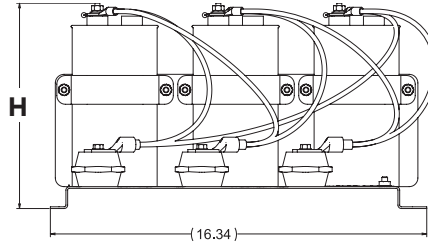
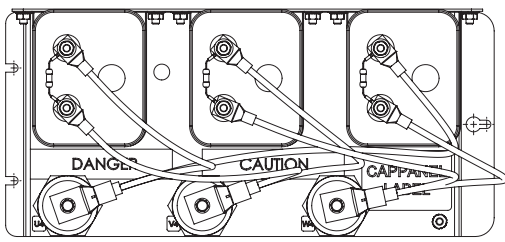
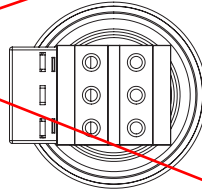


FIGURE 1B



OPEN MAGNETICS

FIGURE 2

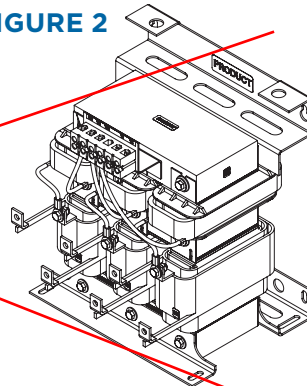
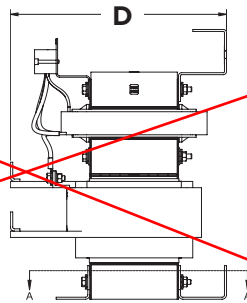
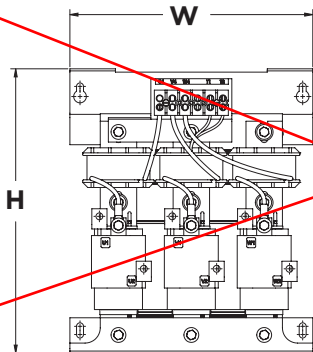


FIGURE 3

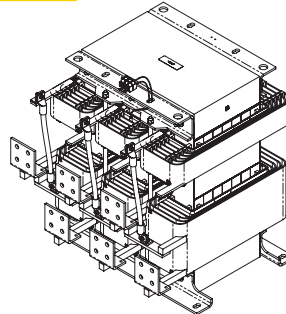
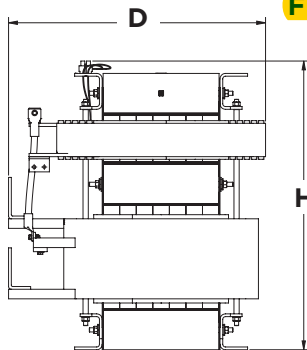
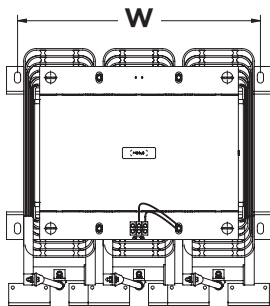
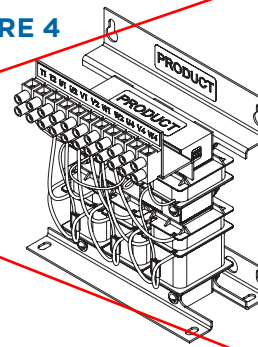
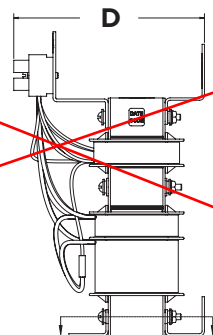
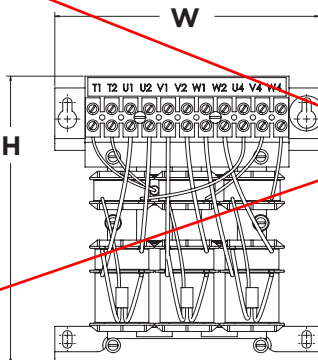


FIGURE 4



ENCLOSURES

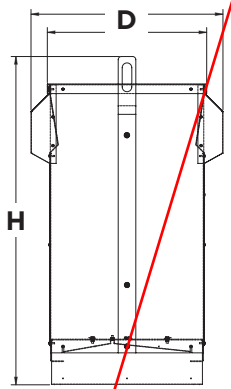
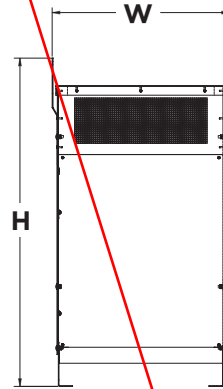
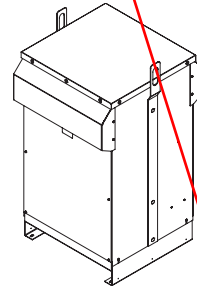


FIGURE 5



NOTE: HOODS
ONLY ON NEMA
3R ENCLOSURES

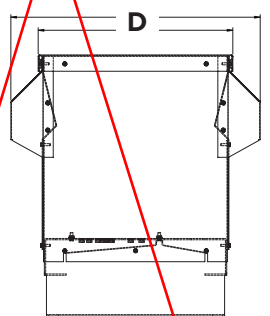
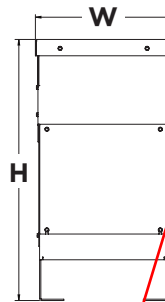
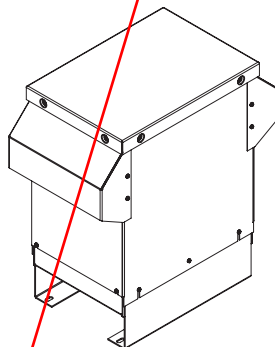


FIGURE 6



NOTE: HOODS
ONLY ON NEMA
3R ENCLOSURES

SELECTION TABLES:

THE MATRIX AP IS AVAILABLE IN OPEN PANEL, NEMA 1/2 AND NEMA 3R

NOTE: MAPXXXXXC IS 400V, 50HZ AND MAPXXXXXD IS 480V, 60HZ.

Amps rating	Open Panel						Capacitor/Capacitor Assemblies Size (included) (in.) (H X W X D)	Capacitor Ref. Figure
	Catalog PN.		Weight (lbs.)	Open Magnetics (in.) (H X W X D)	Ref. Fig.	Watts Loss		
6	MAPP0006C	MAPP0006D	16	8.7 X 8 X 5.5	4	122	7.5 X 2.9	1B
8	MAPP0008C	MAPP0008D	17	8.7 X 8 X 5.5	4	158	7.5 X 2.9	1B
11	MAPP0011C	MAPP0011D	26	9.9 X 9 X 4.8	4	192	7.5 X 2.9	1B
14	MAPP0014C	MAPP0014D	30	9.8 X 9 X 5.25	4	220	7.5 X 2.9	1B
21	MAPP0021C	MAPP0021D	47	11.7 X 10.5 X 6.6	4	251	7.5 X 3.9	1B
27	MAPP0027C	MAPP0027D	52	11.7 X 10.5 X 7	4	283	7.5 X 3.9	1B
34	MAPP0034C	MAPP0034D	62	11.7 X 10.5 X 7.6	4	318	7.5 X 3.9	1B
44	MAPP0044C	MAPP0044D	74	11.7 X 10.5 X 8	4	379	7.5 X 4.6	1B
52	MAPP0052C	MAPP0052D	94	14 X 12 X 9	2	413	9.2 X 4.6	1B
66	MAPP0066C	MAPP0066D	107	14 X 12 X 9	2	488	9.2 X 4.6	1B
83	MAPP0083C	MAPP0083D	135	14 X 12 X 10.9	2	600	9.2 X 4.6	1B
103	MAPP0103C	MAPP0103D	145	14 X 12 X 10.82	2	702	9.2 X 4.6	1B
128	MAPP0128C	MAPP0128D	165	20 X 15.25 X 10.7	2	1,035	6.9 X 16.3 X 7.6	1A
165	MAPP0165C	MAPP0165D	223	20 X 15.25 X 11.75	2	1,096	6.9 X 16.3 X 7.6	1A
208	MAPP0208C	MAPP0208D	237	20 X 15.25 X 11.85	2	1,343	7.9 X 16.3 X 7.6	1A
240	MAPP0240C	MAPP0240D	327	20 X 15.25 X 12.75	2	1,514	7.9 X 16.3 X 7.6	1A
320	MAPP0320C	MAPP0320D	390	20 X 15.25 X 14.8	2	1,543	8.9 X 16.3 X 7.6	1A
403	MAPP0403C	MAPP0403D	433	23.25 X 15.25 X 13.86	2	1,932	10.7 X 16.3 X 7.6	1A
482	MAPP0482C	MAPP0482D	483	23.25 X 15.25 X 14.77	2	2,137	7.9 X 16.3 X 7.6	1A
							7.9 X 16.3 X 7.6	1A
636	MAPP0636C	MAPP0636D	736	26 X 24 X 16.5	3	2,509	8.9 X 16.3 X 7.6	1A
							8.9 X 16.3 X 7.6	1A
786	MAPP0786C	MAPP0786D	911	26 X 24 X 17.8	3	2,771	10.7 X 16.3 X 7.6	1A
							10.7 X 16.3 X 7.6	1A
850	MAPP0850C	MAPP0850D	983	26 X 24 X 20.3	3	3,163	8.9 X 16.3 X 7.6	1A
							8.9 X 16.3 X 7.6	1A
							7.9 X 16.3 X 7.6	1A
1000	MAPP1000C	MAPP1000D	1137	26 X 24 X 21.7	3	4,206	8.9 X 16.3 X 7.6	1A
							8.9 X 16.3 X 7.6	1A
							10.7 X 16.3 X 7.6	1A
1200	MAPP1200C	MAPP1200D	1297	26 X 24 X 22.2	3	4,400	10.7 X 16.3 X 7.6	1A
							10.7 X 16.3 X 7.6	1A
							10.7 X 16.3 X 7.6	1A

Note: drawing dimensions are for reference only. See MTECORP.com for detailed information.

PERFORMANCE GUARANTEE

Select & install the appropriate Matrix Harmonic Filter in a variable torque AC variable frequency drive application, within our published system limits & we guarantee that the input current distortion will be less than or equal to 5% THID for MAP Series filters at full load, and less than 8% at 30% load. If a properly sized & installed filter fails to meet its specified THID level, MTE will provide the necessary modifications or replacement filter at no charge. TDD will typically be even lower than THID.

Matrix filters can also provide similar performance in other drive applications such as constant torque, DC drives & other phase controlled rectifiers, but actual THID levels can vary by load and/or speed & therefore cannot be guaranteed. Consult factory for assistance when applying Matrix filters on these types of equipment.

MINIMUM SYSTEM REQUIREMENTS:

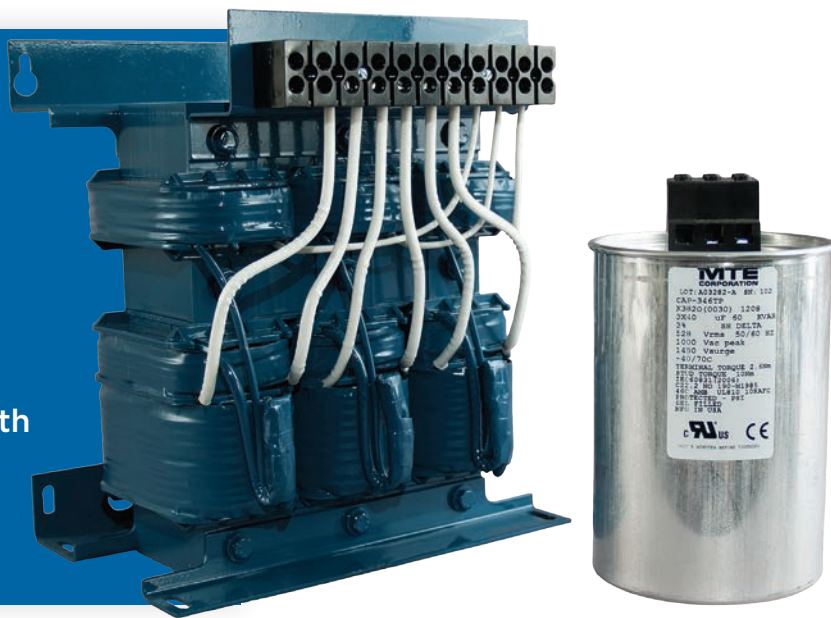
The guaranteed performance levels of this filter will be achieved when the following system conditions are met:

Frequency:	60Hz \pm 0.75Hz
System Voltage:	Nominal System Voltage (line to line) \pm 10%
Balanced Line Voltage:	Within 1%
Background Voltage Distortion:	0% THVD.

NOTE: The presence of background voltage distortion will cause motors & other linear loads to draw harmonic currents. Additional harmonic currents may flow into the Matrix filter if there is harmonic voltage distortion already on the system.

MATRIX AP BENEFITS

- Industry Leading Harmonic Reduction
- Reduced Energy Costs
- Generator Compatible
- Easy To Install & Maintain
- Flexible Mounting Provisions With Integral Lifting Provisions
- Improved Power Factor



Shown: Matrix AP 6A Filter w/ 3 Phase Capacitor
Providing a more robust solution with fewer connections

Our representative in your area is



N83 W13330 Leon Road,
Menomonee Falls, WI 53051

P: 800.455.4MTE (4683) F: 262.253.8222

Form MAP-PSL-E July 2013
Supersedes Form MAP-PSL-E April 2013



Section 4 - Warranty Information

DTN472

Onsite DriveproTecton Warranties

6-year Warranty Coverage from Date of Startup

including travel, labor, parts, or other costs

Contact Information for Warranty/Tech Support:

Danfoss Drives

Phone Number: 1-888-326-36773677

Fact Sheet

Emergency response threatens your budget DrivePro® coverage programs are the solution

Given the rigors and challenges faced in today's facilities, even the best performing VFDs need protection. Combining the reliability of Danfoss products with professional and effective DrivePro® service ensures maximum up-time and eliminates unplanned expenses.

\$3,500

Average savings
compared to the
cost of repairing or
replacing a mid-size
drive

DrivePro® coverage programs offer the comfort of knowing Danfoss takes responsibility for supporting Danfoss products well into the future.

- Industry's longest coverage, up to ten years
- 24/7 factory technical phone support
- One call, one single point of contact
- Certified factory and local technicians
- Original equipment replacement parts

A wide variety of coverage programs are available, tailored to meet the support needs of various VFD applications.

DrivePro® Extended Warranty



DrivePro® Extended Warranty (EW) extends the standard warranty up to six years. Product failures due to defects in materials or workmanship are covered, Depot (Standard) Repair EW covers the replacement parts and repair labor costs. Onsite EW additionally covers travel costs of repairing products onsite.

DrivePro® Service Contract



DrivePro® Service Contract (SC) begins where the warranty leaves off. SC coverage periods of 1 to 4 years are available for many Danfoss Drive products nearing the end of the standard warranty or extended warranty. Most products can be covered until they are 10 years old. Both Depot repair and Onsite versions of SC coverage are available. A performance inspection service is available to validate the eligibility for SC coverage of products with expired standard or extended warranties.

DrivePro®-tection Extended Warranty & Service Contract



A unique Danfoss offering, DrivePro®-tection offers the additional comfort of coverage for many types of accidental damage. Depot repair or Onsite DrivePro®-tection coverage of most products is available for the same periods as standard EW or SC. In addition to product defect and normal-wear coverage, DrivePro®-tection coverage provides coverage for the following:

- Line anomalies
– including lightning strikes
- Load anomalies
- Accidental exposure to moisture or corrosives
- Accidental collision or other physical damage

Product misapplication, vandalism, natural or facility disasters, chronic problems due to the installation environment and shipping damage are not covered.

Program Availability ^(1a)	Extended Warranty & DrivePro®-tection EW coverage period (years) ^(2a)	Service Contract & DrivePro®-tection SC coverage period (years) ⁽⁵⁾	Depot Repair (Replacement material, repair labor and outbound freight ⁽³⁾)	Onsite Repair ⁽⁴⁾ (Replacement material and freight, repair labor and travel costs)
VLT® Micro Drive	2-6	1-4 (to 5yr old)		
VLT® 2800 & FC 280 Drives	2-6	1-4 (to 7yr old)		
FCD 302 and FCP 106 Drives	2-6	1-4 (to 7yr old)		
MCD 100 & 200 Soft Starters	2-6	1-4 (to 5yr old)		
VLT® OneGearDrive	2-6	1-4 (to 5yr old)		
VACON® 20 Drives	2-6			
VLT® AutomationDrive	2-6	1-4 (to 10yr old)	Yes	Yes
VLT® HVAC Drive	2-6	1-4 (to 10yr old)		Yes
VLT® AQUA Drive	2-6	1-4 (to 10yr old)	Yes	Yes
MCD 500 Soft Starter	2-6	1-4 (to 10yr old)	Yes	Yes
VLT® Drive Standard Panels	2-6	1-4 (to 10yr old)	Yes	Yes
AHF and AAF Harmonic Filters	2-6	1-4 (to 10yr old)	Yes	Yes
VLT® LHD and 12-Pulse Drives	2-6	1-4 (to 10yr old)	Yes	Yes
VACON® X, 100 and 100X Drives	2-6	1-4 (to 5yr old)		
VACON® NXC and NXP Drives and Modules	2-6		Yes	
VACON® NXP Liquid Cooled Drive	2-6		Yes	
VACON® NXC Low Harmonic and VACON® NXP 12-pulse Drives	2-6		Yes	

^(1a) Continental 48 states, Oahu, Hawaii, Canada and Puerto Rico.

^(2a) Coverage period begins on the date of the product shipment from Danfoss.

⁽³⁾ Inbound freight cost, retuning product to repair depot is not covered.

⁽⁴⁾ Onsite repair coverage is not available for remote sites such as oil fields, off-shore rigs or agricultural irrigation or for limited access applications such as mining or ship-board applications. Contact Danfoss DrivePro® sales for details.

⁽⁵⁾ SC coverage is available until maximum number of years from date of manufacture as indicated.

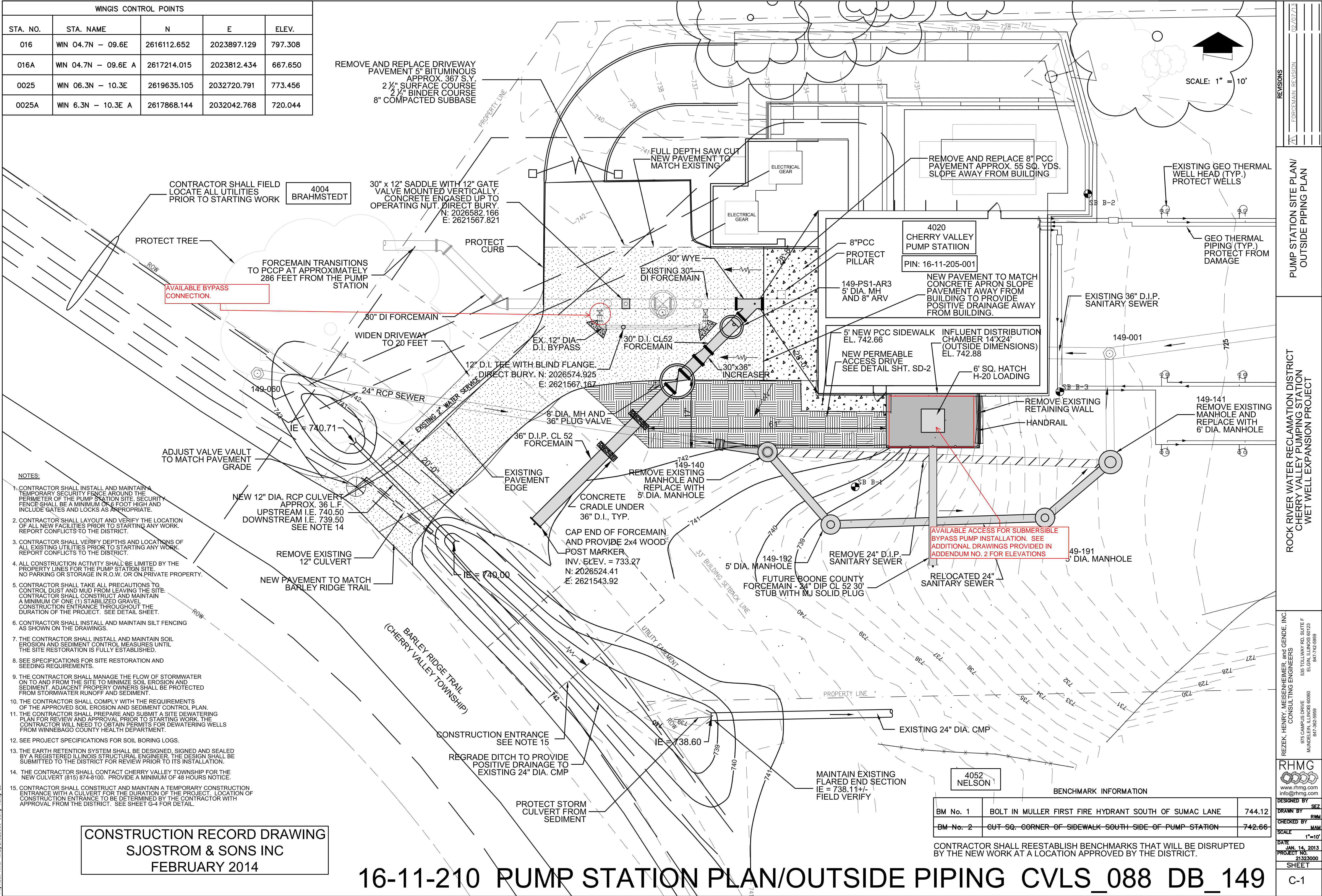
Danfoss Drives

8800 W. Bradley Road
Milwaukee, WI 53224, USA
Phone: 1-888-DANFOSS
1 (414) 355-8800
Fax: 1 (414) 355-6117
www.danfossdrives.com

DrivePro® Services

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WINGIS CONTROL POINTS				
STA. NO.	STA. NAME	N	E	ELEV.
016	WIN 04.7N - 09.6E	2616112.652	2023897.129	797.308
016A	WIN 04.7N - 09.6E A	2617214.015	2023812.434	667.650
0025	WIN 06.3N - 10.3E	2619635.105	2032720.791	773.456
0025A	WIN 6.3N - 10.3E A	2617868.144	2032042.768	720.044

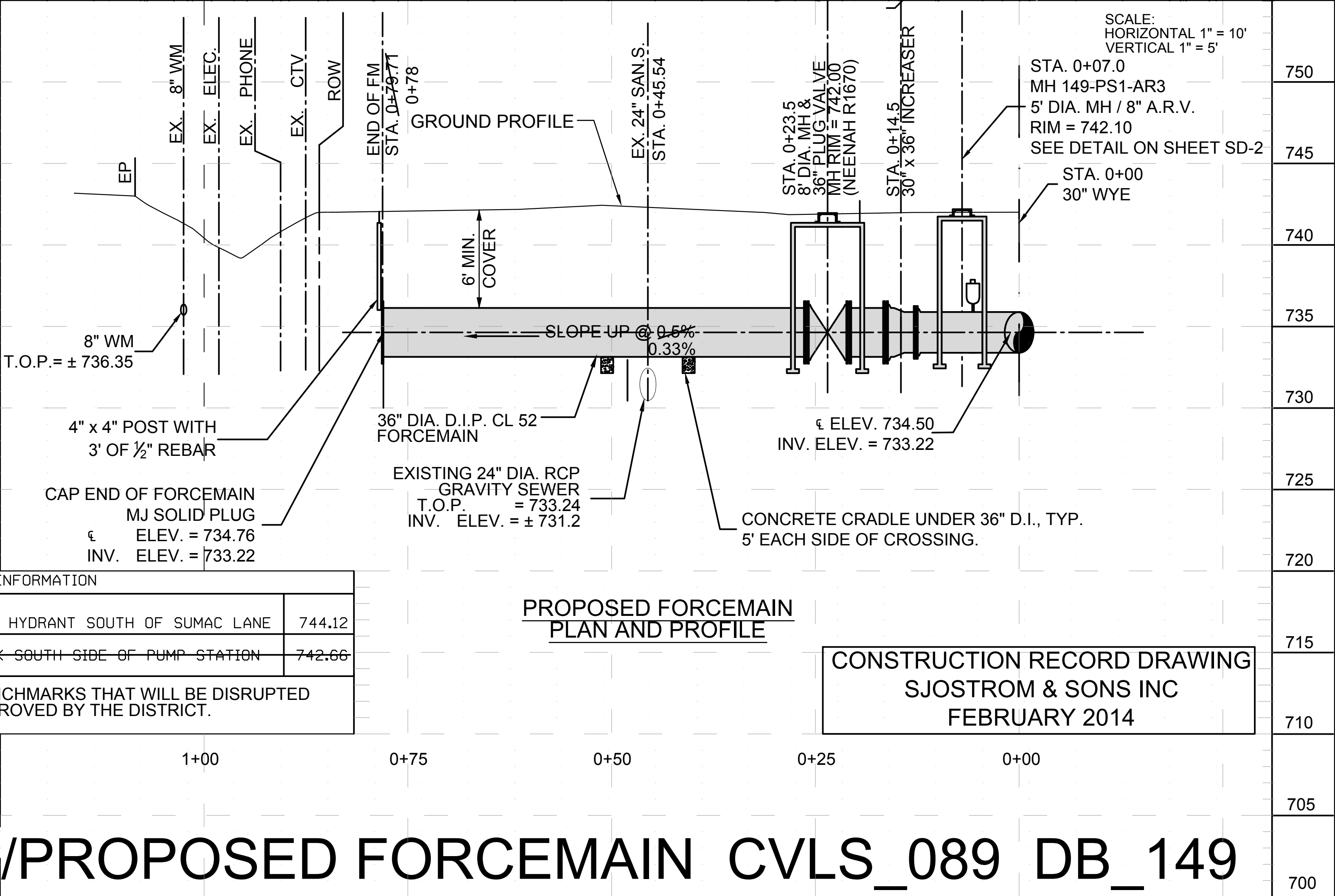
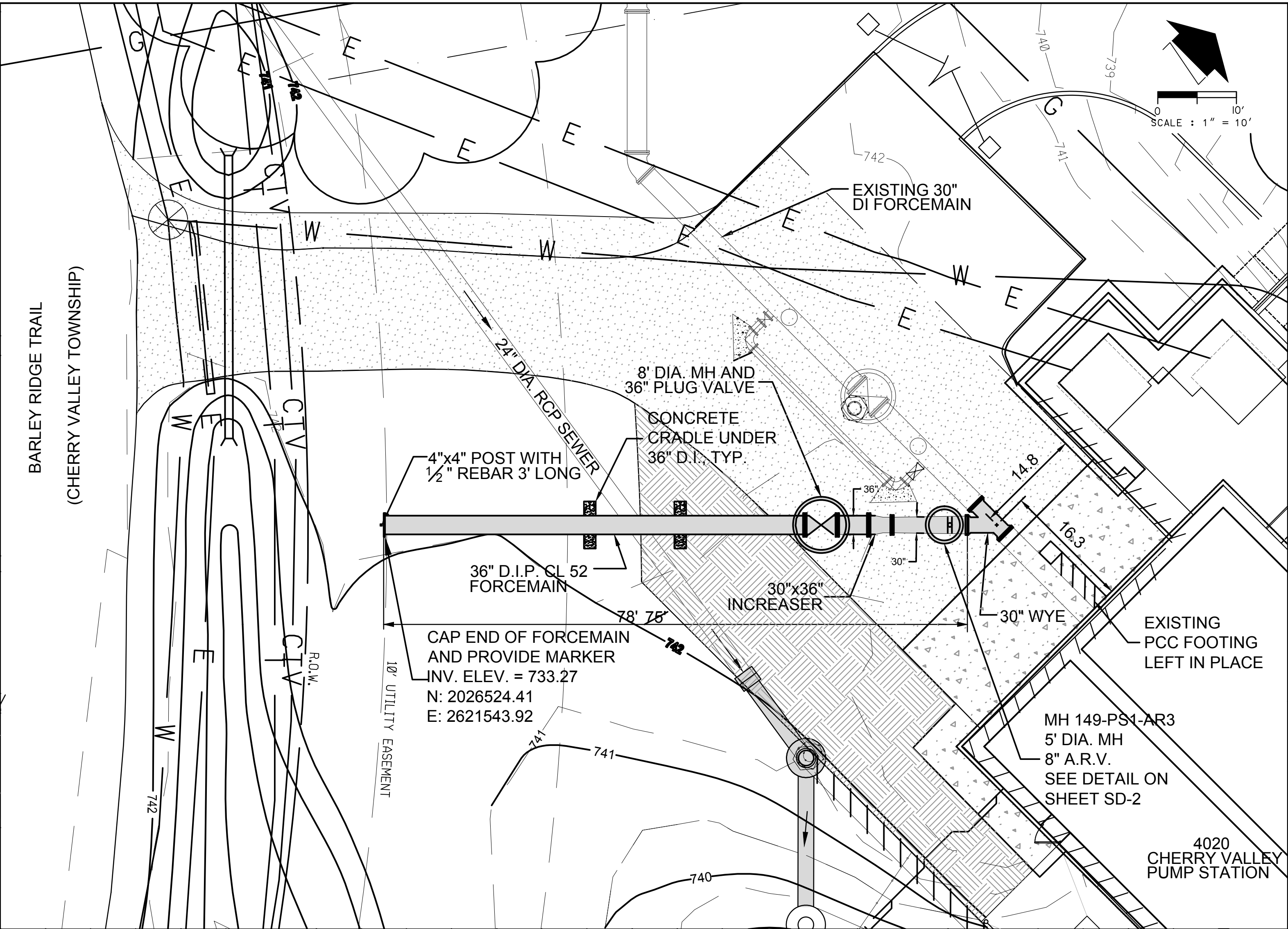
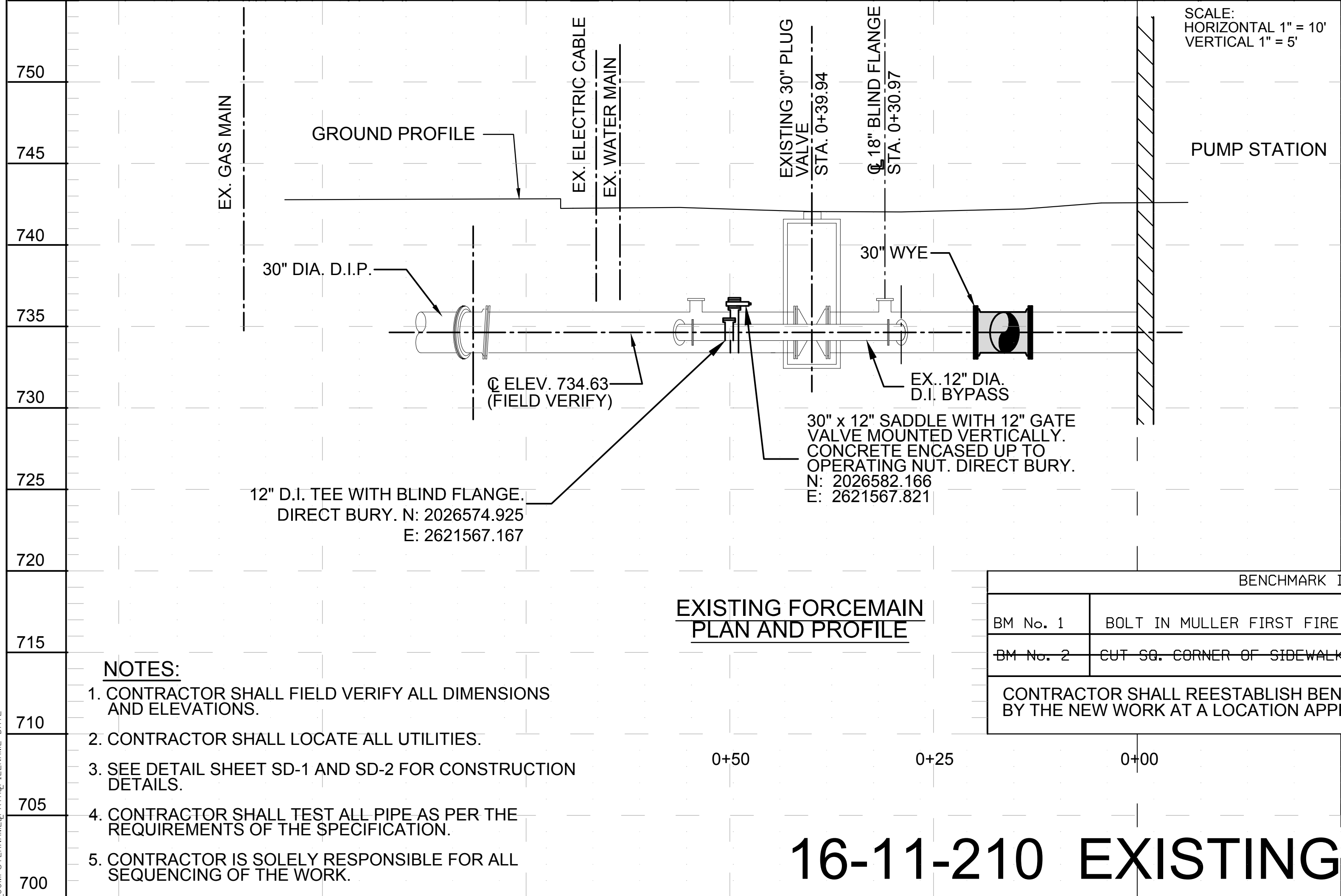
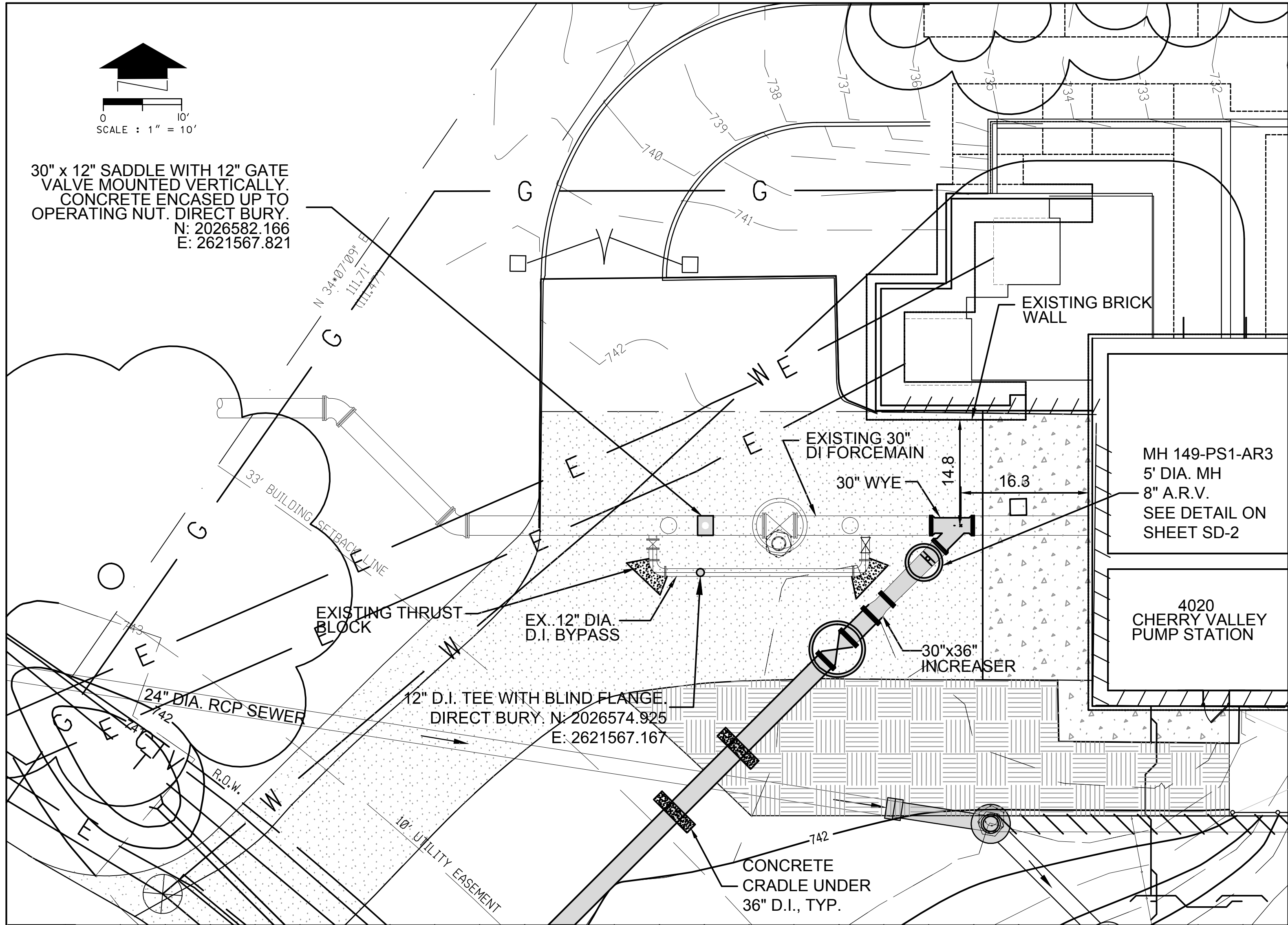


CONSTRUCTION RECORD DRAWING
SJOSTROM & SONS INC
FEBRUARY 2014

16-11-210 PUMP STATION PLAN/OUTSIDE PIPING CVLS_088 DB_149

BM No. 1	BOLT IN MULLER FIRST FIRE HYDRANT SOUTH OF SUMAC LANE	744.12
BM No. 2	CUT SQ. CORNER OF SIDEWALK SOUTH SIDE OF PUMP STATION	742.66

CONTRACTOR SHALL REESTABLISH BENCHMARKS THAT WILL BE DISRUPTED BY THE NEW WORK AT A LOCATION APPROVED BY THE DISTRICT.



REVISIONS

2/7/13

FORCEMAIN REVISION

EXISTING AND PROPOSED FORCEMAIN

PLAN AND PROFILE

ROCK RIVER WATER RECLAMATION DISTRICT

CHERRY VALLEY PUMP STATION

WET WELL EXPANSION PROJECT

REZEX, HENRY, MEISSEHEIMER, and GENDIE, INC.

888 TOLWAY RD. SUITE F

WHEELING, ILLINOIS 60090

847-743-8888

775 CAMPUS DRIVE

WHEELING, ILLINOIS 60090

847-743-8888

RHMG

www.rhmg.com

info@rhmg.com

DESIGNED BY

SEZ

DRAWN BY

RWM

CHECKED BY

MAM

SCALE

1" = 10'

DATE

JAN. 14, 2013

PROJECT NO.

21323000

SHEET

C-2

CONSTRUCTION RECORD DRAWING

SJOSTROM & SONS INC

FEBRUARY 2014

NOTES:

1. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS

AND ELEVATIONS.

2. CONTRACTOR SHALL LOCATE ALL UTILITIES.

3. SEE DETAIL SHEET SD-1 AND SD-2 FOR CONSTRUCTION

DETAILS.

4. CONTRACTOR SHALL TEST ALL PIPE AS PER THE

REQUIREMENTS OF THE SPECIFICATION.

5. CONTRACTOR IS SOLELY RESPONSIBLE FOR ALL

SEQUENCING OF THE WORK.

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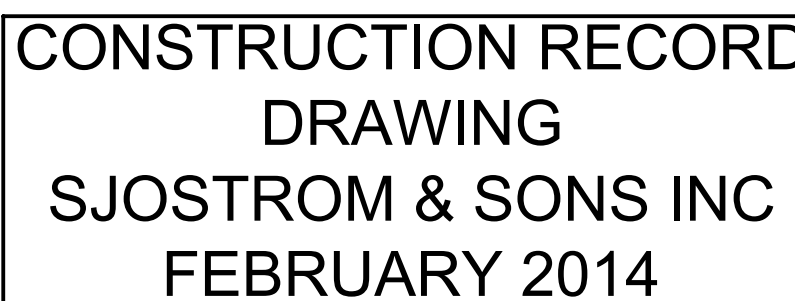
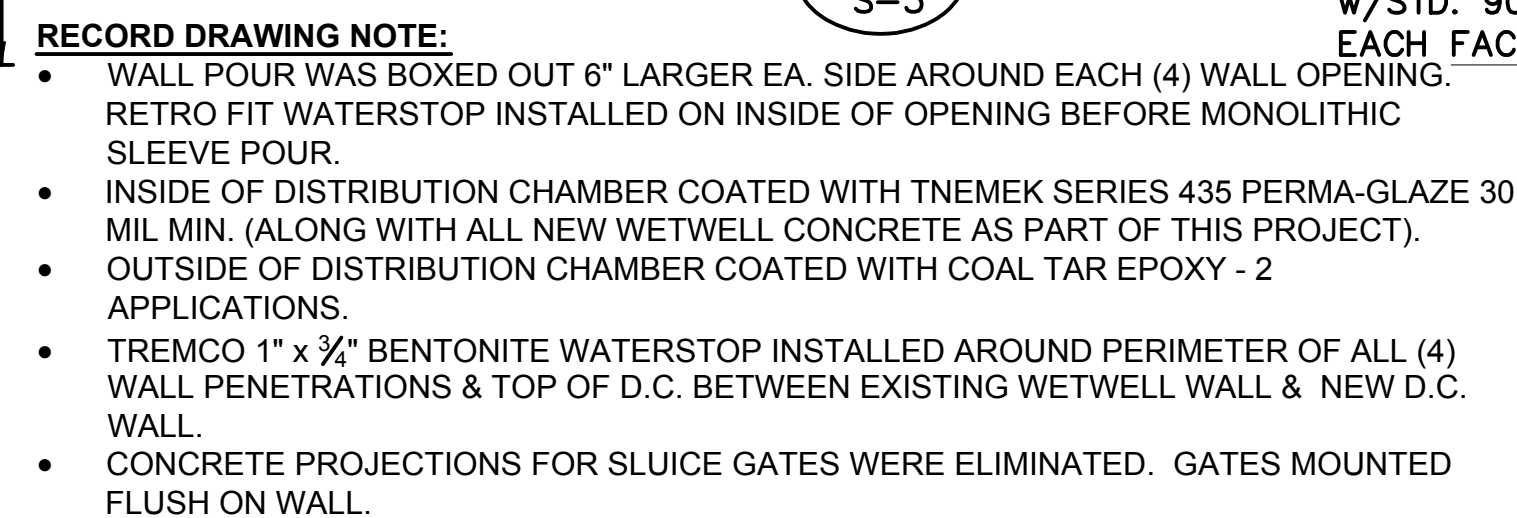
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REZEK, HENRY, MEISENHEIMER, and GENDE, INC. CONSULTING ENGINEERS 975 CAMPUS DRIVE MUNDELEIN, ILLINOIS 60060 847-362-5959 847-762-9559		ROCK RIVER WATER RECLAMATION DISTRICT CHERRY VALLEY PUMP STATION WET WELL EXPANSION PROJECT		STRUCTURAL SECTIONS AND DETAILS		2-6-13 WALL SLEEVE	REVISIONS
 www.rhmg.com info@rhmg.com			DRAWN BY KML CHECKED BY BGR SCALE				
DATE JAN. 14, 2013 PROJECT NO. 28230001 SHEET							
			S-5				

