COOPERATIVE AGREEMENT
Between City of St. Paul and
Capitol Region Watershed District

Operation and Maintenance of Snelling-Midway Rainwater Capture and Use System

March, 2025

This cooperative agreement is made by and between the City of St. Paul, a Minnesota municipal corporation (St. Paul) and Capitol Region Watershed District, a watershed district created pursuant to Minnesota Statutes chapter 103D (CRWD) to achieve shared water-resource protection and improvement goals through expert and experienced operation and maintenance of green infrastructure at the Snelling-Midway Soccer Stadium ("Snelling-Midway") site, which is owned by St. Paul.

Recitals

WHEREAS St. Paul constructed a comprehensive stormwater management facility that serves Snelling-Midway;

WHEREAS the Snelling-Midway comprehensive stormwater management facility collects rainwater from all new roof areas for treatment and distribution as beneficial reuse ("Project);

WHEREAS this Project requires specialized operation and maintenance; CRWD has expertise and experience in maintenance of rainwater capture and use infrastructure and St. Paul seeks to utilize CRWD's expertise;

WHEREAS Snelling-Midway is a green infrastructure system service area whereby properties within the Snelling-Midway area are benefitted by the Project;

WHEREAS CRWD has an approved water resources management plan pursuant to Minnesota Statutes section 103B.231 (the Plan) that has as a primary goal the improvement of water quality in the watershed through partnerships, stormwater management, monitoring and data assessment, and watershed management generally;

WHEREAS St. Paul operates its municipal stormwater-management system under the state Municipal Separate Storm Sewer System (MS4) general permit, and maintenance of the Project will accrue to the benefit of St. Paul's fulfillment of its MS4 permit obligations; and

WHEREAS St. Paul and CRWD acknowledge that their ability to achieve Project objectives depends on both parties satisfactorily and promptly performing individual obligations and working cooperatively with the other parties to this agreement;

Agreement

NOW, THEREFORE St. Paul and CRWD enter into this Agreement to define the scope of CRWD's responsibilities for certain aspects of the Project's operation and maintenance duties ("Project O&M"), affirm other commitments as to the responsibilities of and tasks to be undertaken by each party, grant and assign the necessary land-use rights, and facilitate communication and cooperation to successfully complete the Project O&M.

1 Organization and Relationship of the Parties

A. The CRWD administrator and St. Paul's sewer utility manager or their designees will serve as project leads and the principal contacts for their respective organizations for the Project O&M,

charged to conduct the day-to-day activities necessary to ensure that the Project O&M is conducted in accordance with the terms of this agreement.

B. The project leads will coordinate and communicate informally and formally to timely address any issues of concern to ensure the successful operations and maintenance ("O&M") of the Project.

C. St. Paul and CRWD enter this agreement solely for the purposes of O&M of the Project. Accordingly, this agreement does not create a joint powers board or organization within the meaning of Minnesota Statutes section 471.59, and no party agrees to be responsible for the acts or omissions of another pursuant to subdivision 1(a) of the statute. Only contractual remedies are available for the failure of a party to fulfill the terms of this agreement.

2 Project Design and Construction

A. **Design, Construction**.

i. St. Paul is responsible for Project design and construction in accordance with the Development Agreement between St. Paul and Minnesota United Soccer Club (MUSC) LLC.

ii. St. Paul may engage and consult CRWD on design review during construction and future design development for build out of additional public infrastructure and private development parcels.

iii. Construction completion was December 2018; Project elements are listed in Exhibit A, shown in Exhibit B and included in the O&M plan approved by both parties.

iv. St. Paul oversaw as-built inspection and documentation of Project design and construction.

v. Nothing herein shall be deemed to amend or waive any regulatory obligation imposed on the City or the Project by CRWD in its regulatory capacity.

B. **Ownership of the Project**. St. Paul retains ownership of all installed and constructed public elements of the Project, and will operate the Project.

i. After completion of the Project, St. Paul will not take any action on the Snelling-Midway site that could reasonably be expected to diminish the effectiveness or function of the Project for the purposes intended.

3 Operation and Maintenance Plan

A. St. Paul will provide an operation and maintenance plan (O&M Plan), including spring start up and fall close-down of the treatment skid, (Vault 200), duplex pump station (Structure 251), and water reuse distribution system. The O&M Plan will delineate routine maintenance and repair of the Project.

B. CRWD will review and concur in the O&M Plan prior to finalization.

C. Both parties agree that they will review the O&M Plan annually, and that the O&M Plan shall be updated from time to time with the consent of both parties and agreement as to any amendments. St. Paul, as owner, shall be responsible for any costs associated with updating the O&M Plan.

4 Operation and Maintenance Activities

A. CRWD will oversee, manage, and direct the Project O&M on behalf of St. Paul.

B. CRWD will act as St. Paul's authorized agent utilizing easements and right of way for O&M activities carried out pursuant to the O&M Plan.

C. CRWD will be responsible for direct hiring of contractors, as needed.

D. St. Paul will be responsible for performing Gopher State One-Call Locate Requests of the Project Elements identified within Exhibit A of this Agreement.

E. St. Paul will be responsible for Emergency Operations of the Project Elements identified within Exhibit A of this Agreement. After initial intervention and response, CRWD will be responsible to respond within one business day of notification by St. Paul.

F. CRWD shall coordinate O&M activities with St. Paul and MUSC LLC.

G. CRWD will consult with St. Paul on any substantive deviation from the O&M Plan. Such deviations may consist of recurring activities that warrant a change in planned frequency or occasional planned or unplanned activities that may increase the prior year's annual costs by more than ten percent. For the first year of the agreement, the CRWD will notify St. Paul if the annual costs are expected to exceed $50,000.

H. St. Paul may inspect O&M activities and advise CRWD of any issues or concerns.

I. CRWD and St. Paul will meet on or before April 1 each year to review the annual O&M report and to resolve any outstanding issues as well as review anticipated activities for the forthcoming year. The meeting shall be arranged by CRWD.

5 Payment and Reimbursement of Operation and Maintenance

A. St. Paul will reimburse CRWD for all costs and expenses incurred performing the Project O&M, including annual Opti subscription costs, and any other obligations under this Agreement.

B. Invoices to St. Paul for reimbursement shall be paid within 60 days.

C. Annually, on March 1st, or as soon after as reasonably possible, CRWD will submit an annual O&M report which shall include a summary of all project activities, system performance, major repairs, and the costs, and expenses incurred the prior year. The report will include reasonable documentation of expenses paid by CRWD on behalf of St. Paul, as well as documentation of CRWD staff time and expenses.

6 Parties' Further Rights and Obligations

A. CRWD will not be deemed to have acquired by entry into or performance under this agreement any form of interest or ownership in the Snelling-Midway site. CRWD will not by entry into or performance under this agreement be deemed to have exercised any form of control over the use, operation or management of any portion of the Snelling-Midway site or adjacent property so as to render CRWD a potentially responsible party for any contamination or exacerbation of any contamination conditions under state and/or federal law.

B. St. Paul will provide as-built construction drawings of the Project within 30 days of receipt or as soon after as reasonably possible.

C. St. Paul will contract the plans and specification for the Project, along with all necessary construction documentation and the O&M Plan. CRWD is not responsible for the system design or efficacy. Saint Paul will be responsible for pursuing any warranty claims associated with system design or construction and, in seeking remedy, may request CRWD to provide related ordinary documentation typically used to prepare an annual report in advance of established due dates.

7 General Terms

A. **Publicity and endorsement**. CRWD and St. Paul will collaboratively develop, produce and disseminate public education and outreach materials about the Project. Each party, at its sole expense, may develop, produce and, after written approval of the other parties, distribute educational, outreach and publicity materials related to the Project. Any publicity regarding the

Project must identify St. Paul, CRWD, the Clean Water Legacy Fund, and Metropolitan Council as sponsoring entities. For purposes of this provision, publicity includes notices, informational pamphlets, press releases, research, reports, signs and similar public notices prepared by or for St. Paul or CRWD individually or jointly with others, or any subcontractors, with respect to the Project.

B. **Data management**. All designs, written materials, technical data, research or any other work in progress will be shared among the parties to this agreement upon completion, except as prohibited by law. As soon as is practicable, the party preparing plans, specifications, contractual documents, materials for public communication or education will provide them to the other parties for recordkeeping and other necessary purposes.

C. **Data Practices**. All data created, collected, received, maintained or disseminated for any purpose in the course of this agreement is governed by the Minnesota Government Data Practices Act, Minnesota Statutes chapter 13, and any state rules adopted to implement the act, as well as federal regulations on data privacy

D. **Entire agreement**. This agreement, as it may be amended in writing, contains the complete and entire agreement between the parties relating to the subject matter hereof, and supersedes all prior negotiations, agreements, representations and understandings, if any, between the parties respecting such matters. The recitals stated at the outset are incorporated into and made a part of the agreement.

E. **Force majeure**. St. Paul will not be liable for failure to complete the Project if the failure results from an act of god (including fire, flood, earthquake, storm, other natural disaster or other weather conditions that make it infeasible or materially more costly to perform the specified work), embargo, labor dispute, strike, lockout or interruption or failure of public utility service. In asserting force majeure, St. Paul must demonstrate that it took reasonable steps to minimize delay and damage caused by foreseeable events, that it substantially fulfilled all non-excused obligations, and that it timely notified St. Paul of the likelihood or actual occurrence of the force majeure event. Delay will be excused only for the duration of the force majeure.

F. **Waivers**. The waiver by St. Paul or CRWD of any breach or failure to comply with any provision of this agreement by the other parties will not be construed as nor will it constitute a continuing waiver of such provision or a waiver of any other breach of or failure to comply with any other provision of this agreement.

G. **Notices**. Any notice, demand or communication under this agreement by any party to the others will be deemed to be sufficiently given or delivered if it is dispatched by registered or certified mail, postage prepaid to:

St. Paul
Richard Ekobena
Sewer Utility Manager
25 West 4th Street
St. Paul, MN 55101
richard.ekobena@ci.stpaul.mn.us
651.266.6253

CRWD
Anna Eleria
Administrator
595 Aldine Street
Saint Paul, MN 55104
aeleria@capitolregionwd.org
651.644.8888

H. **Term.** This agreement is effective on execution by each of the parties and will terminate five (5) years from the date of execution of this agreement or on the written agreement of both parties. The agreement may be renewed at the termination of this agreement by the review and execution by both parties of a modified agreement.

I. **Termination.** Either party may terminate this agreement with 180 days written notice to the other party. Early termination will require cost accounting and adherence to the reimbursement schedule for costs CRWD incurs. CRWD will not retain and rights or obligations under this agreement after termination, unless otherwise agreed by both parties.

J. **Liability**. Minnesota Statutes chapter 466 and other applicable law govern liability of the parties. The limits of liability for the parties may not be added together to determine the maximum amount of liability of any party.

K. **Immunity**. This agreement creates no right in and waives no immunity, defense or liability limitation with respect to any non-party.

L. **Indemnification**. Each party agrees to indemnify, defend, and hold harmless the other party, its officers, council members, employees, and agents from any and all actions, costs, damages, and liabilities of any nature arising from the indemnifying party's, or those of any other non-party under contract with the indemnifying party, negligent or otherwise wrongful act or omission, or breach of a specific contractual duty.

Compliance with Laws. Each party agrees to comply with all local, state, federal, and other applicable laws in its execution of and performance under this agreement.

[SIGNATURE PAGE FOLLOWS.]

IN WITNESS WHEREOF, the parties have caused the agreement to be duly executed intending to be bounded thereby.

City of St. Paul

_____

By:

Date: _____

and

_____

By:

Date: _____

Approved as to form & execution:

_____
City attorney

Capitol Region Watershed District

_____

By:

Date: _____

Approved as to form & execution:

_____
CRWD attorney

EXHIBIT A

Project Elements to be Operated and Maintained by CRWD

- Duplex Pump Station within Structure 251
- Systems and components within Vault 200, including
    - Skid System provided by RMS including but not limited to filters, pumps, meters, and UV lights
    - Ozone System
    - Recirculating System (pumping/forcemain)
    - Pump Pump for filter backwash to sanitary
    - Opti-System (to pump down Tank A to accommodate a future storm event)
    - RMS-200 Control System (used for tracking flow meters, turbidity, pH, etc.)
    - Lights, alarms, vents, heating and dehumidifying devices
- Outlot reuse distribution system to proposed adjacent properties

EXHIBIT B

Project Plans

- Sheet C8-10, “Cross Section”
- Sheet M1.01, “Rainwater Vault Mechanical Plan and Skid Section Views”
- Sheet M2.01, “Mechanical Schedules”
- Sheet M3.01, “Mechanical Schedules, Points List, and Flow Diagram”
- Sheet EX 1M, “Water Distribution System”

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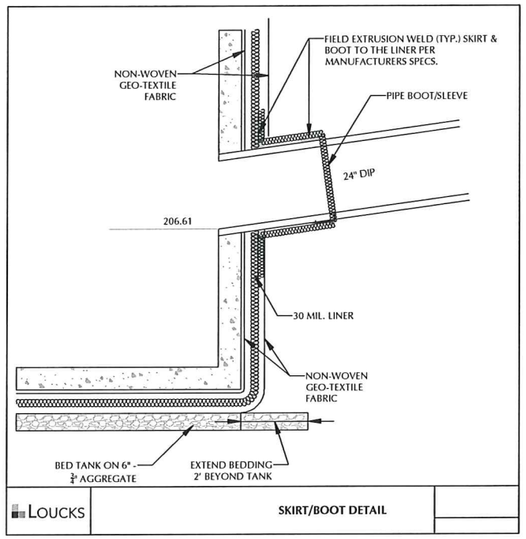
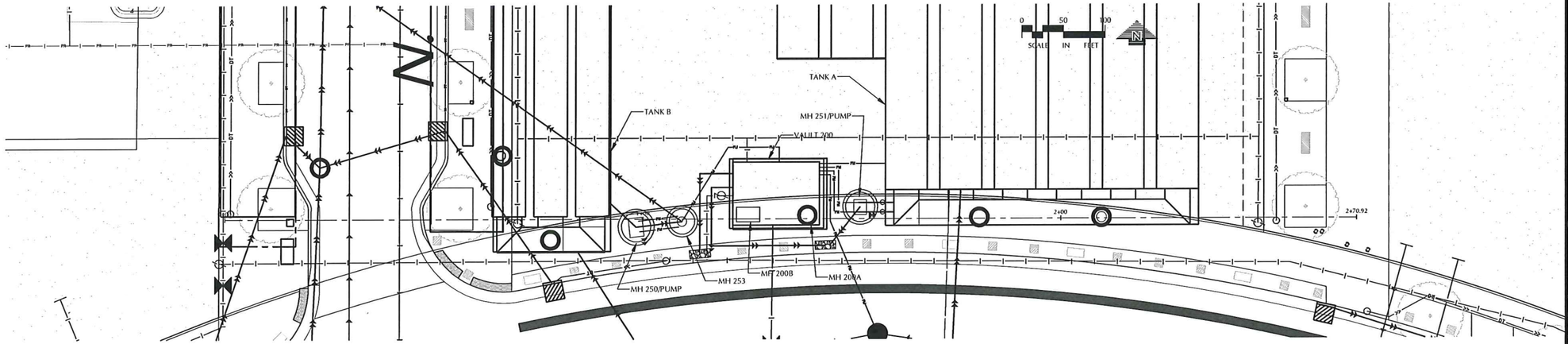
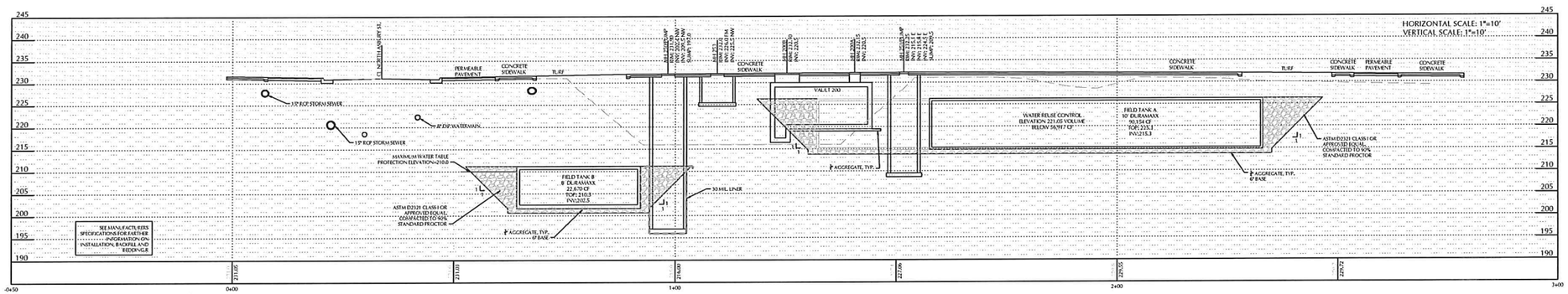






POPULOUS

POPULOUS
Architecture, Planning
Interiors, Programming
4820 Main Street, Suite 300
Kansas City, Missouri 64112
816-221-1500

STRUCTURAL ENGINEER
WALTER P. MOORE
920 MAIN STREET, TENTH FLOOR
KANSAS CITY, MO 64105
816-701-2100

MEP/FP ENGINEER
ME ENGINEERS
14143 DENVER WEST PKWY, SUITE 300
GOLDEN, COLORADO 80401
303-421-6655

AUDIO/VISUAL
WJHW, INC.
4651 SPRING VALLEY RD. STE #113
DALLAS, TX 75244
972-590-7550

CIVIL ENGINEER
LOUCKS, INC.
7200 HEMLOCK LANE, SUITE 300
MAPLE GROVE, MN 55369
763-424-5505

LIFE SAFETY
HOWE ENGINEERS, INC.
101 LONGWATER CIRCLE, SUITE 203
NORWELL, MA 02061
781-878-3500

FOOD SERVICE
SSD CONSULTANTS, INC
13 WINDING BRANCH RD
HAWTHORN WOODS, IL 60047
224-717-1155

LOUCKS
PLANNING
CIVIL ENGINEERING
LAND SURVEYING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL
7200 Hemlock Lane, Suite 300
Maple Grove, MN 55369
763.424.5505
www.loucksinc.com

MINNESOTA MLS STADIUM
SAINT PAUL, MINNESOTA

ASI 12.10

AUGUST 6th, 2018

REVISIONS

NO	DATE	DESCRIPTION
1	N/A	CONTACT CIVIL FOR 1.56 & 56.73
57	06-06-18	ASI 12.9
74	07-31-18	RFI 850
75	07-31-18	RFI 849
76	08-06-18	ASI 12.10

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Jeffrey A. Shippee, PE
License No. 19624
08-06-18

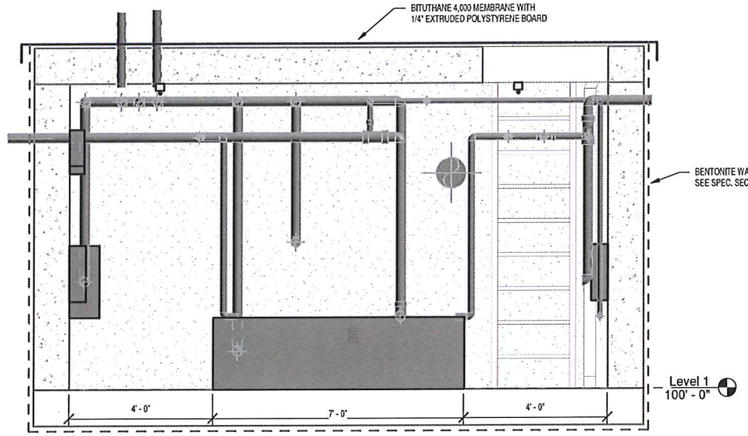
Loucks Project No.	16028A
Project Lead	JAS
Drawn By	TRG
Checked By	JAS
Review Date	08-06-18

PROJECT NO: 16028A
CO-BY: POPULOUS
08-06-18

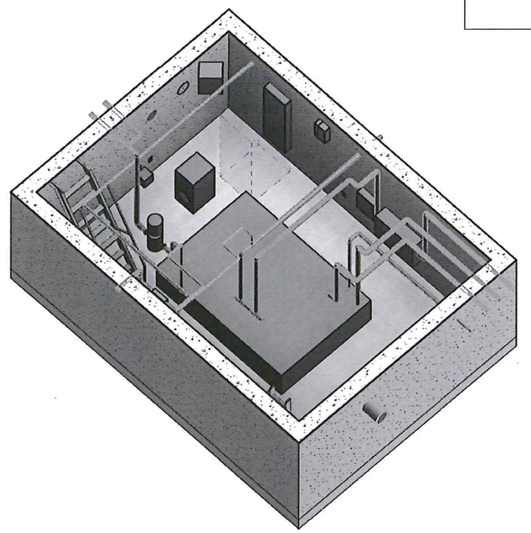
SHEET TITLE
CROSS SECTION

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET
C8-10

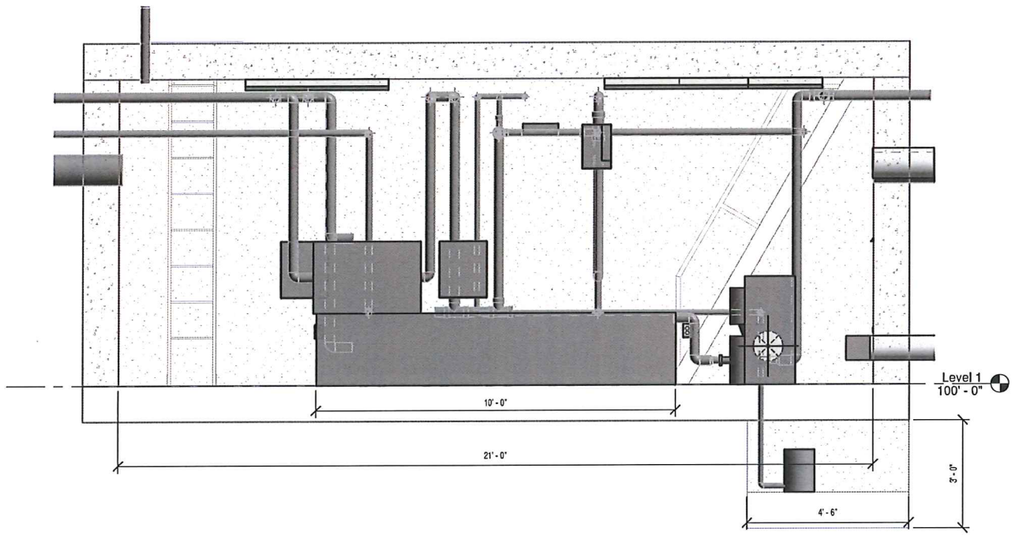
COPYRIGHT © POPULOUS



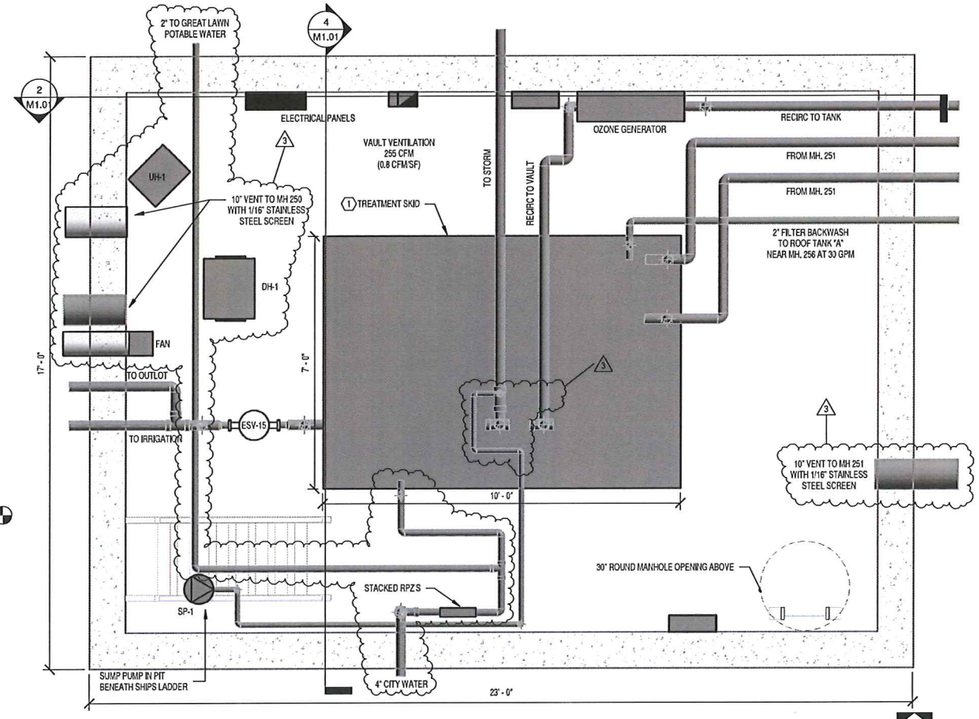
4 SKID SECTION - SIDE VIEW
1/2" = 1'-0"



3 ISO VIEW - SKID



2 SKID SECTION - FRONT VIEW
1/2" = 1'-0"



1 RAINWATER VAULT - MECHANICAL PLAN
1/2" = 1'-0"

KEYED SHEET NOTES

1. SKID LAYOUT AND FINAL DETAILS TO BE PROVIDED IN SHOP DRAWINGS.

LHB
PERFORMANCE DRIVEN DESIGN.
LHBcorp.com
21 W. Superior St., Ste 500 | Duluth, MN 55802 | 218.727.8446

CLIENT:
MINNESOTA UNITED FC

4150 OLSEN MEMORIAL HWY,
SUITE 300, GOLDEN VALLEY,
MN 55422

THIS SQUARE APPEARS 1/2"x1/2"
ON FULL SIZE SHEETS

NO	DATE	ISSUED FOR

NO	DATE	REVISION
3	06/11/2018	ASI 12.9
2	05/09/2018	SUPPLIER COMMENTS
1	03/15/2018	CITY COMMENTS

I HEREBY CERTIFY that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Signature:

Typed or Printed Name: DAVID T. WILLIAMS

Date: 05/07/18 Reg. No.: 16929

PROJECT NAME:
MINNESOTA MLS STADIUM - RAINWATER TREATMENT VAULT

400 SNELLING AVENUE,
ST. PAUL, MN 55104

DRAWING TITLE:
RAINWATER VAULT MECHANICAL PLAN AND SKID SECTION VIEWS

FILE: O:\17Proj\170715\600 Drawings\MEP
DRAWN BY: MSR
CHECKED BY: DTW
PROJ. NO: 170715
DRAWING NO: **M1.01**

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OZONE SYSTEM

OZONE RECIRCULATION TREATMENT

NAME	LOCATION	OPERATING CONDITIONS		NOTES
		RECIRCULATION OR DRAINAGE FLOW	OZONE DOSAGE	
OZONE SYSTEM	VAULT	200 GPM	135G/HR	

OZONE GENERATOR

ID	MANUFACTURER AND MODEL NUMBER	LOCATION	OZONE PRODUCTION		COMPRESSED AIR	ELECTRICAL	NOTES
			FLOW RATE GRAMS/HR	OZONE CONCENTRATION	INLET AIR SCFH/PSI	VOLT/PH/HZ	
OZ-1	PACIFIC OZONE 3M23	VAULT	135	8%	5 / 10	20A 208/1/60	1

2

OZONE VENTURI

ID	MANUFACTURER AND MODEL NUMBER	LOCATION	TYPE	RECIRCULATION		LENGTH	NOTES
				FLOW RATE (GPM)	PRESSURE DROP (PSI)	WIDTH/ HEIGHT (IN)	
V-1	MAZZEI MK-3090	RECIRCULATION LINE	COMPOUND	200	5	3 INCH NPT X 19 INCHES	1

1. PROVIDE SS BALL CHECK VALVE, KYNAR CONSTRUCTION.

1 AIR COMPRESSOR / O2 CONCENTRATOR

ID	MANUFACTURER AND MODEL NUMBER	LOCATION	TYPE	AIR		ELECTRICAL			NOTES
				FLOW RATE (GPM)	PRESS (PSI)	MOTOR SIZE (HP)	MOTOR SPEED (RPM)	VOLT/PH/HZ	
CA-1	SKID MFG. CHOICE	VAULT	WITH TANK	11	115	7.5	1750	208/3/60	1

1. PROVIDE DISCONNECT AND INTERLOCK WITH OZONE GENERATOR AND RECIRCULATION FLOW SWITCH.

2

WATER TREATMENT SKID

WATER TREATMENT SKID

NAME	LOCATION	OPERATING CONDITIONS		NOTES
		RECIRCULATION OR DRAINAGE FLOW	IRRIGATION FLOW	
WATER TREATMENT SKID	VAULT	200 GPM	10-150 GPM	

UV DISINFECTION UNIT

ID	MANUFACTURER AND MODEL	LOCATION	TYPE	PUMP		ELECTRICAL	NOTES
				FLOW RATE (GPM)	UVT (MIN.) (%)	VOLT/PH/HZ	
UV-1	VIQUA UV MAX K+	SKID	VERTICAL INLINE	80	75	120V/230 WATTS	1
UV-2	VIQUA UV MAX K+	SKID	VERTICAL INLINE	80	75	120V/230 WATTS	1

1. TWO UNITS PIPED IN PARALLEL REQUIRED.

CARBON FILTER

ID	MANUFACTURER AND MODEL	LOCATION	TYPE	DOMESTIC			DIMENSIONS	NOTES
				FLOW RATE (GPM)	ENTERING/LEAVING PRESSURE (PSIG)	PRESSURE DROP (PSI)	WIDTH/ HEIGHT(IN)	
F-3	SHELCO 12FOS3	SKID	CARTRIDGE HOUSING WITH CARBON ELEMENTS	100	2	20	17/49	1

1. 304 SS, EACH NSF 61 COMPLIANT AND WITH ONE SET OF CARBON FILTER CARTRIDGES, PLUS 1 SPARE SET.

WATER TREATMENT HMI/CONTROL PANEL

ID	MANUFACTURER AND MODEL NUMBER	LOCATION	TYPE	VOLT/PH/HZ	NOTES
	RMS-200	SKID	PLC WITH GRAPHICAL DIGITAL TOUCH SCREEN	120/1/60	MODBUS INTERFACE, 21 AI, 16 BI, 2 AO, 8 BO.

2

IRRIGATION PUMP SCHEDULE

ID	MANUFACTURER AND MODEL NUMBER	LOCATION	TYPE	DOMESTIC		PUMP		ELECTRICAL				NOTES
				FLOW RATE (GPM)	HEAD (PSI)	EFFICIENCY (%)	CONSTRUCTION	MOTOR SIZE (HP)	MOTOR BHP (HP)	MOTOR SPEED (RPM)	VOLT/PH/HZ	
ESV-15	GOULDS	SKID	VERTICAL INLINE	105	100	70	304 SS WETTED	7.5	8	3500	208/3/60	1

1. TWO PUMP BOOSTER SYSTEM WITH INTEGRAL VFD CONTROL, RANGE 10 TO 150 GPM.

2

BAG FILTER

ID	MANUFACTURER AND MODEL	LOCATION	TYPE	DOMESTIC			DIMENSIONS	NOTES
				FLOW RATE (GPM)	CLEAN PD (PSIG)	DIRTY PD (PSI)	WIDTH/ HEIGHT (IN)	
F-2	SHELCO BFS-2SB-3F-304-2-B150	SKID	#2 BAG FILTER	100	2	15	6/35	1
F-2	SHELCO BFS-2SB-3F-304-2-B150	SKID	#2 BAG FILTER	100	2	15	6/35	1

1. TWO FILTER HOUSINGS REQUIRED, 304 SS, EACH NSF 61 COMPLIANT AND WITH 5 MICRON #2 BAG, PLUS 2 SPARE BAGS.

SELF CLEANING FILTER

ID	MANUFACTURER AND MODEL	LOCATION	TYPE	DOMESTIC			NOTES
				FLOW RATE (GPM)	ENTERING/LEAVING PRESSURE (PSIG)	PRESSURE DROP (PSI)	
F-1	ORVIL ORGB-030-LE DUPLEX	SKID	DUPLEX	200	—	5	1

1. DUPLEX UNIT, NON SIMULTANEOUS CLEANING CYCLE. MINIMUM 170 GPM DURING BACKWASH.

PUMP SURGE TANK SCHEDULE

ID	MANUFACTURER AND MODEL	LOCATION	TYPE	FLUID			PHYSICAL			NOTES
				MIN. TANK/ ACCEPTANCE VOLUME (GAL)	MINIMUM FILL PRESSURE...	MAXIMUM WORKING PRESSURE (PSIG)	TANK SIZE (GAL)	DIA/ HEIGHT (IN)	NPT FITTING (IN)	
ET-1	FLEXCON PC 111	SKID	VERT DIAPH FLOOR	10 (NOM.)	40	112.5	32	21/28	1	

MH. 251 PUMP(S) SCHEDULE

ID	MANUFACTURER AND MODEL NUMBER	LOCATION	TYPE	DOMESTIC		PUMP		ELECTRICAL			NOTES
				FLOW RATE (GPM)	HEAD LOSS (FT)	EFFICIENCY (%)	CONSTRUCTION	MOTOR SIZE (HP)	MOTOR BHP (HP)	VOLT/PH/HZ	
P-2	GOULDS 120L15	LIFT STATION	6 INCH WELL PUMP	100	65	70	SS	15	15	208/3/60	1, 2.
P-4	GOULDS 120L15	LIFT STATION	6 INCH WELL PUMP	100	65	70	SS	15	15	208/3/60	1, 2.

1. PROVIDE REQUIRED FLOW INDUCER SLEEVE.
2. MOTOR STARTER TO BE VARIABLE FREQUENCY DRIVE LOCATED ON SKID / SEPARATE POWER FEED.

2

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PERFORMANCE DRIVEN DESIGN.
LHBcorp.com

21 W. Superior St., Ste 500 | Duluth, MN 55802 | 218.727.8446

CLIENT:
MINNESOTA UNITED FC

4150 OLSEN MEMORIAL HWY,
SUITE 300, GOLDEN VALLEY,
MN 55422

THIS SQUARE APPEARS 1/2"x1/2" ON FULL SIZE SHEETS

NO	DATE	ISSUED FOR

NO	DATE	REVISION
2	06/11/2018	ASI 12.9
1	05/09/2018	SUPPLIER COMMENTS

I HEREBY CERTIFY that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Signature:

Typed or Printed Name: DAVID T. WILLIAMS

Date: 05/07/18 Reg. No.: 18929

PROJECT NAME:
MINNESOTA MLS STADIUM - RAINWATER TREATMENT VAULT

400 SNELLING AVENUE,
ST. PAUL, MN 55104

DRAWING TITLE:
MECHANICAL SCHEDULES

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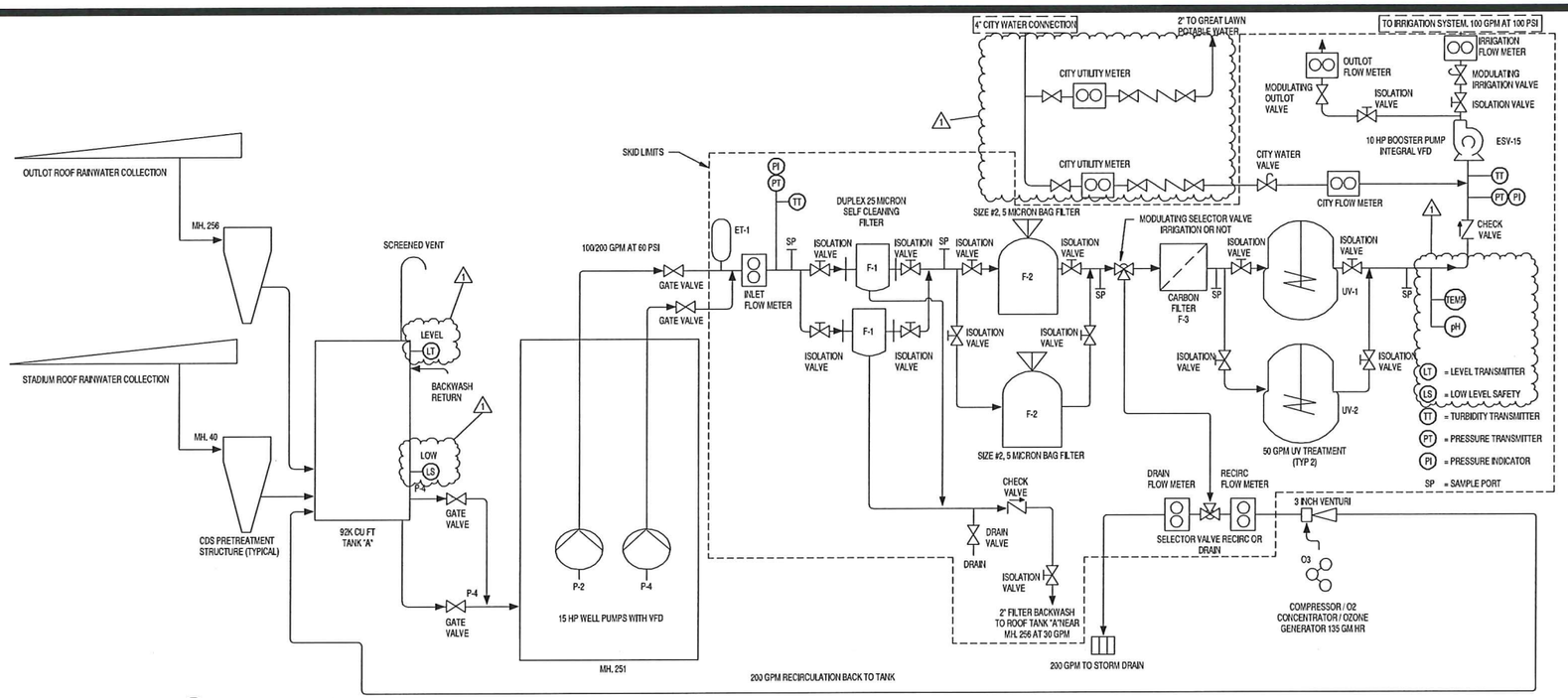
CHECKED BY: DTW
PROJ. NO: 170715
DRAWING NO: **M2.01**



1 **FLOW DIAGRAM**
NO SCALE

SUMP PUMP SCHEDULE

ID	MANUFACTURER	MODEL	SERVES	MECHANICAL REQUIREMENTS GPM	TOTAL HEAD	FLUID TYPE	ELECTRICAL REQUIREMENTS HP	VOLTAGE	PHASE	NOTES
SP-1	LIBERTY PUMPS	257	RAINWATER SYSTEM VAULT	25.0 GPM	15	SANITARY WASTE	1/3	115 V	1	

UNIT HEATER (ELECTRIC) SCHEDULE

ID	MANUFACTURER	MODEL	MECHANICAL REQUIREMENTS CFM	OUTPUT BTU/HR	ELECTRICAL REQUIREMENTS VOLTAGE	PHASE	NOTES
UH-1	BERKO	BWD05832	700 CFM	17060	208 V	3	

DEHUMIDIFIER SCHEDULE

ID	MANUFACTURER	MODEL	AIRFLOW RATE (CFM)	CAPACITY 24 HRS (PINTS)	ELECTRICAL REQUIREMENTS VOLTAGE	NOTES
DH-1	HILE DRY	195	610 CFM	195	120 V	

FAN SCHEDULE

UNIT No.	LOCATION	MANUFACTURER'S DESIGNATION	CFM	SERVES	MECHANICAL REQUIREMENTS TOTAL STATIC	FAN RPM	ELECTRICAL REQUIREMENTS WATTS	VOLTAGE	PHASE	NOTES
FAN	VAULT	FANTECH FKGA18 EC	300	VAULT	1.3	3,619	123	120	1	PROVIDE MTP 10, 10K SPEED CONTROL (3273)

POINTS

POINT	HARDWARE POINTS AI	AO	BI	BO	SOFTWARE POINTS AV	BV	LOOP	SCHED	TREND	ALARM	SHOW ON GRAPHIC
TANK LEVEL	X										X
LIFT STATION LEVEL	X								X		X
LIFT STATIONLOW LEVEL			X							X	X
SUPPLY PRESSURE	X										X
INLET PRESSURE	X										X
PUMP 1 SPEED	X										X
PUMP1 VFD STATUS			X							X	X
PUMP 2 SPEED	X										X
PUMP 2 VFD STATUS			X							X	X
VAULT VENTILATION FAN				X							X
25 MICRON FILTER PD	X								X	X	X
5 MICRON FILTER PD	X								X	X	X
DIVERTING VALVE			X	X							X
CARBON FILTER PD	X								X	X	X
DEHUMIDIFIER FAULT			X							X	X
UV 1 ENABLE				X							X
UV 2 ENABLE				X							X
UV 1 STATUS			X							X	X
UV 2 STATUS			X							X	X
SUPPLY PUMP STATUS / FAULT			X							X	X
IRRIGATION FLOW METER	X								X		X
RECIRCULATION FLOW METER	X								X		X
DRAIN FLOW METER	X								X		X
OUTLOT FLOW METER	X								X		X
INLET FLOW METER	X								X		X
IRRIGATION VALVE		X	X								X
SELECTOR VALVE		X	X								X
DRAIN FLOW RATE					X				X		X
RECIRCULATION FLOW RATE					X				X		X
CITY WATER VALVE			X	X							X
CITY WATER FLOW METER	X								X		X
RECIRCULATION FLOW SWITCH			X								X
OZONE ENABLE / STATUS / FAULT			X	X						X	X
SHIP LEVEL	X								X	X	X
INLET TURBIDITY	X								X	X	X
OUTLET TURBIDITY	X								X	X	X
AIR COMPRESSURE ENABLE / FAULT			X	X							X
SPARE			X	X							X
VAULT TEMPERATURE	X				X				X	X	X
IRRIGATION SCHEDULE					X			X			X
OUTLOT IRRIGATION SCHEDULE					X			X			X
HIGH WATER LEVEL IN VAULT			X							X	X
SUPPLY WATER TEMPERATURE	X								X		
SUPPLY WATER Ph	X								X		
	21	2	16	8	5	0	0	2	18	16	42

1. PROVIDE REQUIRED FLOW INDUCER SLEEVE.
2. MOTOR STARTER TO BE VARIABLE FREQUENCY DRIVE LOCATED ON SKID.

C:\Users\djv\Documents\170715_MLS Stadium_MEP18_rstbeil.rvt
6/11/2018 11:46:44 AM

LHB
PERFORMANCE DRIVEN DESIGN.
LHBcorp.com
21 W. Superior St., Ste 500 | Duluth, MN 55802 | 218.727.8446

CLIENT:
MINNESOTA UNITED FC

4150 OLSEN MEMORIAL HWY, SUITE 300, GOLDEN VALLEY, MN 55422

THIS SQUARE APPEARS 1/2"x1/2" ON FULL SIZE SHEETS

NO	DATE	ISSUED FOR

NO	DATE	REVISION
1	06/11/2018	ASI 12.9

I HEREBY CERTIFY that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Signature:

Typed or Printed Name: DAVID T. WILLIAMS

Date: 05/07/18 Reg. No.: 18929

PROJECT NAME:
MINNESOTA MLS STADIUM - RAINWATER TREATMENT VAULT

400 SNELLING AVENUE, ST. PAUL, MN 55104

DRAWING TITLE:
MECHANICAL SCHEDULES, POINTS LIST, AND FLOW DIAGRAM

FILE: O:\17Proj\170715\600 Drawings\MEP
DRAWN BY: MSR
CHECKED BY: DTW
PROJ. NO: 170715
DRAWING NO: **M3.01**

12/19/2016 2:48:33 PM

BENCHMARK

TOP NUT OF FIRE HYDRANT 370 FEET SOUTH OF THE INTERSECTION OF UNIVERSITY AVENUE AND SNELLING AVENUE ON THE EAST SIDE OF SNELLING
TNH ELEVATION = 228.15
ELEVATIONS SHOWN ARE BASED ON CITY OF ST PAUL DATUM.
CONVERSION FACTOR TO 1929 NGVD, ADD 694.10.

N

0 50 100
SCALE IN FEET

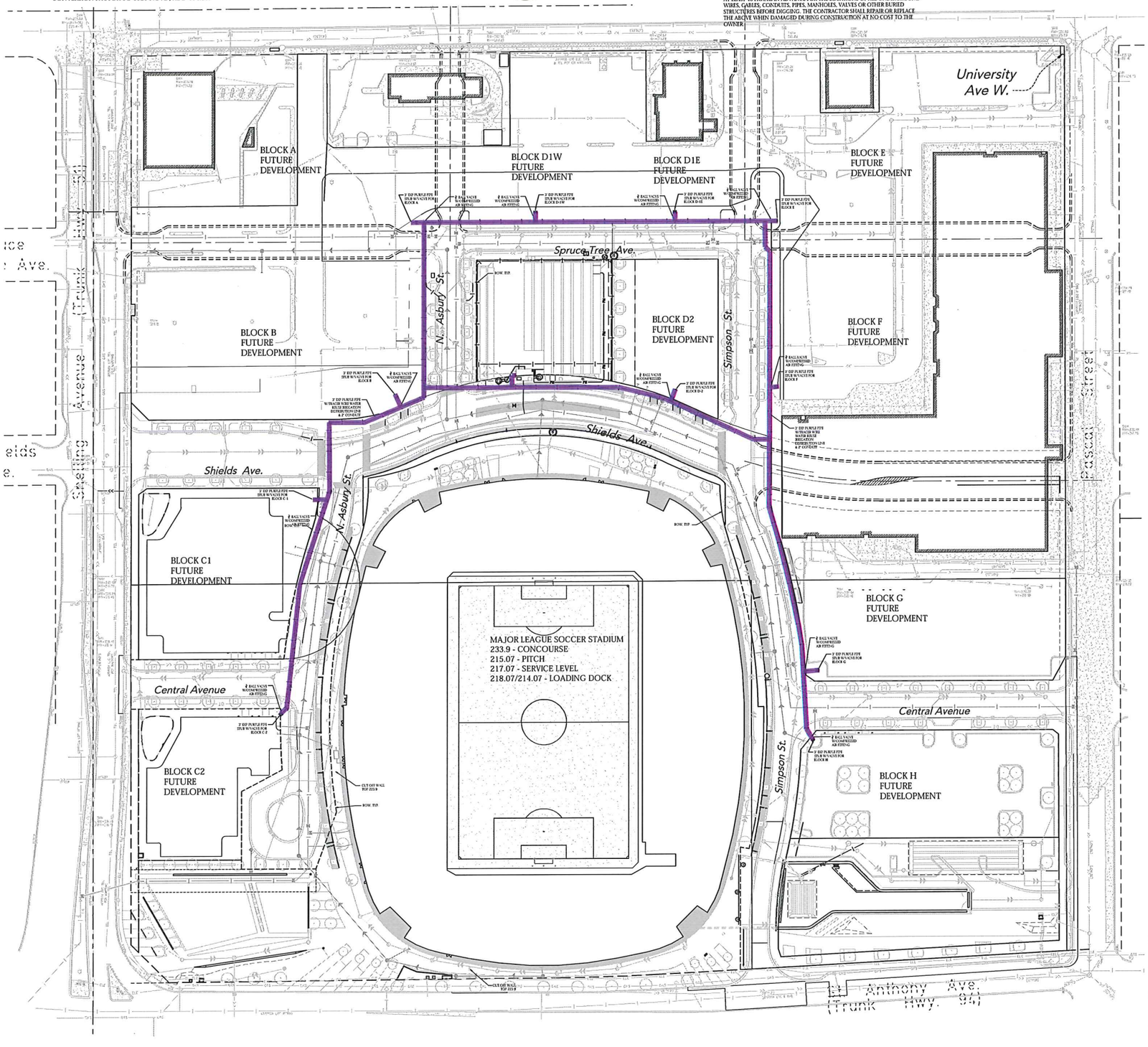
CALL BEFORE YOU DIG!
Gopher State One Call
TWIN CITY AREA: 651-454-0002
TOLL FREE: 1-800-252-1166

WARNING:

THE CONTRACTOR SHALL BE RESPONSIBLE FOR CALLING FOR LOCATIONS OF ALL EXISTING UTILITIES. THEY SHALL COOPERATE WITH ALL UTILITY COMPANIES IN MAINTAINING THEIR SERVICE AND / OR RELOCATION OF LINES.

THE CONTRACTOR SHALL CONTACT GOPHER STATE ONE CALL AT 651-454-0002 AT LEAST 48 HOURS IN ADVANCE FOR THE LOCATIONS OF ALL UNDERGROUND WIRES, CABLES, CONDUITS, PIPES, MANHOLES, VALVES OR OTHER BURIED STRUCTURES BEFORE DIGGING. THE CONTRACTOR SHALL REPAIR OR REPLACE THE ABOVE WHEN DAMAGED DURING CONSTRUCTION AT NO COST TO THE OWNER

WATER REUSE DISTRIBUTION SYSTEM



CITY OF ST. PAUL NOTES

1. SIGNS REGULATING PARKING AND/OR TRAFFIC ON PRIVATE PROPERTY SHALL BE INSTALLED BY THE PROPERTY OWNER OR CONTRACTOR OUTSIDE OF THE PUBLIC RIGHT-OF-WAY. REMOVAL OF SIGNS WITHIN THE PUBLIC RIGHT OF WAY SHALL BE COMPLETED BY THE CITY. NEW SIGNS OR THE REINSTALLATION OF EXISTING SIGNS, AS APPROVED BY PUBLIC WORKS TRAFFIC ENGINEERING, REGULATING PARKING AND/OR TRAFFIC IN THE PUBLIC ROW FOR THIS DEVELOPMENT SHALL BE INSTALLED BY THE CITY AT THE EXPENSE OF THE DEVELOPMENT. CONTACT RICK SOLHEID (651-266-9781) OF PUBLIC WORKS TWO WEEKS IN ADVANCE OF NEEDED SIGN WORK.
2. ALL WORK ON CURBS, DRIVEWAYS, AND SIDEWALKS WITHIN THE PUBLIC RIGHT OF WAY MUST BE DONE BY A LICENSED AND BONDED CONTRACTOR UNDER A PERMIT FROM PUBLIC WORKS SIDEWALK SECTION (651-266-6120). SIDEWALK GRADES MUST BE CARRIED ACROSS DRIVEWAYS.
3. STREET RESTORATION: AS PER THE CITY'S "STANDARD SPECIFICATION FOR STREET OPENINGS" POLICY, RESTORATION OF ROADWAY SURFACES LESS THAT 5 YEARS OLD WILL REQUIRE FULL WIDTH MILL AND OVERLAY OR ADDITIONAL DEGRADATION FEES. DEGRADATION FEES ARE DETERMINED BY CONTACTING THE RIGHT OF WAY SERVICE DESK (651-266-6151) PAVEMENT RESTORATION SHALL BE COMPLETED BY THE ST. PAUL PUBLIC WORKS STREET MAINTENANCE DIVISION. ALL RELATED COSTS ARE THE RESPONSIBILITY OF THE DEVELOPER/CONTRACTOR. CONTACT STREET MAINTENANCE (651-266-9700) FOR AN ESTIMATE OF COSTS FOR PAVEMENT RESTORATION.
4. THE CONTRACTOR SHALL CONTACT DON BJORKMAN AT 651-266-9780, GENERAL FOREMAN, LIGHTING - SIGNAL MAINTENANCE, IF REMOVAL OR RELOCATION OF EXISTING FACILITIES IS REQUIRED OR IN THE EVENT OF DAMAGE TO THE LIGHTING OR SIGNAL UTILITIES. THE CONTRACTOR SHALL ASSUME RESPONSIBILITY (AND RELATED COSTS) FOR ANY DAMAGE OR RELOCATIONS. ACCESS TO SIGNAL CONTROLLER & LIGHTING CABINETS MUST BE MAINTAINED AT ALL TIMES. IF FENCING IS REQUIRED FOR A JOB SITE, A KEY OR OTHER MEANS OF ACCESS MUST BE PROVIDED TO THE CITY OF ST. PAUL'S TRAFFIC OPERATIONS DEPARTMENT. CONTACT DON BJORKMAN.
5. ENCROACHMENTS: PER CHAPTER 134 OF THE LEGISLATIVE CODE, NO PERSON SHALL CONSTRUCT AND MAINTAIN ANY PROJECTION OR ENCROACHMENT WITHIN THE PUBLIC RIGHT OF WAY. CONSTRUCTION OF THE DEVELOPMENT THAT NECESSITATES TEMPORARY USE OF THE RIGHT OF WAY FOR CONSTRUCTION PURPOSES SHALL BE LIMITED TO EQUIPMENT, PERSONNEL, DEVICES AND APPURTENANCES THAT ARE REMOVABLE FOLLOWING CONSTRUCTION. ENCROACHMENT PERMITS WILL NOT BE GRANTED FOR DEVICES SUCH AS TIE BACKS, ROCK BOLTS, H-PILES, LAGGING, TIMBERS, SHEET PILING, ETC. THAT THE OWNER IS SEEKING TO ABANDON IN THE ROW. FOOTINGS MAY BE ALLOWED TO ENCROACH INTO THE CITY RIGHT OF WAY NO MORE THAN TWELVE (12) INCHES AT DEPTHS BELOW EIGHT (8) FEET PER SATE BUILDING CODE SECTION 3202. SAID ENCROACHMENTS WILL REQUIRE AN ENCROACHMENT PERMIT FROM THE CITY. ENCROACHMENTS INTO COUNTY OR STATE RIGHT OF WAY ARE NOT ALLOWED UNLESS AUTHORIZATION HAS BEEN GRANTED FROM SAID AGENCY. ENCROACHMENTS INSTALLED IN THE RIGHT OF WAY WITHOUT AUTHORIZATION WILL BE REMOVED AT NO EXPENSE TO CITY/COUNTY/STATE.
6. STRIPING: ROADWAY STRIPING IMPACTED BY THE WORK ZONE SHALL BE REPLACED IN-KIND AT NO COST TO THE CITY. IF THERE ARE QUESTIONS AS TO THE TYPE OF MATERIAL TO BE USED, CONTACT RICK SOLHEID (651-266-9781) IN THE CITY'S TRAFFIC OPERATIONS SECTION. STRIPING RESTORATION SHALL BE COMPLETED IMMEDIATELY FOLLOWING FINAL PAVEMENT RESTORATION. IF THERE IS A DESIRE FOR THE CITY OF ST. PAUL PUBLIC WORKS DEPARTMENT TO COMPLETE PAVEMENT MARKING RESTORATION WORK, CONTACT RICK SOLHEID. IF ADVANCE NOTICE IS NOT PROVIDED, ANY ASSOCIATED PROJECT DELAYS, AND COSTS INCURRED RESULTING FROM SAID DELAYS, SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
7. CARE MUST BE TAKEN DURING CONSTRUCTION AND EXCAVATION TO PROTECT ANY SURVEY MONUMENTS AND/OR PROPERTY IRONS. CALL SAM GIBSON OF PUBLIC WORKS SURVEYING (651-266-6073) IF YOU HAVE ANY QUESTIONS
8. PIPE WORK INSIDE PROPERTY TO BE PERFORMED BY A PLUMBER LICENSED BY THE STATE OF MINNESOTA AND CERTIFIED BY THE CITY OF SAINT PAUL. PIPE WORK WITHIN THE PUBLIC RIGHT OF WAY TO BE PERFORMED BY SPRWS.
9. ABANDONING EXISTING SEWER SERVICE OR MAKING NEW CONNECTIONS TO CITY SEWER MUST BE DONE TO CITY STANDARDS BY A LICENSED HOUSE DRAIN CONTRACTOR UNDER A PERMIT FROM PUBLIC WORKS SEWER SECTION (651-266-6234).
10. INSPECTION CONTACT: THE DEVELOPER SHALL CONTACT THE RIGHT OF WAY INSPECTOR, DICK ROHLAND, AT 651-165-1688 (ONE WEEK PRIOR BEGINNING WORK) TO DISCUSS TRAFFIC CONTROL, PEDESTRIAN SAFETY, & COORDINATION OF ALL WORK IN THE PUBLIC RIGHT OF WAY. IF A ONE WEEK NOTICE IS NOT PROVIDED TO THE CITY, ANY RESULTING DELAYS SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
11. AS PART OF THE ROW PERMITTING PROCESS, TWO WEEKS BEFORE ANY WORK BEGINS THAT IMPACTS THE ROW IN ANY WAY, THE DEVELOPER SHALL PROVIDE TO THE RIGHT OF WAY INSPECTOR THE NAME AND CONTACT INFORMATION OF THE CONSTRUCTION PROJECT MANAGER OR CONSTRUCTION PROJECT SUPERINTENDENT. IF THIS INFORMATION IS NOT PROVIDED THERE MAY BE A DELAY IN OBTAINING PERMITS FOR THE WORK IN THE ROW. SAID DELAYS WILL BE THE SOLE RESPONSIBILITY OF THE DEVELOPER.
12. SAFE WORK SITE REQUIREMENTS: THE CONTRACTOR SHALL PROVIDE A CONTINUOUS, ACCESSIBLE AND SAFE PEDESTRIAN WALKWAY THAT MEETS ADA AND MN MUTCD STANDARDS IF WORKING IN A SIDEWALK AREA, AND TRAFFIC CONTROL PER MN MUTCD REQUIREMENTS FOR WORK IN THE PUBLIC RIGHT OF WAY.
13. NO PRIVATE FACILITIES IN THE RIGHT OF WAY: THE DEVELOPER IS STRICTLY PROHIBITED FROM INSTALLING PRIVATE ELECTRICAL WIRING, CONDUIT, RECEPTACLES AND/OR LIGHTING IN THE CITY'S RIGHT OF WAY. THIS INCLUDES STUBBING CONDUIT OR CABLE INTO THE PUBLIC RIGHT OF WAY TO ACCOMMODATE UTILITY FEEDS TO THE SITE. COORDINATE WITH EACH UTILITY PRIOR TO CONSTRUCTION TO DETERMINE FEED POINTS INTO THE PROPERTY. UTILITIES ARE RESPONSIBLE FOR SECURING EXCAVATION PERMITS TO RUN THEIR SERVICE INTO A SITE, AND (WHERE REQUIRED) SUBMITTING PLANS FOR REVIEW BY THE PUBLIC WORKS UTILITY REVIEW COMMITTEE.
14. ALL UNUSED EXISTING WATER SERVICES TO BE CUT OFF BY SAINT PAUL REGIONAL WATER SERVICE , WORK SCHEDULED BY OWNER'S CONTRACTOR.
15. STATE ROADWAYS: WORK CONDUCTED ON STATE ROADWAYS, TRUNK HIGHWAYS OR RIGHT OF WAY MAY ALSO REQUIRE PERMITTING THROUGH MNDOT. CONTACT BUCK CRAIG (651-234-7911). STATE AND CITY APPROVAL IS REQUIRED ON MNDOT ROADWAYS MAINTAINED BY THE CITY.
16. WATER SERVICES TO BE INSTALLED ACCORDING TO SPRWS "STANDARDS OF THE INSTALLATION OF WATER MAINS.
17. A 4-SIDED TRENCH BOX IS REQUIRED ON ALL EXCAVATIONS DEEPER THAN 5 FEET WHERE UNDERGROUND WORK OR INSPECTION IS TO BE PERFORMED BY SPRWS. LADDERS ARE REQUIRED AND MUST EXTEND 3 FEET ABOVE THE SURFACE OF THE TRENCH. SIDEWALKS, PAVEMENTS, DUCTS, AND APPURTENANT STRUCTURES SHALL NOT BE UNDERMINED UNLESS A SUPPORT SYSTEM OR ANOTHER METHOD OF PROTECTION IS PROVIDED. TRENCHES IN EXCESS OF 20 FEET IN DEPTH MUST BE SIGNED OFF BY A REGISTERED PROFESSIONAL ENGINEER. EXCAVATED MATERIAL MUST BE KEPT A MINIMUM OF 2 FEET FROM THE EDGE OF THE TRENCH.
18. MAINTAIN 8 FEET OF COVER OVER ALL WATER MAINS AND SERVICES.
19. PIPE MATERIAL FOR 8" & LARGER DUCTILE IRON PIPE MUST BE CLASS 52. PIPE MATERIAL FOR 4" & 6" DUCTILE IRON PIPE MUST BE CLASS 53. THE EXTERIOR OF DUCTILE IRON PIPE SHALL BE COATED WITH A LAYER OF ARC-SPRAYED ZINC PER ISO 8179. THE INTERIOR CEMENT MORTAR LINING SHALL BE APPLIED WITHOUT ASPHALT SEAL COAT.
20. PIPE MUST BE WRAPPED IN V-BIO POLYETHYLENE ENCASEMENT. THE ENCASEMENT SHALL BE INSTALLED SUCH THAT ALL METALLIC SURFACES AND APPURTENANCES OF THE PIPE ARE COVERED WITH THE ENCASEMENT AND SECURED USING POLYETHYLENE COMPATIBLE ADHESIVE TAPE. ALL RIPS, TEARS, AND OTHER DAMAGE SHALL BE REPAIRED WITH COMPATIBLE ADHESIVE TAPE.
21. MAINTAIN 3 FEET VERTICAL SEPARATION BETWEEN WATER AND SEWER PIPES OR A 12 INCH SEPARATION WITH 4 INCH HIGH DENSITY INSULATION PER SPRWS STANDARD PLATE D-10 FOR TYPICAL WATER MAIN OFF SETS.
22. REFER TO SPRWS "STANDARDS FOR THE INSTALLATION OF WATER MAINS" STANDARD PLATE D-11 FOR RESTRAINED PIPE REQUIREMENT.
23. ALL WATER SERVICE VALVE BOXES WITHIN CONSTRUCTION AREA MUST BE EXPOSED AND BROUGHT TO GRADE UPON COMPLETION OF CONSTRUCTION.
24. ALL PIPE WORK INSIDE OF THE PROPERTY TO BE PERFORMED BY A PLUMBER LICENSED BY THE STATE OF MINNESOTA AND CERTIFIED BY THE CITY OF ST. PAUL. SPRWS REQUIRES SEPARATE OUTSIDE AND INSIDE PLUMBING PERMITS FOR EACH NEW WATER SERVICE.
25. ALL UNUSED EXISTING WATER SERVICES TO BE CUT OFF BY SPRWS. EXCAVATION AND RESTORATION BY OWNER'S CONTRACTOR. NEW WATER SERVICES WILL NOT BE TURNED ON UNTIL REQUIRED CUTOFFS HAVE BEEN PERFORMED.
26. WATER FACILITY PIPE WORK WITHIN SNELLING RIGHT-OF-WAY TO BE INSTALLED BY SPRWS. EXCAVATION AND RESTORATION BY OWNER'S CONTRACTOR.
27. THE CONTRACTOR PROVIDING EXCAVATION IS RESPONSIBLE FOR OBTAINING ALL EXCAVATION AND OBSTRUCTION PERMITS REQUIRED BY ANY GOVERNING AUTHORITY.
28. IN ORDER TO SCHEDULE SPRWS FORCES FOR INSTALLATION CALL 651-266-6270 A MINIMUM OF TWO WEEKS PRIOR TO CONSTRUCTION.
29. NOTIFY GRAEME CHAPLE (651-266-6882) A MINIMUM OF 48 HOURS PRIOR TO CONSTRUCTION AND/OR TESTING.
30. BLOW-OUT LOCATIONS FOR WINTERIZATION TO BE DETERMINED BY THE INSTALLATION CONTRACTOR.

CITY OF ST. PAUL PERMIT REQUIREMENTS

1. ORDERING OBSTRUCTION AND EXCAVATION PERMITS: CONTACT PUBLIC WORKS RIGHT OF WAY SERVICE DESK AT (651) 266-6151. IT IS STRONGLY RECOMMENDED THAT CONTRACTORS CALL FOR COST ESTIMATES PRIOR TO BIDDING TO OBTAIN ACCURATE COST ESTIMATES.
2. OBSTRUCTION PERMITS: THE CONTRACTOR MUST OBTAIN AN OBSTRUCTION PERMIT IF CONSTRUCTION (INCLUDING SILT FENCES) WILL BLOCK CITY STREETS, SIDEWALKS OR ALLEYS, OR IF DRIVING OVER CURBS.
3. EXCAVATION PERMITS: ALL DIGGING IN THE PUBLIC RIGHT OF WAY REQUIRES AN EXCAVATION PERMIT. IF THE PROPOSED BUILDING IS CLOSE TO THE RIGHT OF WAY, AND EXCAVATING INTO THE RIGHT OF WAY IS NEEDED TO FACILITATE CONSTRUCTION, CONTACT THE UTILITY INSPECTOR.
4. FAILURE TO SECURE PERMITS: FAILURE TO SECURE OBSTRUCTION PERMITS OR EXCAVATION PERMITS WILL RESULT IN A DOUBLE-PERMIT FEE AND OTHER FEES REQUIRED UNDER CITY OF ST. PAUL LEGISLATIVE CODES.
5. REQUIREMENTS TO WORK IN THE PUBLIC RIGHT OF WAY: ALL UTILITIES AND CONTRACTORS WORKING IN THE PUBLIC RIGHT OF WAY MUST BE REGISTERED, INSURED AND BONDED, AS RECOGNIZED BY THE PUBLIC WORKS SERVICE DESK. (651-266-6151)

POPULOUS

POPULOUS
Architecture, Planning
Interiors, Programming
4600 Main Street, Suite 300
Kansas City, Missouri 64112
816-221-1500

STRUCTURAL ENGINEER
WALTER P. MOORE
920 MAIN STREET, TENTH FLOOR
KANSAS CITY, MO 64105
816-701-2100

MEP/FP ENGINEER
ME ENGINEERS
14143 DENVER WEST PKWY, SUITE 300
GOLDEN, COLORADO 80401
303-421-6655

AUDIO/VISUAL
WJHW, INC.
4651 SPRING VALLEY RD. STE #113
DALLAS, TX 75244
972-590-7530

CIVIL ENGINEER
LOUCKS, INC.
7200 HEMLOCK LANE, SUITE 300
MAPLE GROVE, MN 55369
763-424-5505

LIFE SAFETY
HOWE ENGINEERS, INC.
101 LONGWATER CIRCLE, SUITE 203
NORWELL, MA 02061
781-878-3500

FOOD SERVICE
530 CONSULTANTS, INC.
13 WINDING BRANCH RD
HAWTHORN WOODS, IL 60047
224-717-1555

LOUCKS
PLANNING
CIVIL ENGINEERING
LAND SURVEYING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL
7200 Hemlock Lane, Suite 300
Maple Grove, MN 55369
763.424.5505
www.loucksinc.com

MINNESOTA MLS STADIUM
SAINT PAUL, MINNESOTA

ASI 12.9

JUNE 06, 2018

REVISIONS

NO	DATE	DESCRIPTION
1	N/A	CONTACT CVIL FOR 1-41
42	01-25-18	ASI 12.2
43	01-23-18	ASI 12.5
44	02-09-18	City Comment Tank D
45	02-09-18	DRAFT ASI 12.6
46	03-12-18	MNDOT Permit
47	03-13-18	City Comments
48	03-19-18	ASI 12.7
49	04-20-18	ASI 12.8
50	05-01-18	RFI 619
51	05-11-18	RFI 642
52	05-15-18	ASI 36
53	05-17-18	RFI 0059
55	05-31-18	RFI 691
56	06-05-18	RFI 709
57	06-06-18	ASI 12.9

Hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly licensed Professional Engineer under the laws of the State of Minnesota.

Jeffrey A. Dhopek PE
License No. 19624
06-06-18

Loucks Project No.	16028A
Project Lead	JAS
Drawn By	TRG
Checked By	JAS
Review Date	06-06-18

PROJECT NO: 16028A
ISSUED BY: POPULOUS
ISSUED DATE: 06-06-18

SHEET TITLE
WATER REUSE DISTRIBUTION SYSTEM

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET
EX. 1M

EXHIBIT C

O&M Plans

- Allianz Field Rainwater Reuse Vault Utility and Control Reference (August 22, 2018) by LHB Corp.
- RMS Soccer Stadium Startup Plan O&M Manual (October 15, 2018)
- Opti Statement of Work dated 10/27/2023

Allianz Field
Rainwater Reuse Vault
Utility and Control Reference

Great Lawn Area
St Paul, Minnesota

August 22, 2018

FOR:
St Paul DSI
375 Jackson St
Suite 200
St Paul, MN 55101

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LHBcorp.com

Table of Contents

g) Dehumidifier

h) Unit Heater

i) Opti-RTC

Tank A, Roof Water Tank.

1) Summary (From Stormwater Management Plan):

The drainage to Tank A has direct stormwater runoff from the stadium roof and future developments within the block. Piping is proposed to bring future roofs from lots throughout the super block. The stadium has a piping system around the entire building that connects the roof leaders to MH 40 located at the middle of the north end of the stadium. MH 40 is a CDS pretreatment manhole for filtering runoff before discharging to Tank A. MH 40 CDS is sized to pretreat stadium roof runoff plus the two future developments on Snelling Avenue south of Shields and the one future development on Pascal south of Shields. The roof runoff from the future lots north of Shields Avenue located on Snelling and Pascal Avenues have stormwater pipes stub into the property that connects them to pretreatment CDS MH 256 located in the middle of the sidewalk on the north side of the Great Lawn Area. MH 256 enters Tank A from the north.

Tank A is designed to capture runoff from the roofs for irrigation reuse. Future irrigation needs are intended to be approximately 5.38 acres. The design volume stored in Tank A is equal to two weeks of storage over the intended irrigation area assuming an irrigation rate of 1.5 inches per week. The total stored volume for reuse in Tank A is 56,917 cubic feet. The remainder of the volume within the Tank A is for flood storage and rate control.

There are two outlets to the tank system, a lift station and gravity pipe outlet. Lift Station Pumps are located in MH 251, with the controller located in Vault 200.

See Stormwater Management Plan for detailed elevations and size information.

Tank B – Pitch Tank

1) Summary (From Stormwater Management Plan):

Stadium field (pitch) drains via field drain tile to Field Tank B located in the Great Lawn Area. Tank B will be pumped, without additional treatment, to the storm sewer piping system in Spruce Tree Lane that connects to the existing storm sewer pipe on Pascal just south of University Ave. Lift Station Pumps are located in MH 250, with the controller located in Vault 200.

See Stormwater Management Plan for detailed elevations and size information.

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MH 250 – Pitch Tank Lift Station Pumps

a) Two 700 gpm submersible pumps with 32 feet of lift will operate using the internal float system to provide rate controlled drainage of tank B. It is intended that they run as alternate, non-simultaneous mode. Low water and thermal protection systems are to be provided. The control cabinet for this MH is located in Vault 200 and provides electrical service to the Vault and SCADA interface for the Vault systems.

MH 251 – Roof Tank Lift Station Pumps

a) The pumps are 170 gpm submersible multistage centrifugal pumps that lift rain water from the Storage Tank to the precast vault and through the treatment skid at a pressure of 65 psi. The pumps are controlled by a pressure transducer, skid mounted controller, and VFD drive system to maintain design pressure. It is intended that they run as variable speed lead-lag operation.

b) The pumps are protected from low water level by a low-level float switch located in the Storage Tank. When the low-level float switch opens, pump start shall be prevented.

c) The control cabinet for this MH is located on the Treatment Skid in Vault 200, with power fed from the MH 250 control cabinet.

Vault 200

1) Water Connection Summary.

   a. Incoming:

      i. Two – 3 inch pumped rainwater connections from MH 251, each capable of a nominal 200 gpm.

      ii. One – 4 inch City Water connection, to serve a 2 inch meter capable of 160 gpm.

   b. Outgoing:

      i. One 2 inch domestic water connection for Great Lawn Event water supply, designed for 60 gpm@40 psi (City Pressure, bypasses treatment skid)

      ii. One 2 inch Irrigation connection for outlots, designed for 50 gpm@100 psi.

      iii. One 2 inch Irrigation connection for site irrigation, designed for 100 gpm@100 psi.

iv. One 2 inch pumped Sanitary connection, for filter backwash, air compressor and dehumidifier condensate, and any internal leakage, designed for 30 gpm@20 FT.

v. One 3 inch recirculation line to Tank A, designed for 100 gpm@20 psi (~40Ft).

vi. One 3 inch line to storm system, designed for 200 gpm@20 psi (~40 ft).

2) Electrical Connections.

a. 400A 208/3p/60, 4 wire from Great Lawn Electrical Service.

i. Within the vault, the control panel for MH 250 will provide service disconnect, house circuit breakers, and feeds to MH 250, MH 251, and the treatment skid. A subpanel on the treatment skid will provide electrical distribution and disconnecting means for the treatment skid and ozone system.

b. Outgoing Power and control to MH 250.

c. Outgoing Power and control to MH 251.

3) Low Voltage Connections.

a. Cat4 Telephone to stadium, for SCADA interconnection.

b. Cat 6 or fiber to stadium, for BACnet/building automation interface.

c. Storm Control (Opti-RTC) connections: float/level sensors in Tank A, rain sensor, cellular antenna.

d. Rainwater treatment skid (RMS) Float/level tree for MH 251

4) HVAC Connection/Operation.

a. 10 inch fresh air inlet with 300 cfm fan and 10 inch air outlet. Fan shall operate at a minimum of whenever the ozone system is operating and a maximum of 24/7 during the operating season.
b. 192 pint/day dehumidifier with integral humidistat. Unit shall automatically control humidity by turning on the unit during the operating season.
c. 5 KW washdown electric unit heater, design for nominal heating only. Integral thermostat shall provide freeze protection heating in shoulder season. The heater is not sized to maintain heated space in winter months.

5) Sequence of Operation.

a. General
    i. The purpose of the rain water harvesting system is to provide treated rain water under pressure to irrigation systems, while providing storm event rate control.
b. MH 251 Wet Well Transfer Pump(s) (see above) :
    i. 170 gpm at 65 psi as noted above controlled by pressure transmitter on the treatment skid.
    ii. City water back up: when the wet well level is at the low level and the pumps are inhibited, city water flow will be allowed.
c. Booster Pump System:
    i. This 100 gpm booster pump shall start and stop based on the factory mounted pressure transducer to maintain distribution system pressure of 100 psi. The pumps are controlled by an

onboard pressure transducer, controller, and VFD drive system to maintain design pressure.

d. Filtration System:
    i. Self-cleaning filters will us onboard differential pressure to initiate short partial flow backflushing mode as needed.
    ii. Bag filters have no moving parts, but are sized to allow maintenance of one filter while the other remains in service.
    iii. Carbon filters have no moving parts.
    iv. The system controller will monitor each filtration stage for excessive pressure drop and send a service indicator Alarm.
e. Disinfection Systems:
    i. UV treatment will be used on irrigation water to inactivate biological contamination. The units self-monitor UV dosage and will send alarms and status reports to the Treatment controller as necessary.
    ii. Ozone treatment will be used on recirculated flow to Tank A to improve stored water quality. The system consists of a standard air compressor, oxygen concentrator (which filters out excess nitrogen),an ozone producer, and a venturi mixer device. The piping and tank systems are intended to provide the required ozone dissipation. The Ozone producer will send alarm to the treatment controller as necessary.
f. Treatment skid water supply modes:

i. Normal operation: water is pumped from MH 251 through the filtration and UV treatment stages to the booster pump inlet. The MH 251 pumps will maintain 20 psi at the booster pump inlet. The booster pump will maintain 100 psi at its discharge ready for irrigation to occur.

ii. Normal operation with recirculation: water is pumped from MH 251 through the filtration and UV treatment stages to the booster pump inlet. A portion of the flow will be diverted back to Tank A through the ozone treatment system. The diverting valve will be positioned to allow a maximum of 100 gpm to be recirculated. The MH 251 pumps will maintain 20 psi at the booster pump inlet. The booster pump will maintain 100 psi at its discharge ready for irrigation to occur.

iii. Storm event operation: Upon a signal for the Optic RTC system, water is pumped from MH 251 through the mechanical filtration stages and diverted to the storm connection with a flow limited to 160 gpm. Further discussion with Opti-RTC may allow flow to the irrigation system during this mode as long as at least 160 gpm to being removed from Tank A.

g. Occupant Alarms:

i. Alarms for door access, high water level, ventilation status, atmospheric ozone, and other selected vault hazards will be provided either through the Treatment skid controller or the SCADA controller for MH 250.

6) Maintenance Procedures.

a. 5 micron and carbon filter elements should be changed at specified pressure drop.

b. UV lamps to be changed at system indicated end of life.

c. Air compressor and ozone treatment system to be maintained per the manufacturer's instructions.

d. Ozone has a life of 20 minutes, so service of ozone components or entry of Tank A, should be done after the ozone system has been shut down for at least 20 minutes.

7) Winterization Procedures.

a. Manually put the treatment system into storm drain mode.

b. Open the MH 251 low level inlet to allow full drainage of Tank A into MH 251. Pump out as much as possible.

c. Turn off power to MH 251 and the treatment skid.

d. Close water service curb valve.

e. Open the water meter, RPZ, filter and other low point drains.

f. Blow out the irrigation lines with compressed air.

g. Blow out the great lawn event water spigots with compressed air.

8) Emergency Procedures.

a. Shut off power at the electric service pedestal.

b. Ozone has a life of 20 minutes, so an ozone alarm call should be done after the ozone system has been shut down for at least 20 minutes.

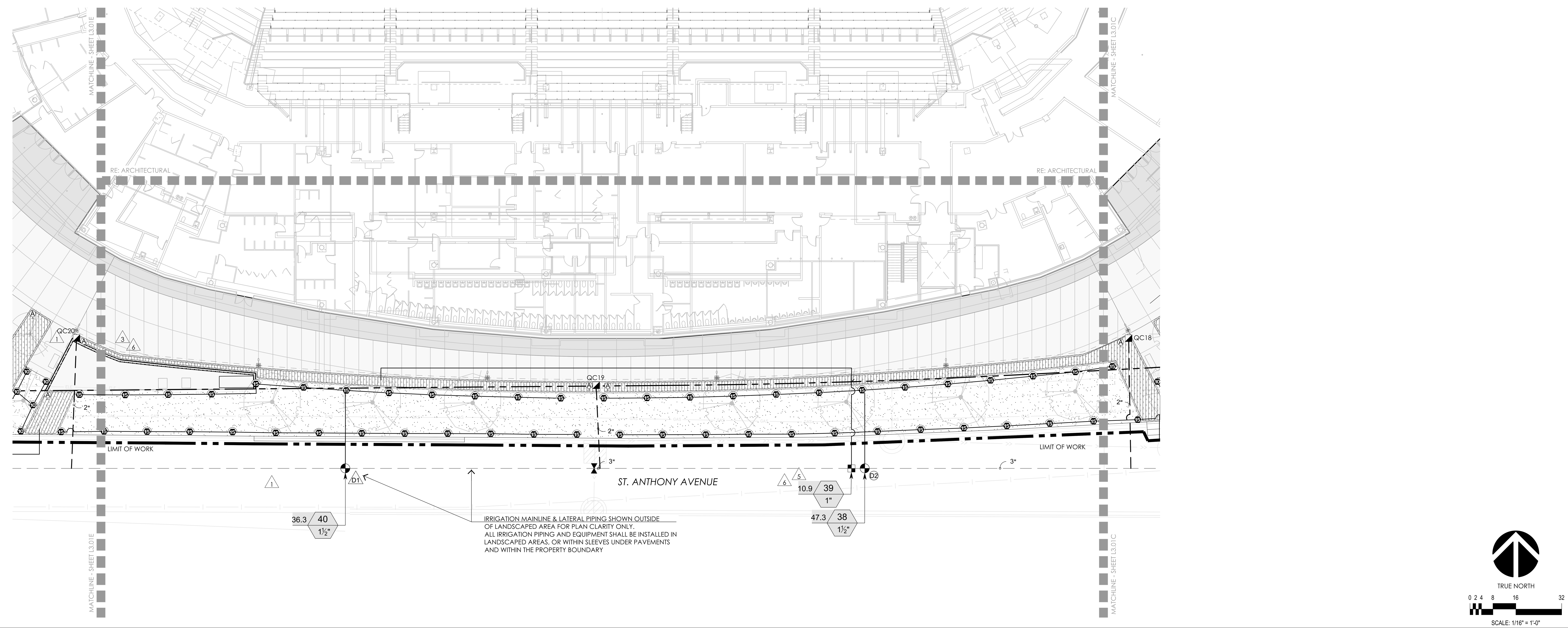
c. Follow City of St Paul procedures for confined space.

Appendix A: Water Use Matrix

MLS Stadium Rainwater System Matrix									
	Demand			Condition					Source
	Flow	Pressure		1	2	3	4	5	
Phase 1 Irrigation	30-100	100		X			X		Booster
Phase 2 Irrigation	50	30			X			X	Booster
Filter Backwash	30	20		X	X	X	X	X	MH 251
Opti-RTC drawdown (max)	>160	20				X	X	X	MH 251
Recirculation	100	30		X	X				MH 251
MH 251 flow requirement				230	180	190	190	190	
Booster Flow Requirement				100	50	0	100	50	
MH 251 Available F/P	240	60							
Booster Available F/P	105	100							

**Opti-RC flow can be lowered through irrigation flow as long as 160 gpm is removed from Tank A.

Appendix B: Irrigation Use Matrix



AREA D SITE IRRIGATION PLAN

1/16" = 1'-0"

VALVE SCHEDULE

NUMBER	MODEL	SIZE	TYPE	GPM	PSI	PSI @ POC	PRECIP
2	Toro DZK-EZF-1-MF	1"	Area for Dripline	7.44	35.69	38.25	0.85 in/h
4	Toro DZK-EZF-1-MF	1"	Area for Dripline	4.36	35.07	36.27	0.85 in/h
5	Toro 220G-27-06E	1-1/2"	Turf Rotor	24.53	51.75	52.72	0.43 in/h
6	Toro 220G-27-06E	2"	Turf Rotor	54.45	49.85	50.82	0.36 in/h
9	Toro 220G-27-06E	1-1/2"	Turf Rotor	24.53	52.77	54.89	0.43 in/h
10	Toro DZK-EZF-1-MF	1"	Area for Dripline	13.59	38.11	40.18	0.85 in/h
12	Toro 220G-27-06E	1"	Turf Spray	14.34	31.87	34.89	1.11 in/h
13	Toro 220G-27-06E	1-1/2"	Turf Spray	34.18	35.32	38.22	1.34 in/h
14	Toro 220G-27-06E	1"	Turf Spray	16.99	32.18	35.21	1.28 in/h
15	Toro DZK-EZF-1-MF	1"	Area for Dripline	18.98	45.37	50.39	0.85 in/h
18	Toro 220G-27-06E	1-1/2"	Turf Spray	29.74	35.75	41.52	1.13 in/h
20	Toro 220G-27-06E	1-1/2"	Turf Spray	37.00	35.91	41.72	1.13 in/h
23	Toro 220G-27-06E	1-1/2"	Turf Spray	18.76	34.64	41.75	1.20 in/h
24	Toro 220G-27-06E	1-1/2"	Turf Spray	15.26	34.68	42.49	1.19 in/h
25	Toro 220G-27-06E	1-1/2"	Turf Spray	26.00	35.64	43.46	1.15 in/h
26	Toro 220G-27-06E	1-1/2"	Turf Spray	19.12	34.22	42.80	1.33 in/h
27	Toro 220G-27-06E	1"	Turf Spray	26.40	35.05	45.21	1.07 in/h
28	Toro DZK-EZF-1-MF	1"	Area for Dripline	7.44	35.06	45.19	0.85 in/h
30	Toro 220G-27-06E	1-1/2"	Turf Rotor	18.43	49.61	59	0.65 in/h
31	Toro 220G-27-06E	1-1/2"	Turf Spray	23.61	38.89	48.25	1.06 in/h
32	Toro 220G-27-06E	1-1/2"	Turf Rotor	19.89	49.72	59.06	0.63 in/h
33	Toro DZK-EZF-1-MF	1"	Area for Dripline	13.96	37.45	46.85	0.85 in/h
35	Toro DZK-EZF-1-MF	1"	Area for Dripline	17.74	41.68	51.87	0.85 in/h
36	Toro DZK-EZF-1-MF	1"	Area for Dripline	18.65	41.88	51.74	0.85 in/h
38	Toro 220G-27-06E	1-1/2"	Turf Spray	47.25	37.54	47.73	1.06 in/h
39	Toro DZK-EZF-1-MF	1"	Area for Dripline	10.95	36.76	46.97	0.85 in/h
40	Toro 220G-27-06E	1-1/2"	Turf Spray	36.25	35.32	45.58	1.08 in/h
42	Toro DZK-EZF-1-MF	1"	Area for Dripline	10.13	35.85	45.26	0.85 in/h
43	Toro 220G-27-06E	1-1/2"	Turf Spray	29.21	35.07	44.46	1.08 in/h
44	Toro DZK-EZF-1-MF	1"	Area for Dripline	19.19	42.55	50.68	0.85 in/h
47	Toro 220G-27-06E	1-1/2"	Turf Rotor	24.61	49.66	56.23	0.53 in/h
48	Toro 220G-27-06E	1-1/2"	Turf Rotor	48.91	51.60	59.30	0.53 in/h
49	Toro DZK-EZF-1-MF	1"	Area for Dripline	15.32	38.47	46.15	0.85 in/h
50	Toro DZK-EZF-1-MF	1"	Area for Dripline	12.74	36.42	42.82	0.85 in/h
51	Toro DZK-EZF-1-MF	1"	Area for Dripline	18.08	42.13	48.49	0.85 in/h
55	Toro DZK-EZF-1-MF	1"	Area for Dripline	17.04	42.37	47.01	0.85 in/h
56	Toro DZK-EZF-1-MF	1"	Area for Dripline	16.49	40.34	49.71	0.85 in/h
57	Toro 220G-27-06E	1"	Turf Spray	15.41	32.92	41.45	0.91 in/h
58	Toro 220G-27-06E	1"	Turf Rotor	23.47	49.84	58.39	0.60 in/h

CRITICAL ANALYSIS

Generated:	2018-06-07 13:54
P.O.C. NUMBER: 01	
Water Source Information:	Non-Potable Irrigation
Pump Station w/ Automatic Change Over Valve Provided by Others	
FLOW AVAILABLE	
Point of Connection Size:	2-1/2"
Flow Available:	112.10 gpm
PRESSURE AVAILABLE	
Static Pressure at POC:	100.00 psi
Pressure Available:	100.00 psi
DESIGN ANALYSIS	
Maximum Multi-valve Flow:	110.00 gpm
Flow Available at POC:	112.10 gpm
Residual Flow Available:	2.10 gpm
Critical Station:	48
Design Pressure:	45.00 psi
Friction Loss:	1.58 psi
Fittings Loss:	0.16 psi
Elevation Loss:	0.00 psi
Loss through Valve:	4.87 psi
Pressure Req. at Critical Station:	51.60 psi
Loss for Fittings:	0.70 psi
Loss for Main Line:	6.99 psi
Loss for POC to Valve Elevation:	0.00 psi
Loss for Backflow:	0.00 psi
Critical Station Pressure at POC:	59.29 psi
Pressure Available:	100.00 psi
Residual Pressure Available:	40.71 psi

LATERAL LINE SIZING CHART

GPM	PIPE SIZE
0-15	1"
16-30	1 1/2"
31-50	2"
51-75	2 1/2"
76-100	3"
101-190	4"
190+	6"

WATERING SCHEDULE

NUMBER	MODEL	TYPE	PRECIP	SUN	MON	TUE	WED	THU	FRI	SAT	IN./WEEK	MIN./WEEK	GAL./WEEK	GAL./DAY
2	Toro DZK-EZF-1-MF	Area for Dripline	0.85 in/h	9 min	9 min	9 min	9 min	9 min	9 min	9 min	0.86	61	453.9	64.8
4	Toro DZK-EZF-1-MF	Area for Dripline	0.85 in/h	9 min	9 min	9 min	9 min	9 min	9 min	9 min	0.86	61	265.7	38.0
5	Toro 220G-27-06E	Turf Rotor	0.43 in/h	30 min	30 min	30 min	30 min	30 min	30 min	30 min	1.50	210	5,151	735.9
6	Toro 220G-27-06E	Turf Rotor	0.36 in/h	36 min	36 min	36 min	36 min	36 min	36 min	36 min	1.50	252	13,721	1,960
9	Toro 220G-27-06E	Turf Rotor	0.43 in/h	31 min	31 min	31 min	31 min	31 min	31 min	31 min	1.50	211	5,176	739.4
10	Toro DZK-EZF-1-MF	Area for Dripline	0.85 in/h	9 min	9 min	9 min	9 min	9 min	9 min	9 min	0.86	61	829.2	118.5
12	Toro 220G-27-06E	Turf Spray	1.11 in/h	12 min	12 min	12 min	12 min	12 min	12 min	12 min	1.50	81	1,162	165.9
13	Toro 220G-27-06E	Turf Spray	1.34 in/h	10 min	10 min	10 min	10 min	10 min	10 min	10 min	1.50	67	2,290	327.2
14	Toro 220G-27-06E	Turf Spray	1.28 in/h	11 min	11 min	11 min	11 min	11 min	11 min	11 min	1.50	71	1,206	172.3
15	Toro DZK-EZF-1-MF	Area for Dripline	0.85 in/h	9 min	9 min	9 min	9 min	9 min	9 min	9 min	0.86	61	1,158	165.4
18	Toro 220G-27-06E	Turf Spray	1.13 in/h	12 min	12 min	12 min	12 min	12 min	12 min	12 min	1.50	80	2,379	339.9
20	Toro 220G-27-06E	Turf Spray	1.13 in/h	12 min	12 min	12 min	12 min	12 min	12 min	12 min	1.50	80	2,960	422.9
23	Toro 220G-27-06E	Turf Spray	1.20 in/h	11 min	11 min	11 min	11 min	11 min	11 min	11 min	1.50	76	1,426	203.7
24	Toro 220G-27-06E	Turf Spray	1.19 in/h	11 min	11 min	11 min	11 min	11 min	11 min	11 min	1.50	76	1,160	165.7
25	Toro 220G-27-06E	Turf Spray	1.15 in/h	12 min	12 min	12 min	12 min	12 min	12 min	12 min	1.50	79	2,054	293.4
26	Toro 220G-27-06E	Turf Spray	1.33 in/h	10 min	10 min	10 min	10 min	10 min	10 min	10 min	1.50	68	1,300	185.7
27	Toro 220G-27-06E	Turf Spray	1.07 in/h	12 min	12 min	12 min	12 min	12 min	12 min	12 min	1.50	84	2,218	316.8
28	Toro DZK-EZF-1-MF	Area for Dripline	0.85 in/h	9 min	9 min	9 min	9 min	9 min	9 min	9 min	0.86	61	454.1	64.9
30	Toro 220G-27-06E	Turf Rotor	0.65 in/h	20 min	20 min	20 min	20 min	20 min	20 min	20 min	1.50	139	2,562	366.0
31	Toro 220G-27-06E	Turf Spray	1.06 in/h	13 min	13 min	13 min	13 min	13 min	13 min	13 min	1.50	86	2,030	290.1
32	Toro 220G-27-06E	Turf Rotor	0.63 in/h	21 min	21 min	21 min	21 min	21 min	21 min	21 min	1.50	142	2,824	403.5
33	Toro DZK-EZF-1-MF	Area for Dripline	0.85 in/h	9 min	9 min	9 min	9 min	9 min	9 min	9 min	0.86	61	851.5	121.6
35	Toro DZK-EZF-1-MF	Area for Dripline	0.85 in/h	9 min	9 min	9 min	9 min	9 min	9 min	9 min	0.86	61	1,082	154.6
36	Toro DZK-EZF-1-MF	Area for Dripline	0.85 in/h	9 min	9 min	9 min	9 min	9 min	9 min	9 min	0.86	61	1,138	162.6
38	Toro 220G-27-06E	Turf Spray	1.06 in/h	13 min	13 min	13 min	13 min	13 min	13 min	13 min	1.50	85	4,016	573.8
39	Toro DZK-EZF-1-MF	Area for Dripline	0.85 in/h	9 min	9 min	9 min	9 min	9 min	9 min	9 min	0.86	61	667.7	95.4
40	Toro 220G-27-06E	Turf Spray	1.08 in/h	12 min	12 min	12 min	12 min	12 min	12 min	12 min	1.50	84	3,045	435
42	Toro DZK-EZF-1-MF	Area for Dripline	0.85 in/h	9 min	9 min	9 min	9 min	9 min	9 min	9 min	0.86	61	617.7	88.2
43	Toro 220G-27-06E	Turf Spray	1.08 in/h	12 min	12 min	12 min	12 min	12 min	12 min	12 min	1.50	84	2,454	350.5
44	Toro DZK-EZF-1-MF	Area for Dripline	0.85 in/h	9 min	9 min	9 min	9 min	9 min	9 min	9 min	0.86	61	1,171	167.3
47	Toro 220G-27-06E	Turf Rotor	0.53 in/h	25 min	25 min	25 min	25 min	25 min	25 min	25 min	1.50	170	4,184	597.7
48	Toro 220G-27-06E	Turf Rotor	0.53 in/h	25 min	25 min	25 min	25 min	25 min	25 min	25 min	1.50	169	8,266	1,181
49	Toro DZK-EZF-1-MF	Area for Dripline	0.85 in/h	9 min	9 min	9 min	9 min	9 min	9 min	9 min	0.86	61	934.3	133.5
50	Toro DZK-EZF-1-MF	Area for Dripline	0.85 in/h	9 min	9 min	9 min	9 min	9 min	9 min	9 min	0.86	61	777.3	111.0
51	Toro DZK-EZF-1-MF	Area for Dripline	0.85 in/h	9 min	9 min	9 min	9 min	9 min	9 min	9 min	0.86	61	1,103	157.6
55	Toro DZK-EZF-1-MF	Area for Dripline	0.85 in/h	9 min	9 min	9 min	9 min	9 min	9 min	9 min	0.86	61	1,039	148.5
56	Toro DZK-EZF-1-MF	Area for Dripline	0.85 in/h	9 min	9 min	9 min	9 min	9 min	9 min	9 min	0.86	61	1,006	143.7
57	Toro 220G-27-06E	Turf Spray	0.91 in/h	15 min	15 min	15 min	15 min	15 min	15 min	15 min	1.50	100	1,541	220.1
58	Toro 220G-27-06E	Turf Rotor	0.60 in/h	22 min	22 min	22 min	22 min	22 min	22 min	22 min	1.50	150	3,521	502.9
		TOTALS:		532	532	532	532	532	532	532		3,620	90,194	12,885

TOTAL DRIP ZONE RUN TIME PER DAY: 45 MINUTES

9 min. / 9 min. / 9 min. / 9 min. / 9 min.

31 MIN / 36 MIN. / 12 MIN / 12 MIN / 12 MIN / 21 MIN / 13 MIN / 25 MIN / 15 MIN

TOTAL TURF ZONE RUN TIME PER DAY: 177 MINUTES (1 HR 57 MIN)

TOTAL RUN TIME PER DAY: 222 MINUTES (3 HR 42 MIN)

BASIS OF WATERING SCHEDULE

PEAK MONTH:	JULY
ETo VALUE:	6.80 INCHES PER MONTH
RAINFALL:	3.35 INCHES PER MONTH
DIFFERENCE:	3.45 INCHES PER MONTH
	0.86 INCHES PER WEEK

DATA TAKEN FROM EPA WATERSENSE WATER BUDGET FINDER (www.epa.gov/watersense/water-budget-data-finder)

SYSTEM IS SIZED AS TO ALLOW FOR THE OPERATION OF THE LARGEST 2 ZONES (GPM), AT ONCE.

LEGEND

- LANDSCAPE AREA RE: LANDSCAPE PLANS
- STANDARD CONCRETE PAVEMENT RE: CIVIL PLANS FOR PROFILE
- INTEGRALLY COLORED STANDARD CONCRETE PAVEMENT
- POROUS PAVE
- CRUSHED LIMESTONE FINES
- CONCRETE CURB & GUTTER PER CIVIL PLANS
- LIMIT OF WORK

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816-701-2100

MEP/FP ENGINEER
ME ENGINEERS
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GOLDEN, COLORADO 80401
303-421-6655

AUDIO/VISUAL
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DALLAS, TX 75244
972-590-7530

CIVIL ENGINEER
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7200 HEMLOCK LANE, SUITE 300
MAPLE GROVE, MN 55369
763-424-5505

LIFE SAFETY
HOWE ENGINEERS, INC.
101 LONGWATER CIRCLE, SUITE 203
NORWELL, MA 02061
781-878-3500

FOOD SERVICE
S2O CONSULTANTS, INC.
13 WINDING BRANCH RD
HAWTHORN WOODS, IL 60047
224-717-1555

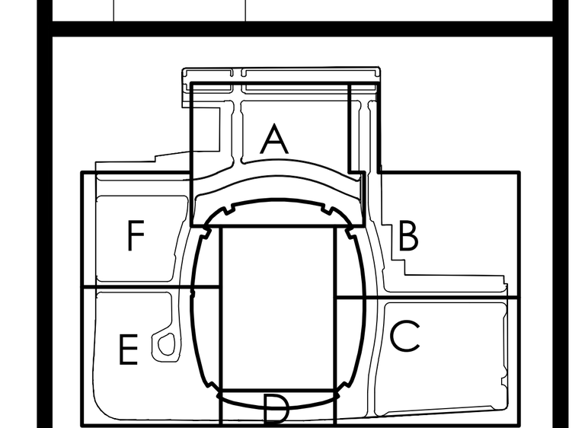
MINNESOTA MLS STADIUM
SAINT PAUL, MINNESOTA

BID PACKAGE #4 - CONSTRUCTION DOCUMENTS

JUNE 30, 2017

REVISIONS

NO.	DATE	DESCRIPTION
1	08.02.17	BP4 - ADDENDUM #3
2	11.03.17	ORDINANCE PACKAGE
2	12.07.17	DRAFT ASI 12
3	01.19.18	DRAFT ASI 12.4
4	02.09.18	DRAFT ASI 12.6
5	03.19.18	DRAFT ASI 12.7
	04.20.18	ASI 12.8
6	05.15.18	ASI 36
7	06.06.18	ASI 12.9
8	08.02.18	ASI 50
9	08.06.18	ASI 12.10



PROJECT NO. 15.4157
ISSUED BY: POPULOUS
ISSUED DATE: 06/30/17

SHEET TITLE:
AREA D SITE IRRIGATION PLAN

L3.01D

12/19/2016 3:46:23 PM

Block A
1.84 Ac
1.47 Ac roof to Reuse
5.68 CFS 10-YR roof
Additional 0.11 Ac. Imp
Irrig. 0.25 Ac.

DRIPLINE
3 EQ. ZONES @ 17 MIN RUNTIME/DAY
17 MIN X 3 ZONES = 51 MIN/DAY
275.7 GAL/DAY/ZONE = 827.1 GAL/DAY
850 GAL DAY TANK = 17 MIN TO FILL

Future Park
0.93 Ac
Irrig. 0.83 Ac

DRIPLINE
1 ZONE @ 17 MIN RUNTIME/DAY
264.7 GAL/DAY
300 GAL DAY TANK = 6 MIN TO FILL

Block D1
0.73 Ac
0.2 Ac to Reuse
0.64 CFS 10-YR
Add. .14 Ac. Imp
Irrig. 0.08

Block E
1.89 Ac
1.51 Ac roof to Reuse System
5.91 CFS 10-YR roof
Add. 0.12 Ac. Imp.
Irrig. 0.24 Ac.

DRIPLINE
3 EQ. ZONES @ 17 MIN RUNTIME/DAY
17 MIN X 3 ZONES = 51 MIN/DAY
176.13 GAL/DAY/ZONE = 528.4 GAL/DAY
550 GAL DAY TANK = 11 MIN. TO FILL

TURF ROTORS
7 EQ. ZONES @ 19 MIN RUNTIME/DAY
19 MIN X 7 ZONES = 133 MIN/DAY
693.34 GAL/DAY/ZONE = 4853.4 GAL/DAY
5000 GAL DAY TANK = 100 MIN TO FILL

Block B
1.70 Ac
1.36 Ac to Reuse System
5.26 CFS 10-YR roof
Additional 0.09 Ac. Imp.
Irrig. 0.23 Ac.

DRIPLINE
3 EQ. ZONES @ 17 MIN RUNTIME/DAY
17 MIN X 3 ZONES = 51 MIN/DAY
253.63 GAL/DAY/ZONE = 760.9 GAL/DAY
800 GALLON TANK = 16 MIN TO FILL

Block D2
0.58 Ac
0.2 Ac to Reuse
0.64 CFS 10-YR
Add. .14 Ac. Imp
Irrig. 0.05 Ac

DRIPLINE
1 ZONE @ 17 MIN RUNTIME/DAY
165.4 GAL/DAY
200 GAL DAY TANK = 4 MIN TO FILL

Block F
2.10 Ac
1.68 Ac roof to Reuse System
6.79 CFS 10-YR roof
Add. 0.13 Ac. Imp.
Irrig. 0.27 Ac.

DRIPLINE
3 EQ. ZONES @ 17 MIN RUNTIME/DAY
17 MIN X 3 ZONES = 51 MIN/DAY
297.73 GAL/DAY/ZONE = 893.2 GAL/DAY
1000 GAL DAY TANK = 20 MIN. TO FILL

Block C1
1.10 Ac
0.88 to Reuse System
3.09 CFS 10-YR
Add. .05 Ac. Imp.
Irrig. 0.15 Ac.

DRIPLINE
2 EQ. ZONES @ 17 MIN RUNTIME/DAY
34 MIN./DAY RUNTIME
248.1 GAL/DAY/ZONE = 496.2 GAL/DAY
500 GALLON TANK = 10 MIN TO FILL

MAJOR LEAGUE SOCCER STADIUM
233.9 - CONCOURSE
215.07 - PITCH
217.07 - SERVICE LEVEL
218.07/214.07 - LOADING DOCK

Block G
1.81 Ac
1.44 Ac roof to Reuse System
5.52 CFS 10-YR roof
Additional .08 Ac. Imp.
Irrig. 0.24 Ac.

DRIPLINE
3 EQ. ZONES @ 17 MIN RUNTIME/DAY
17 MIN X 3 ZONES = 51 MIN/DAY
264.67 GAL/DAY/ZONE = 794.0 GAL/DAY
800 GAL DAY TANK = 16 MIN TO FILL

Block C2
0.77 Ac
0.62 Ac to Reuse System
2.39CFS 10-YR
Add. .06 Ac. Imp
Irrig. 0.09 Ac

DRIPLINE
1 ZONE @ 17 MIN RUNTIME/DAY
297.7 GAL/DAY
300 GALLON TANK = 6 MIN TO FILL

Block H
1.12 Ac
0.0 Ac to Reuse System
Irrig. 0.15 Ac.

DRIPLINE
2 EQ. ZONES @ 17 MIN RUNTIME/DAY
17 MIN X 2 ZONES = 34 MIN/DAY
247.8 GAL/DAY/ZONE = 495.6 GAL/DAY
500 GAL DAY TANK = 10 MIN TO FILL

0.25 Ac. OF FUTURE IRRIGATION TO TAKE PLACE IN FUTURE ROW.

ASSUMPTIONS:

DRIPLINE
0.6 GPH @ 18" O.C.
0.85"/WEEK
EQUAL ZONES OF < 20 GPM

TURF AREAS
TURF ROTORS @ 50' O.C.
1.5"/WEEK
EQUAL ZONES OF < 50 GPM

DAYTANK FILL RATE = 50 GPM
TOTAL FILL TIME = 216 MIN

BENCHMARK

TOP NUT OF FIRE HYDRANT 370 FEET SOUTH OF THE INTERSECTION OF UNIVERSITY AVENUE AND SNELLING AVENUE ON THE EAST SIDE OF SNELLING
TNH ELEVATION = 228.15
ELEVATIONS SHOWN ARE BASED ON CITY OF ST PAUL DATUM.
CONVERSION FACTOR TO 1929 NGVD, ADD 694.10.

N
0 45 90
SCALE IN FEET

POPULOUS

POPULOUS
Architecture, Planning, Interiors, Programming
4800 Main Street, Suite 300
Kansas City, Missouri 64112
816-221-1500

STRUCTURAL ENGINEER
WALTER P. MOORE
920 MAIN STREET, TENTH FLOOR
KANSAS CITY, MO 64105
816-701-2100

MEP/FP ENGINEER
ME ENGINEERS
14143 DENVER WEST PKWY, SUITE 300
GOLDEN, COLORADO 80401
303-421-6655

AUDIOVISUAL
WJHW, INC.
4801 SPRING VALLEY RD. STE #113
DALLAS, TX 75244
972-590-7530

CIVIL ENGINEER
LOUCKS, INC.
7200 HEMLOCK LANE, SUITE 300
MAPLE GROVE, MN 55369
763-424-5505

LIFE SAFETY
HOWE ENGINEERS, INC.
101 LONGWATER CIRCLE, SUITE 203
NORWELL, MA 02061
781-878-3500

FOOD SERVICE
S2O CONSULTANTS, INC.
13 WINDING BRANCH RD
HAWTHORN WOODS, IL 60047
224-717-1555

LOUCKS
PLANNING
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LANDSCAPE ARCHITECTURE
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MINNESOTA MLS STADIUM
SAINT PAUL, MINNESOTA

RFI 0650

May 17, 2018

REVISIONS

NO.	DATE	DESCRIPTION
1	N/A	CONTACT CIVIL FOR 1-41
42	01-25-18	ASI 12.2
43	01-23-18	ASI 12.5
44	02-05-18	City Comment Tank D
45	02-09-18	DRAFT ASI 12.6
46	03-12-18	MNDOT Permit
47	03-13-18	City Comments
48	03-19-18	ASI 12.7
49	04-20-18	ASI 12.8
50	05-01-18	RFI 619
51	05-11-18	RFI 642
52	05-15-18	ASI 36
53	05-17-18	RFI 0650

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Jeffrey A. Shopek - PE
License No. 19624
05-17-18

Loucks Project No.	16028A
Project Lead	JAS
Drawn By	TRG
Checked By	JAS
Review Date	05-17-18

PROJECT NO. 16028A
ISSUED BY: POPULOUS
ISSUED DATE: 05-17-18

SHEET TITLE: FUTURE LOT STORMWATER REUSE ASSUMPTIONS

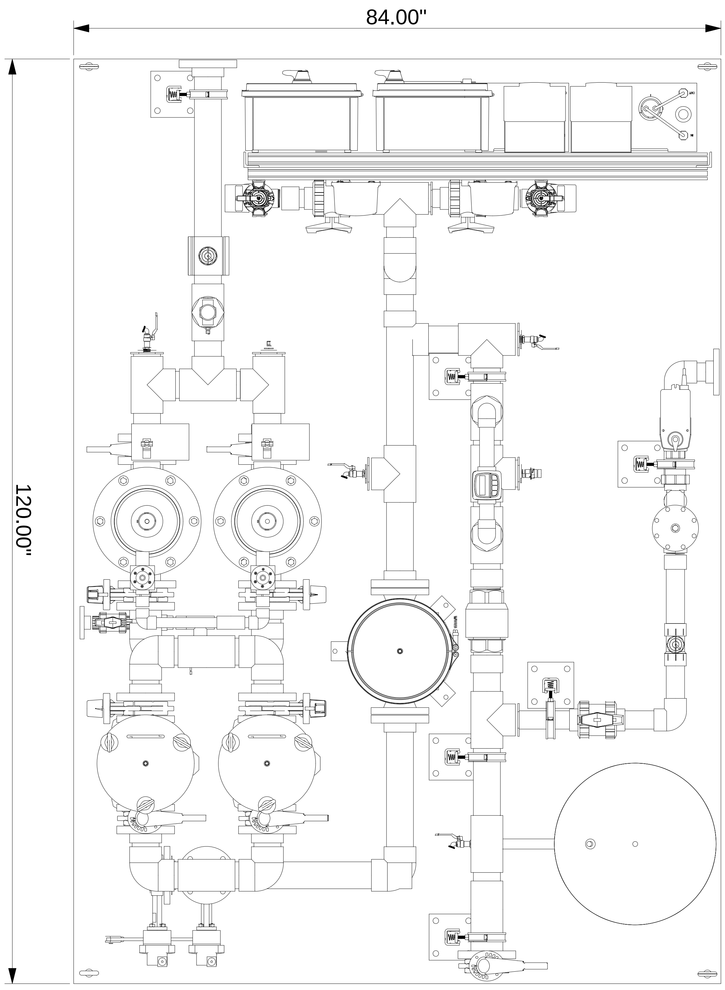
DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET
EXHIBIT

SUMMARY OF TOTAL PUMP OPERATION:
(ASSUMES ALL FUNCTIONS OPERATE INDIVIDUALLY)

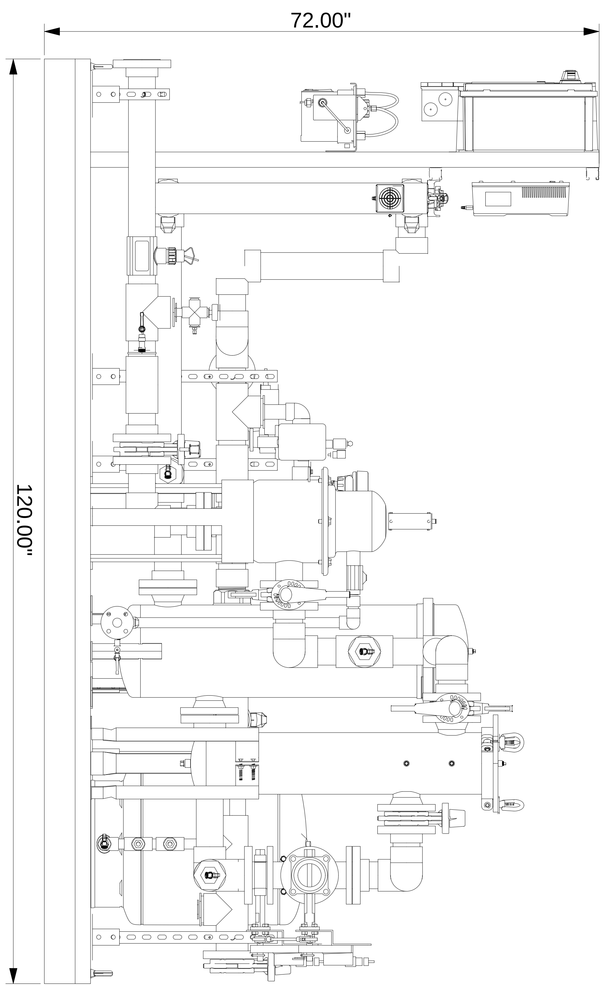
STADIUM RUN TIME: 222 MIN PER DAY
TOTAL OUTLOT DAY TANK FILL TIME: 216 MIN
TOTAL PUMP OPERATION TIME: 438 MIN (7 HR 18 MIN)

Appendix C: Water Treatment Skid Shop Drawing

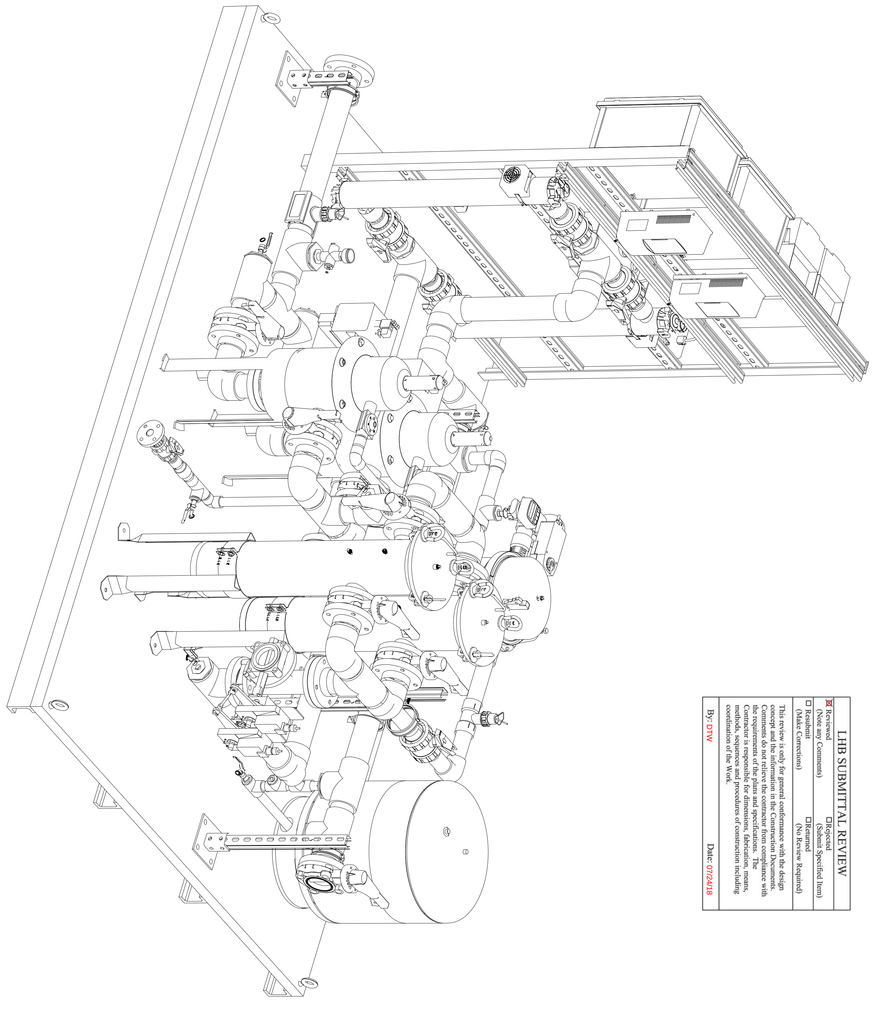
TOP VIEW



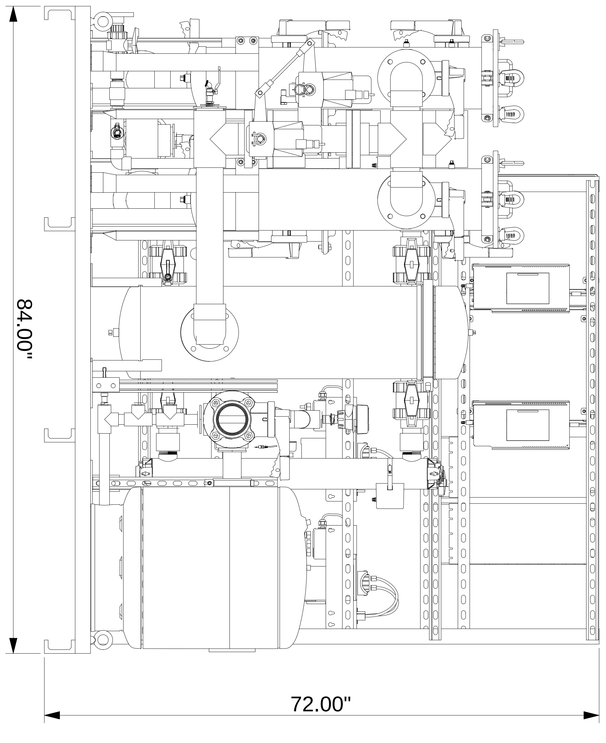
FRONT VIEW



ISO VIEW



RIGHT VIEW



LHB SUBMITTAL REVIEW

☒ Reviewed as Submitted (Note any Comments)
☐ Resubmit (Make Corrections)
☐ Reviewed as Submitted (Submit Specified Item)
☐ Returned (No Review Required)

This review is only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Comments do not relieve the contractor from compliance with the requirements of the plans and specifications. The contractor is responsible for the dimensions, quantities, methods, sequences and procedures of construction including coordination of the Work.

By: DTW
Date: 07/24/18

RMS

RAINWATER MANAGEMENT SOLUTIONS

MINNESOTA UNITED

RAINWATER FILTRATION, DOMESTIC BACK-UP, CONTROLS SKID

ALL GRADES & ELEVATIONS TO BE SITE VERIFIED PRIOR TO CONSTRUCTION

DRAWN BY: CR 7/16/2018
CHECKED BY: DS 7/16/2018

REV 2

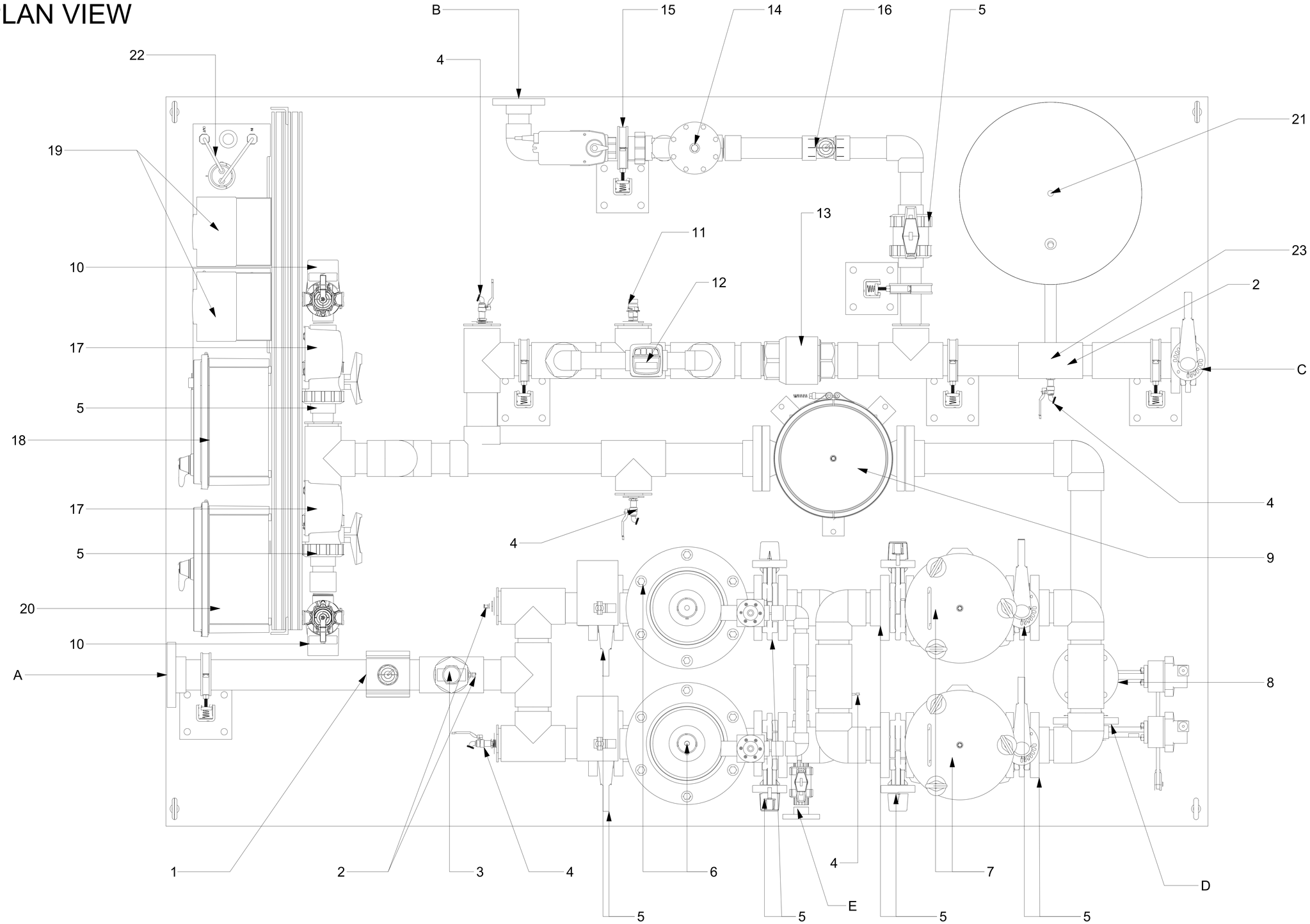
NOT TO SCALE

DRAWING FOR ILLUSTRATIVE PURPOSES ONLY. NOT FOR CONSTRUCTION.
DIMENSIONS AND LAYOUT SUBJECT TO CHANGE

RAINWATER MANAGEMENT SOLUTIONS, 1-866-653-8337
WWW.RAINWATERMANAGEMENT.COM

D001

PLAN VIEW



ITEM LIST

1. INLET FLOWMETER
2. TURBIDITY PORTS
3. PRESSURE GAUGE
4. SAMPLING PORT
5. ISOLATION VALVE
6. SELF-CLEANING FILTER
7. BAG FILTER
8. 3-WAY BUTTERFLY VALVE
9. CARBON CARTRIDGE FILTER
10. UV LIGHT WITH COMM CENTER
11. TEMPERATURE PROBE
12. PH PROBE
13. CHECK VALVE
14. DOMESTIC PRV (2")
15. MOTORIZED VALVE (2")
16. DOMESTIC FLOWMETER
17. UV POWER SUPPLY
18. RMS 200 CONTROLLER
19. VFD FOR SUBMERSIBLE PUMP
20. RMS SINGLE-POINT POWER SOURCE
21. PRESSURE TANK
22. TURBIDITY MONITOR
23. TRANSDUCERS FOR VFDS

(LOCATED AT PRESSURE TANK, NOT VISIBLE IN THIS VIEW)

CONNECTION SCHEDULE

A. 3" RAINWATER INLET
B. 2" DOMESTIC INLET
C. 3" COMBINED OUTLET TO IRRIGATION, OUTLOTS
D. 3" TO DRAIN, RECIRCULATION
E. 2" BACKWASH DRAIN LINE TO TANK

DRAWN BY: CR 7/16/2018
CHECKED BY: DS 7/16/2018

REV 2

NOT TO SCALE

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D002

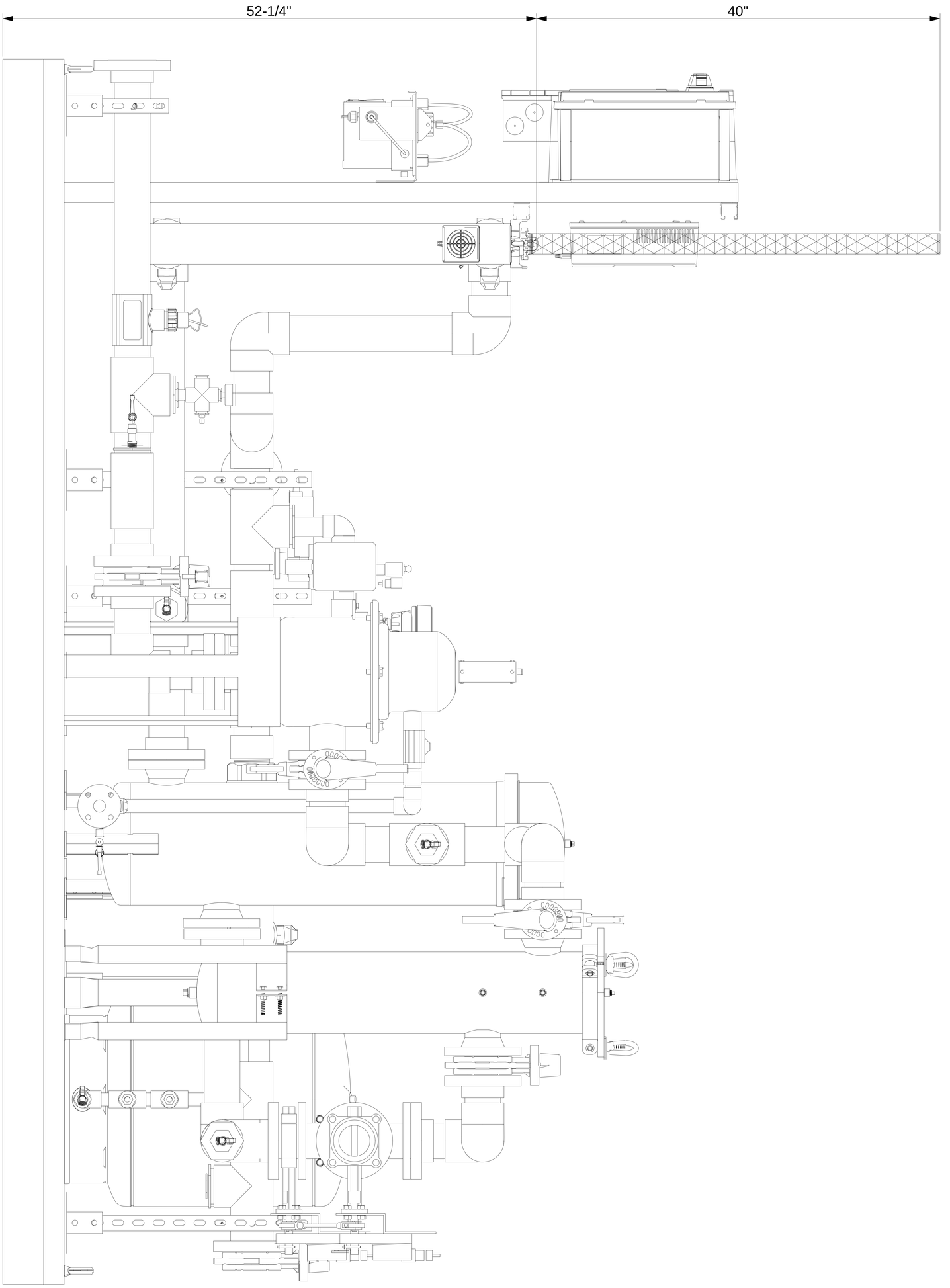
MINNESOTA UNITED

RAINWATER FILTRATION, DOMESTIC
BACK-UP, CONTROLS SKID

RMS

RAINWATER MANAGEMENT SOLUTIONS

TOP VIEW



NOTES:
- TO BE POWEDERCOATED
- TO BE PLUMBED IN SCH. 80 PVC
- 208V/3/60HZ REQUIRED INTO RMS SINGLE POINT POWER SOURCE
- SKID TO BE ACCESSIBLE FROM ALL SIDES
- CLEAR SPACE REQUIRED AS SHOWN FOR UV LIGHT BULB REMOVAL

RMS
RAINWATER MANAGEMENT SOLUTIONS

MINNESOTA UNITED
RAINWATER FILTRATION, DOMESTIC BACK-UP, CONTROLS SKID

ALL GRADES & ELEVATIONS TO BE SITE VERIFIED PRIOR TO CONSTRUCTION

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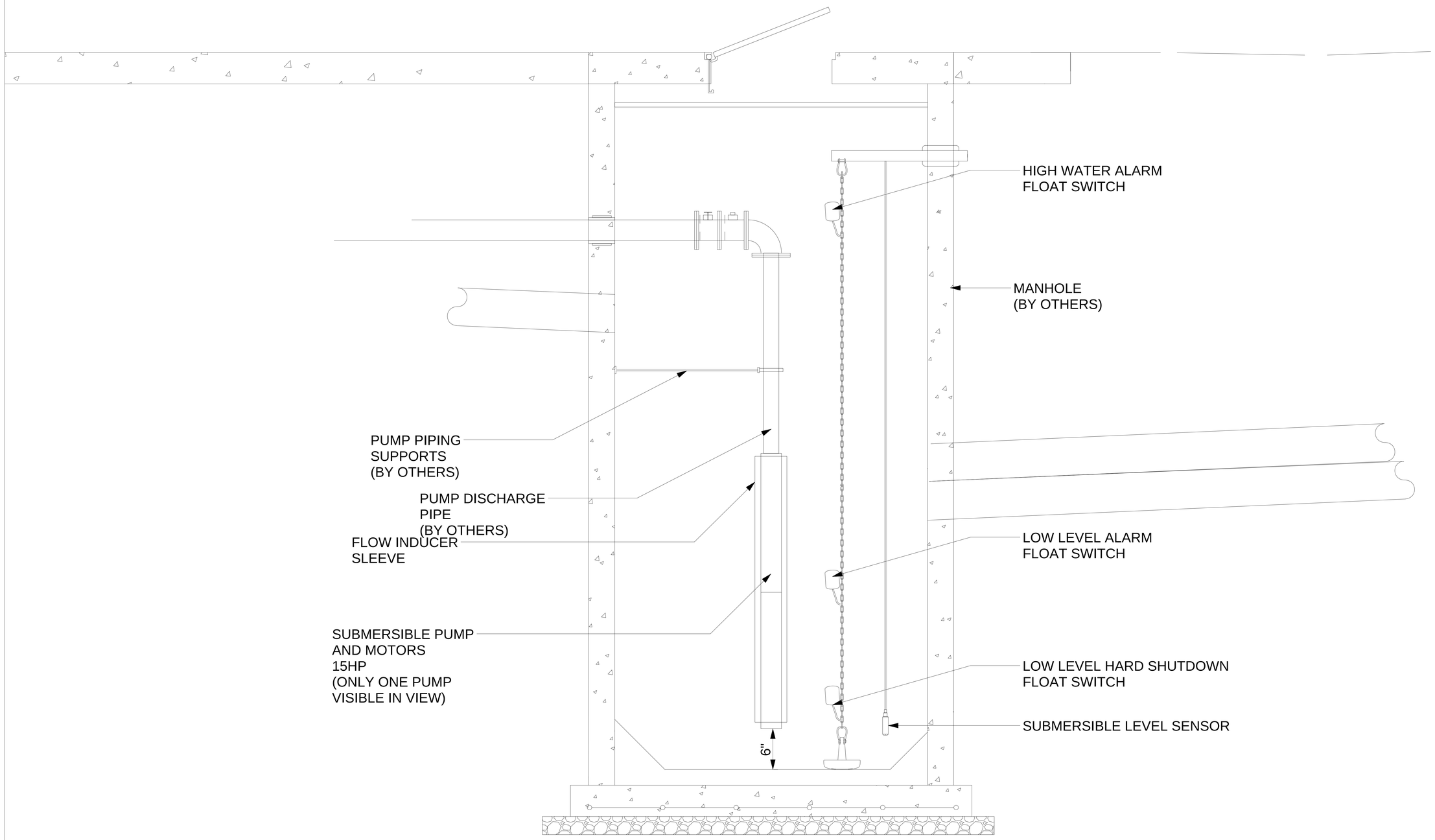
RAINWATER MANAGEMENT SOLUTIONS, 1-866-653-8337
WWW.RAINWATERMANAGEMENT.COM

D003

MANHOLE VIEW



NOTES:
- RMS TO PROVIDE PUMPS FLOW INDUCER SLEEVE
- PUMPS TO BE FIELD INSTALLED BY CONTRACTOR
- UNIONS AND ISOLATION VALVES RECOMMENDED

DRAWN BY: CR 7/18/2018
CHECKED BY: DS 7/18/2018

REV 2

NOT TO SCALE

ALL GRADES & ELEVATIONS TO BE SITE VERIFIED PRIOR TO CONSTRUCTION

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D004

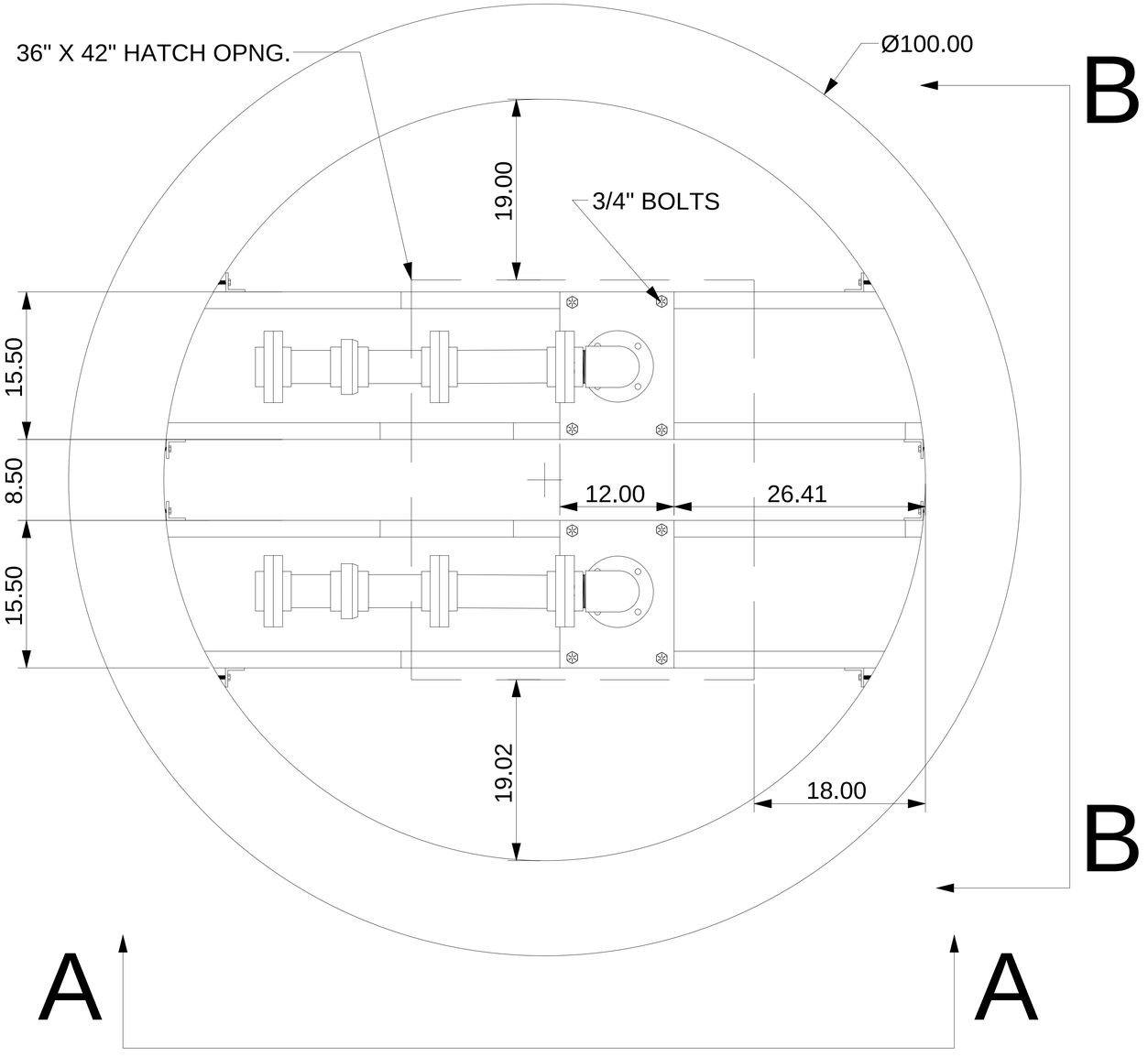
MINNESOTA UNITED

PUMPS IN MH251

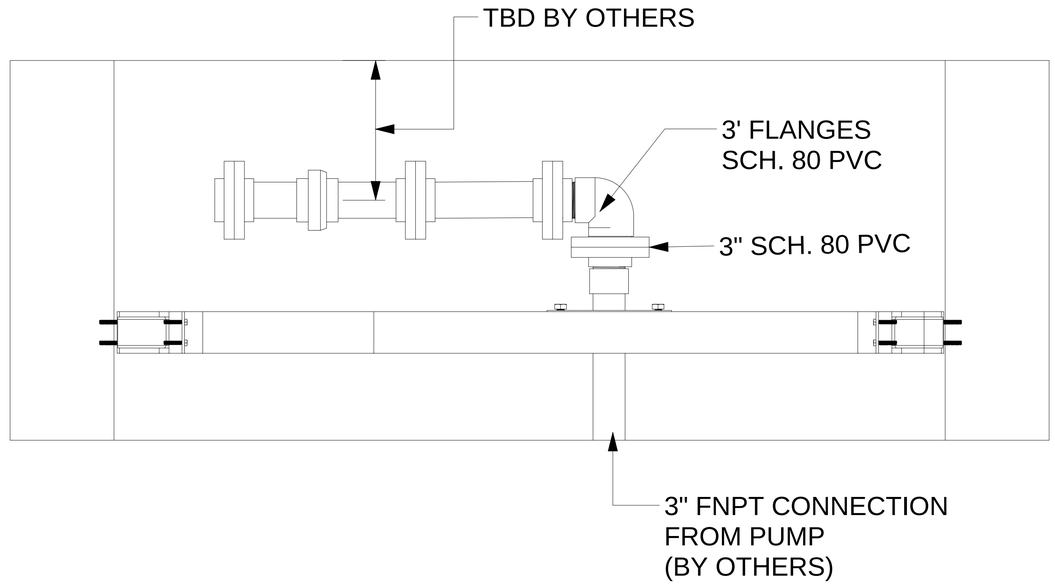
RMS

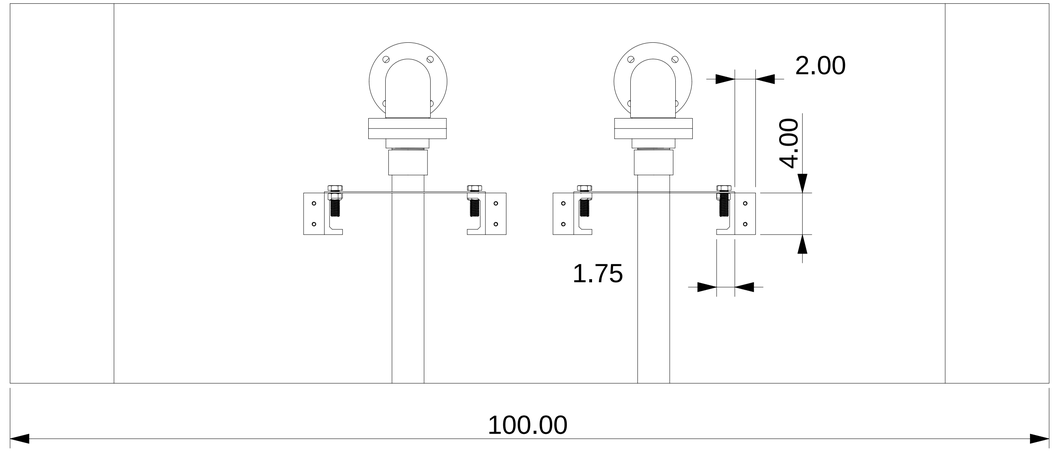
RAINWATER MANAGEMENT SOLUTIONS

TOP VIEW



VIEW A-A





VIEW B-B

RMS

RAINWATER MANAGEMENT SOLUTIONS

MINNESOTA UNITED

BRACKET DETAILS

DRAWN BY: JH 8/28/2018
CHECKED BY: DS 8/28/2018

REV

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DIMENSIONS AND LAYOUT SUBJECT TO CHANGE

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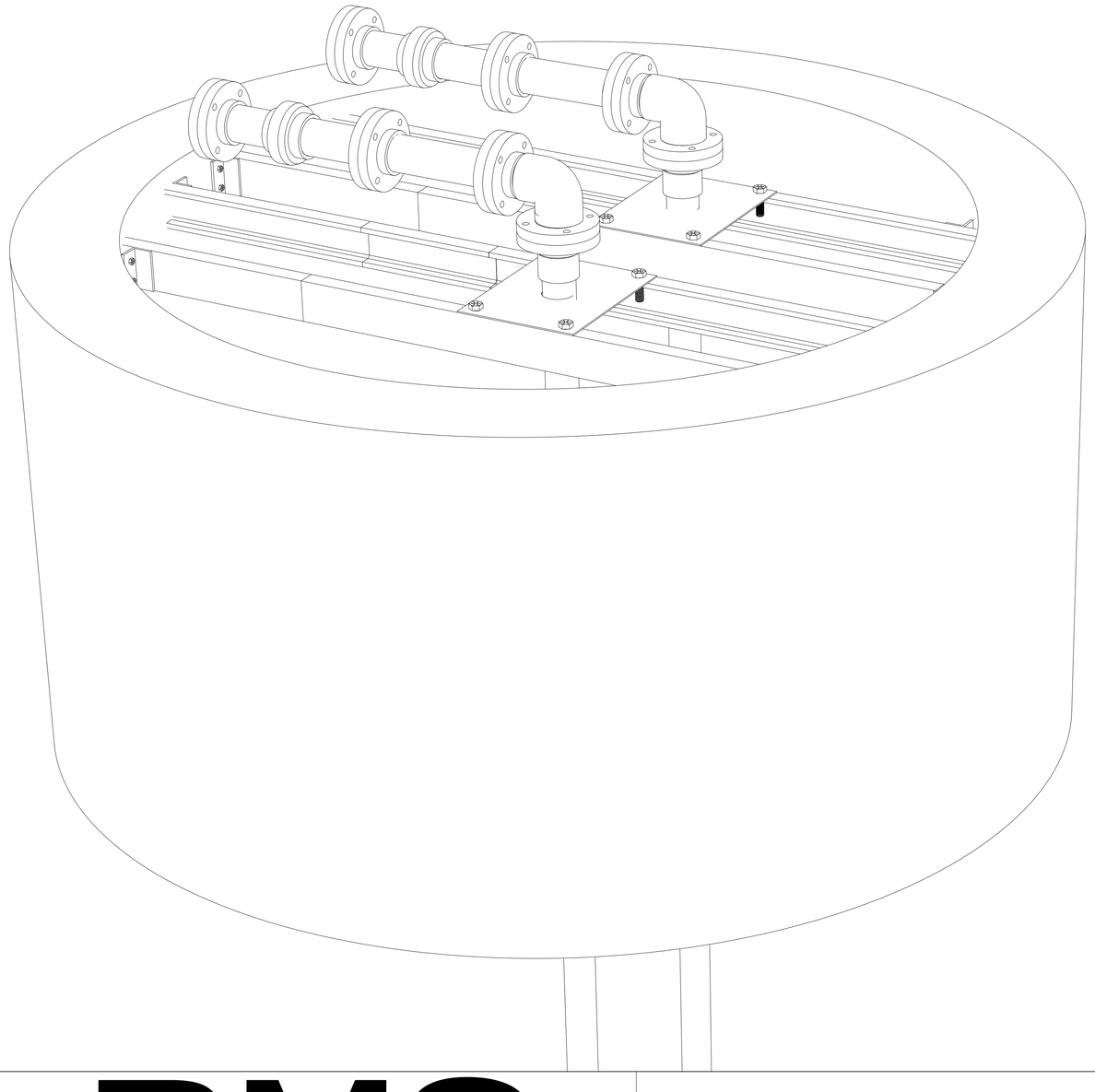
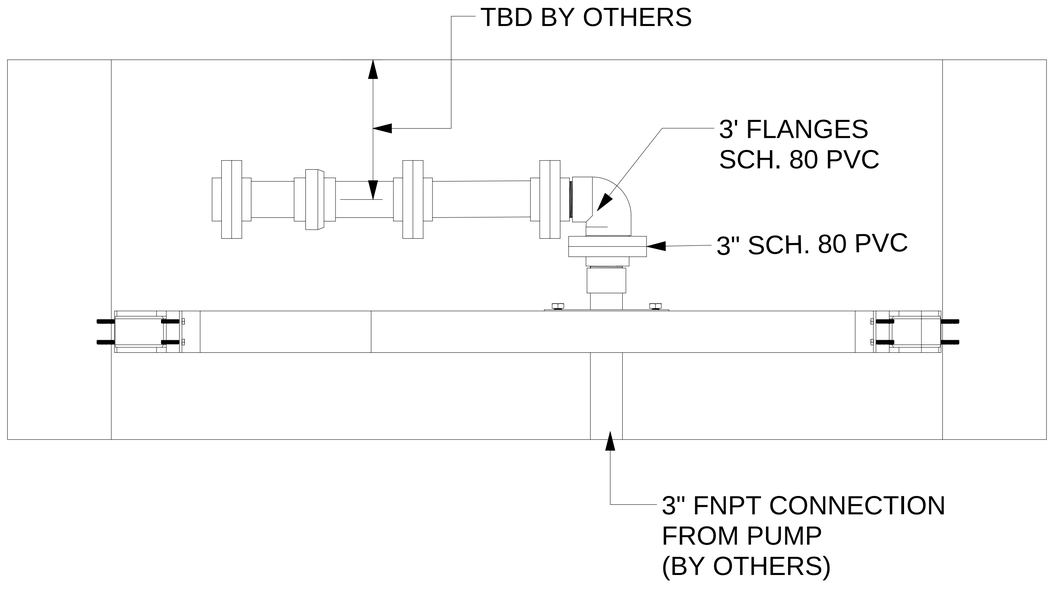
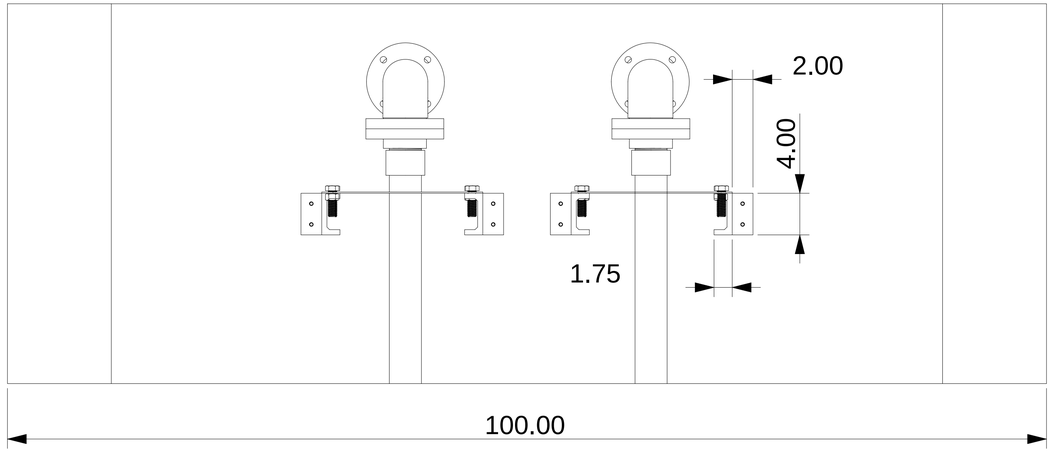
FRONT VIEW



SIDE VIEW





RMS

RAINWATER MANAGEMENT SOLUTIONS

MINNESOTA UNITED

BRACKET DETAILS

DRAWN BY: JH 8/28/2018
CHECKED BY: DS 8/28/2018

REV

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DIMENSIONS AND LAYOUT SUBJECT TO CHANGE

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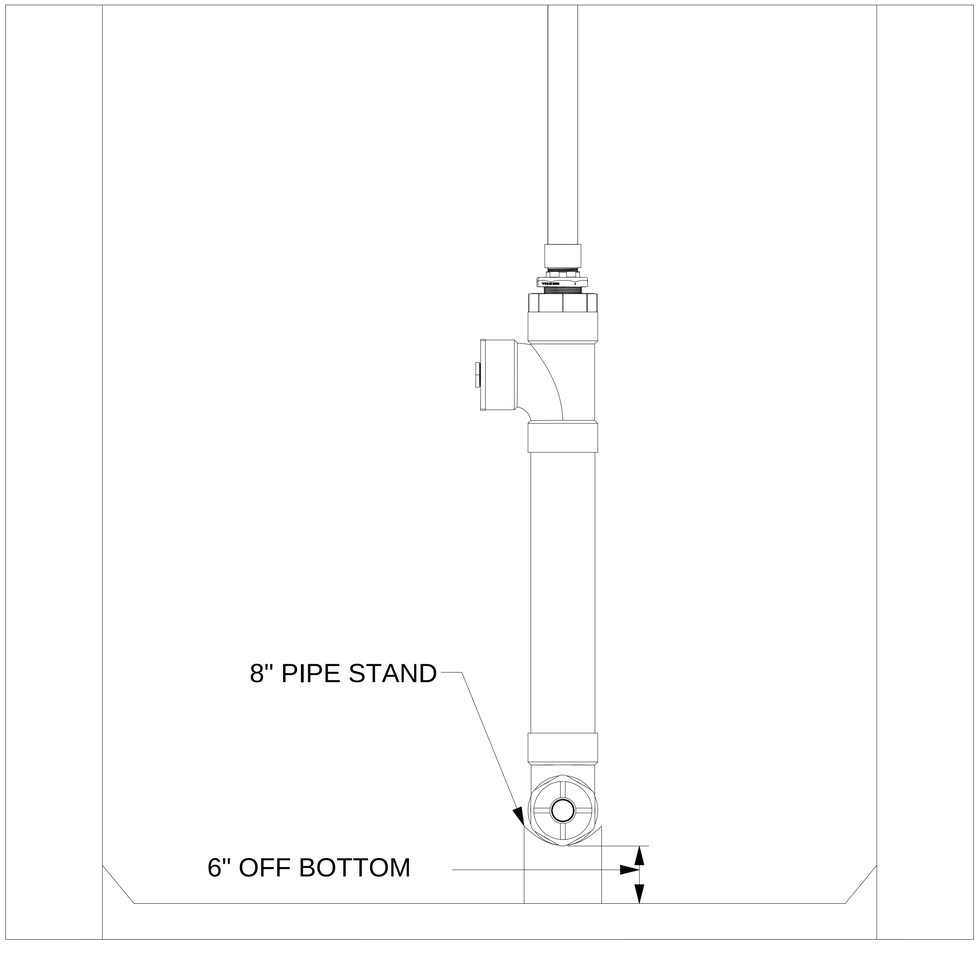
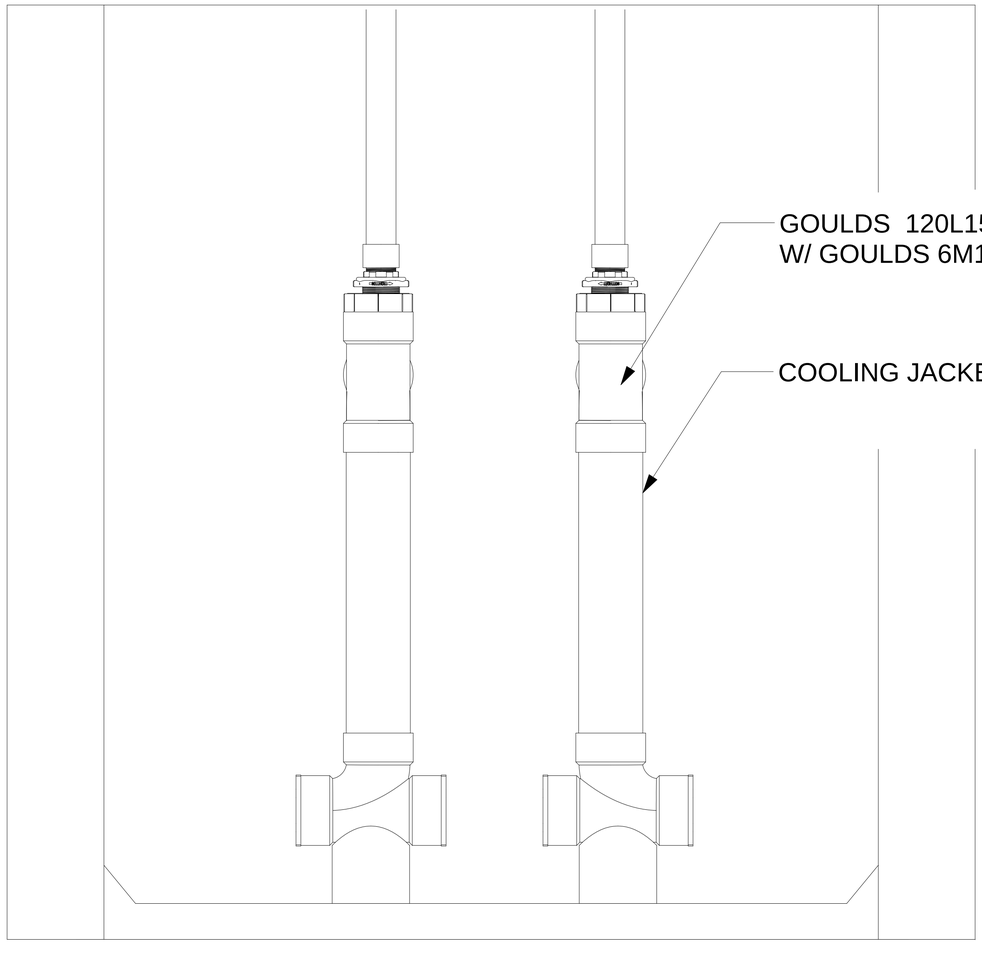
FRONT VIEW



SIDE VIEW



RMS

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PUMP & COOLING JACKET DETAILS

DRAWN BY: JH 8/28/2018
CHECKED BY: DS 8/28/2018

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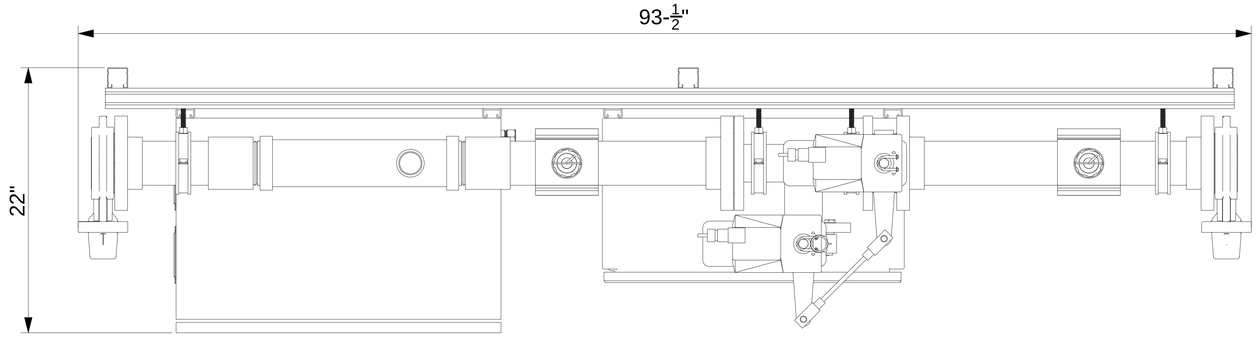
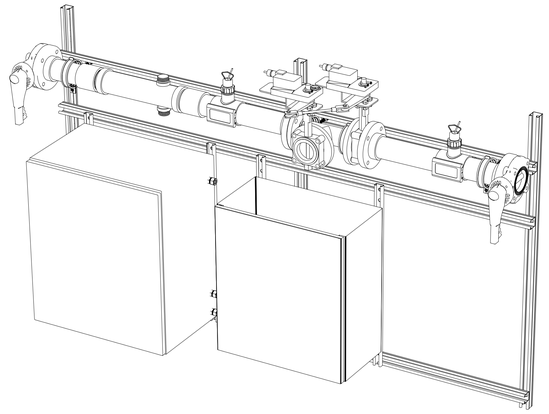
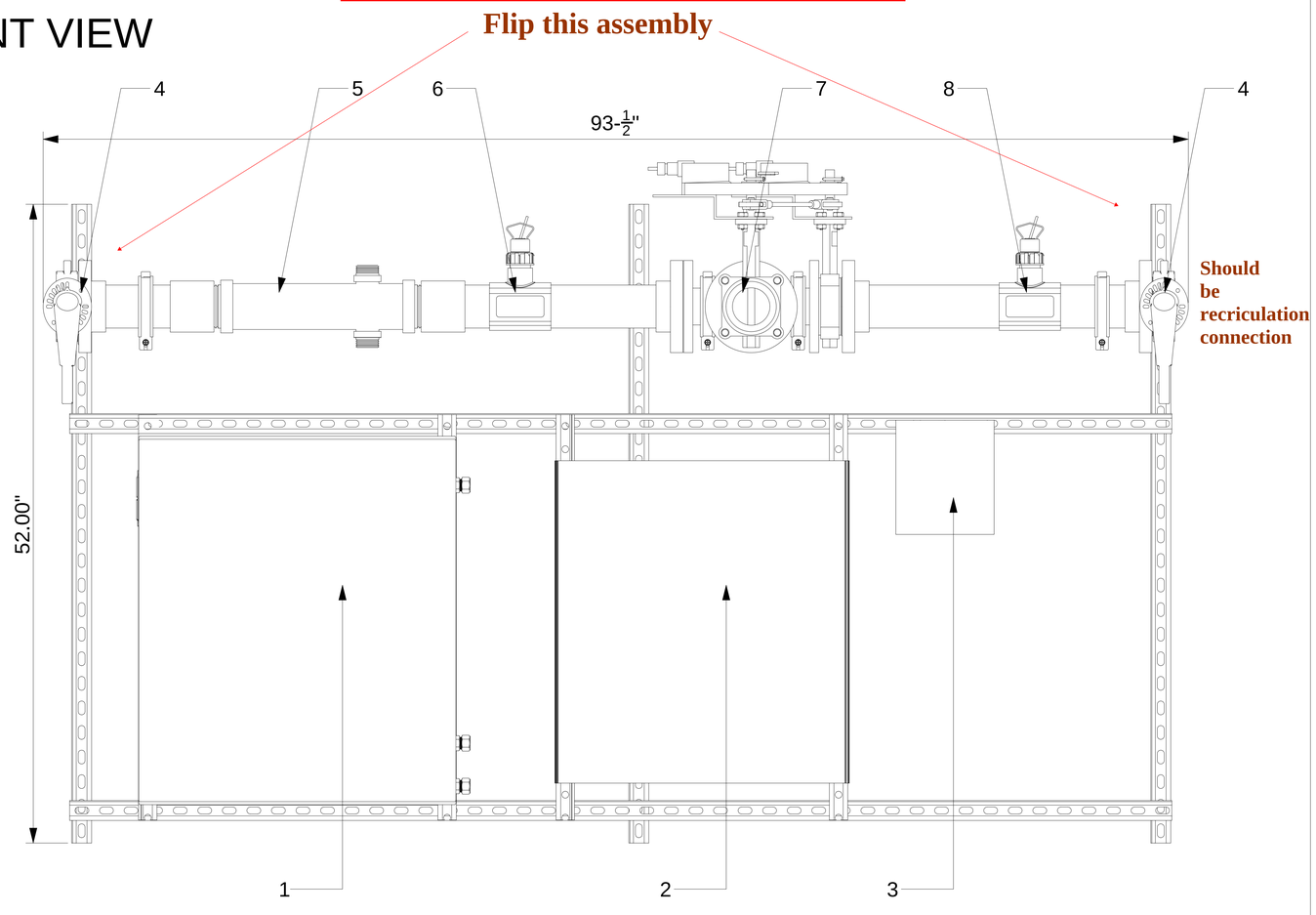
TOP VIEW





Revise to match DOR flow direction/connection "handness". 8/2/18

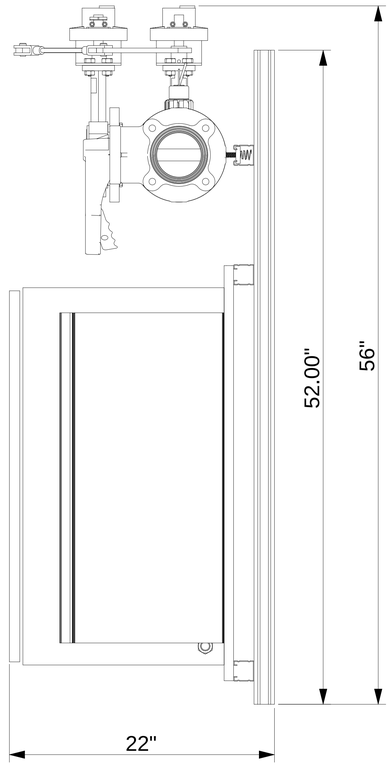
FRONT VIEW



Should be Drain Connection

Should be recriculation connection

SIDE VIEW



ITEM LIST:
1. OZONE GENERATOR
2. OZONE CONCENTRATOR
3. OZONE AIR QUALITY MONITOR
4. FLANGED ISOLATION VALVE
5. VENTURI
6. RECIRCULATION FLOWMETER
7. SELECTOR VALVE: DRAIN OR RECIRC
8. STORM FLOW METER

NOTES:
- DUE TO SPACE CONSTRAINTS, FLOWMETERS MAY NOT READ ACCURATELY
- IF FLOWMETERS ARE MOUNTED IN FIELD IN PIPING RUNS, MORE LIKELY TO BE ACCURATE AND WALL-MOUNTED MANIFOLD DIMENSIONS CAN BE REDUCED

DRAWN BY: CR 7/182018
CHECKED BY: DS 7/18/2018
REV 2

NOT TO SCALE

ALL GRADES & ELEVATIONS TO BE SITE VERIFIED PRIOR TO CONSTRUCTION

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D005

MINNESOTA UNITED

DRAIN/RECIRCULATION MANIFOLD SKID
OZONE SUB SKID

RMS
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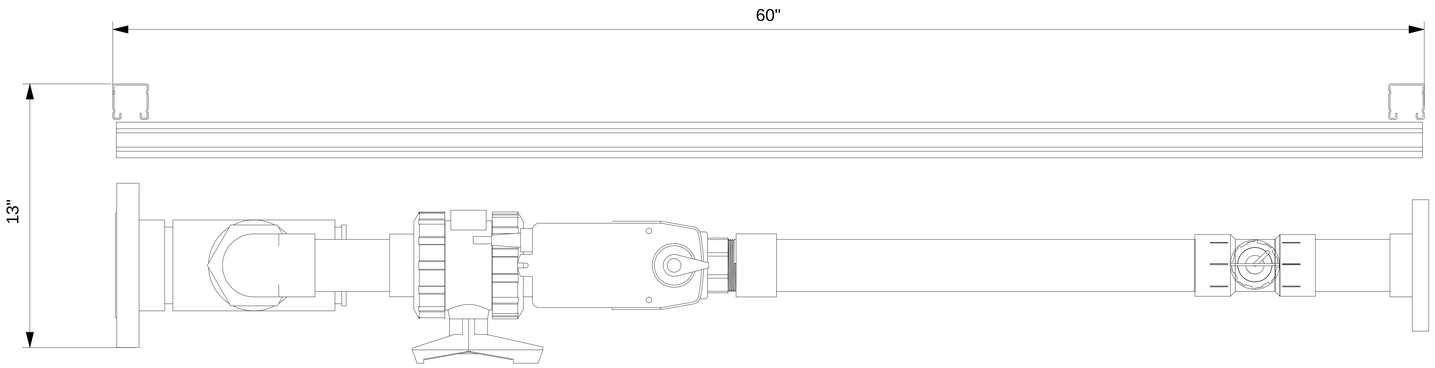
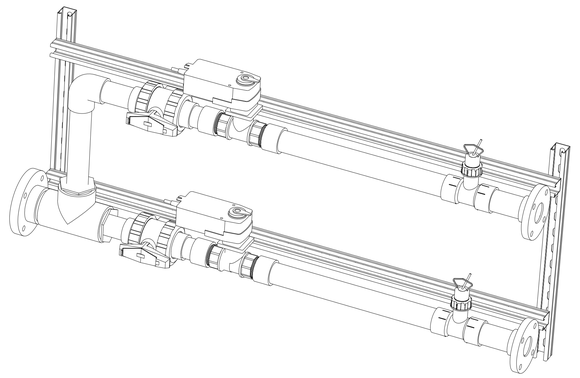
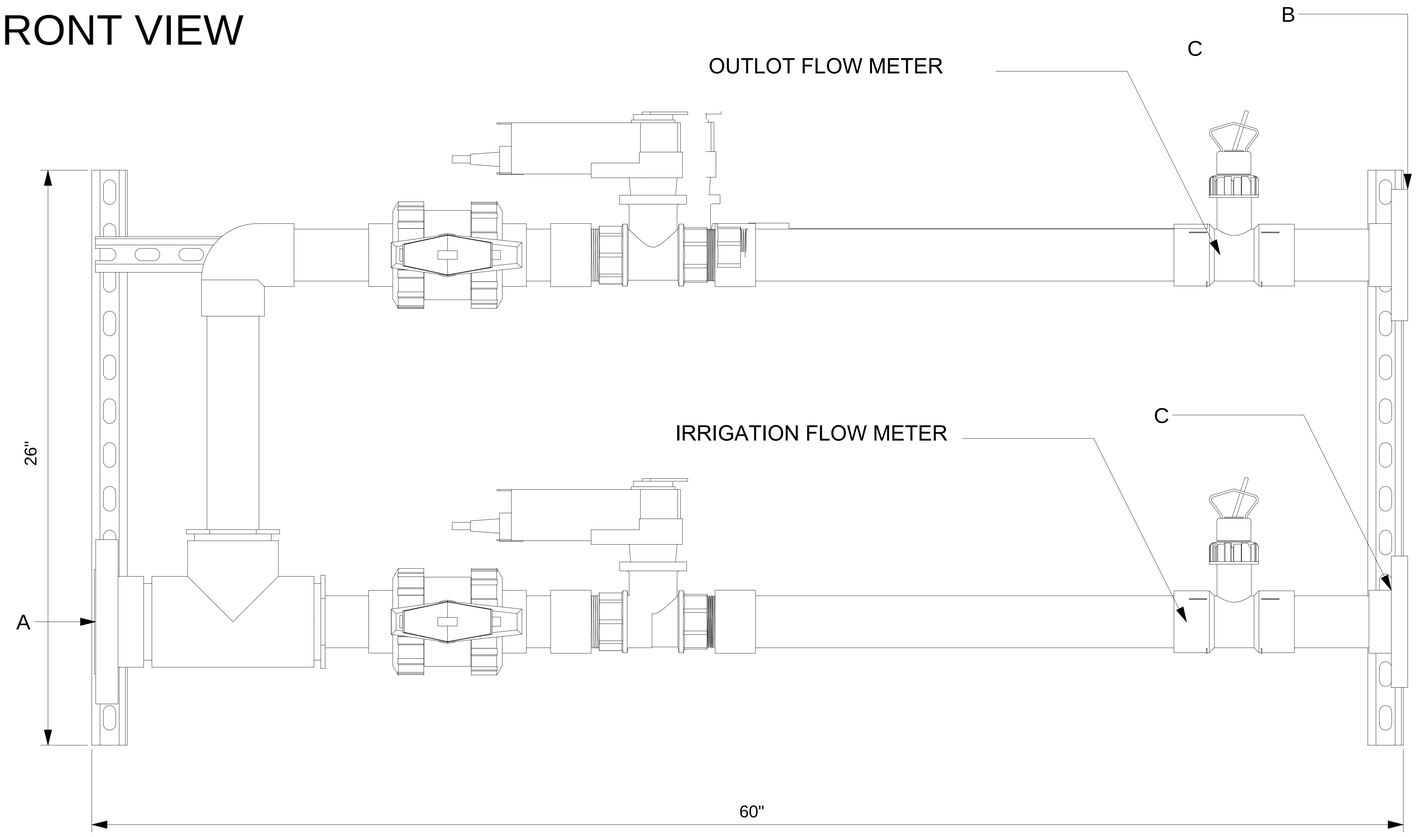
PLAN VIEW



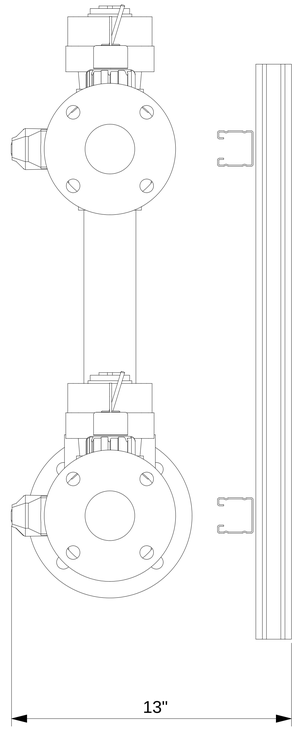
ISO VIEW



FRONT VIEW



SIDE VIEW



NOTES:
- DUE TO SPACE RESTRICTIONS, PROPER LENGTH PRIOR TO FLOWMETER IS NOT ACHIEVABLE AND MAY CAUSE INACCURATE READINGS.
- RMS TO PRE-PLUMB AND MOUNT COMPONENTS TO UNISTRUT ASSEMBLY.
- INSTALLING CONTRACTOR TO WIRE FLOWMETERS AND MOTORIZED BALL VALVES TO RMS-200 CONTROLLER.
- IF DESIRED FLOW IS OPPOSITE OF SHOWN (RIGHT TO LEFT INSTEAD OF LEFT TO RIGHT), PVC MANIFOLD CAN BE REMOVED FROM STRUT ASSEMBLY AND RE-MOUNTED IN DESIRED ORIENTATION. TRUE UNION BALL VALVES WILL NEED TO BE DISCONNECTED AND ROTATED.

FLANGE SCHEDULE:

A. INLET FROM PUMP
B. OUTLOT
C. IRRIGATION

DRAWN BY: CR 7/17/2018
CHECKED BY: DS 7/17/2018

REV 2

NOT TO SCALE

ALL GRADES & ELEVATIONS TO BE SITE VERIFIED PRIOR TO CONSTRUCTION

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DIMENSIONS AND LAYOUT SUBJECT TO CHANGE

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WWW.RAINWATERMANAGEMENT.COM

D006

MINNESOTA UNITED

IRRIGATION SELECTOR SUBSKID

RMS

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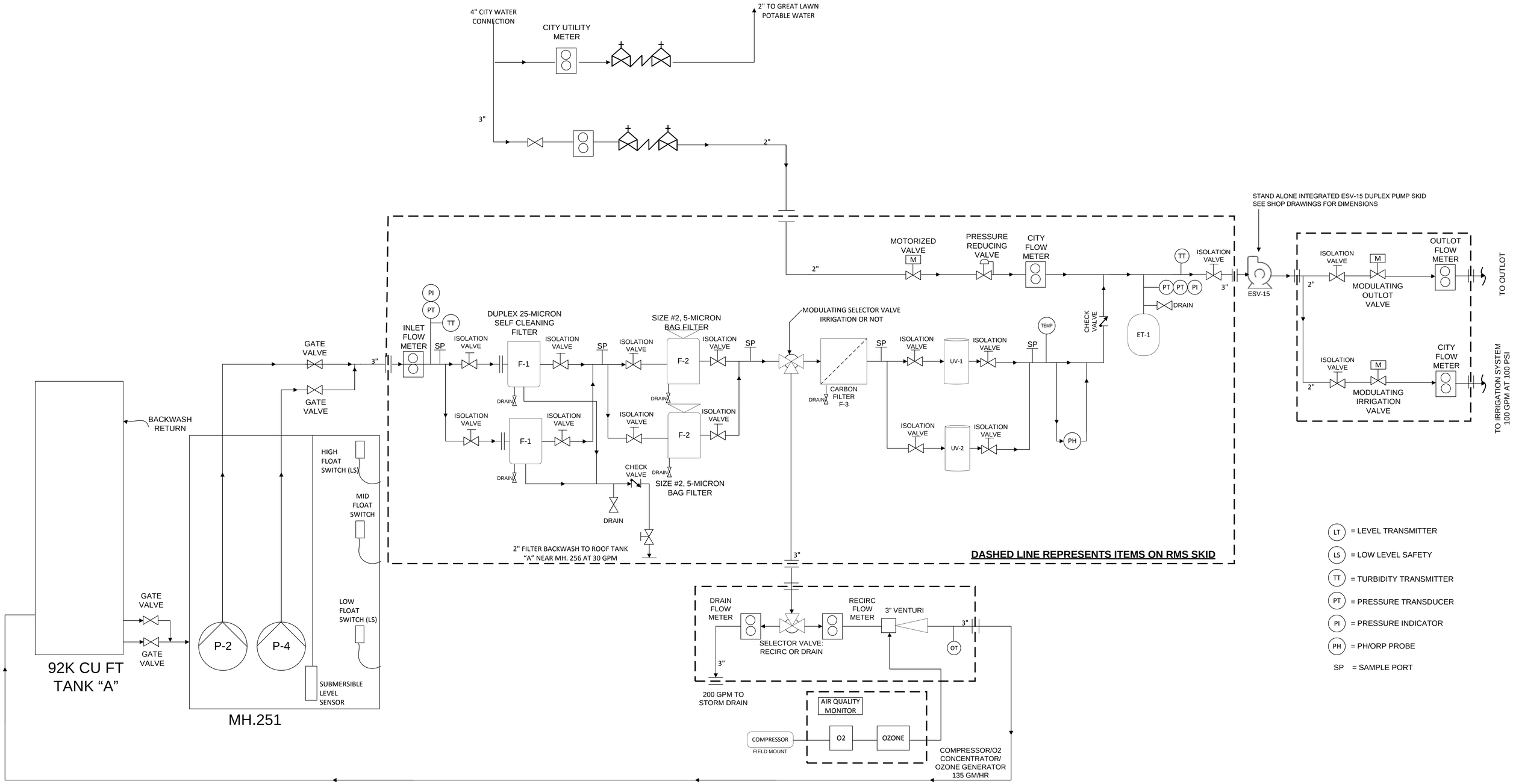

RMS

RAINWATER MANAGEMENT SOLUTIONS™

MINNESOTA UNITED STADIUM FLOW DIAGRAM

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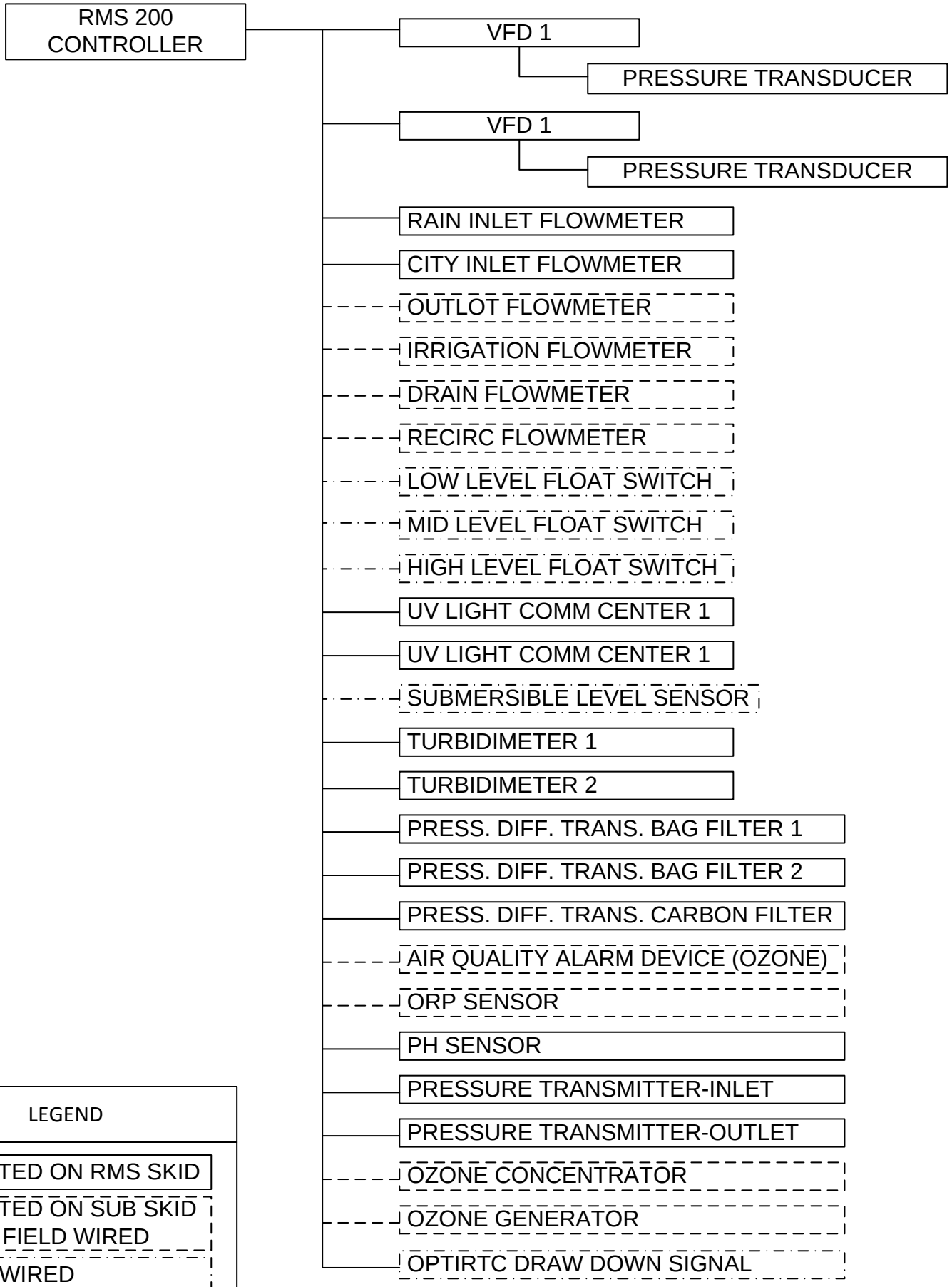
DESIGN FOR REPRESENTATIONAL PURPOSES ONLY
NOT FOR CONSTRUCTION, NOT TO SCALE

LOW VOLTAGE/CONTROL WIRING FROM RMS 200 CONTROLLER



LEGEND

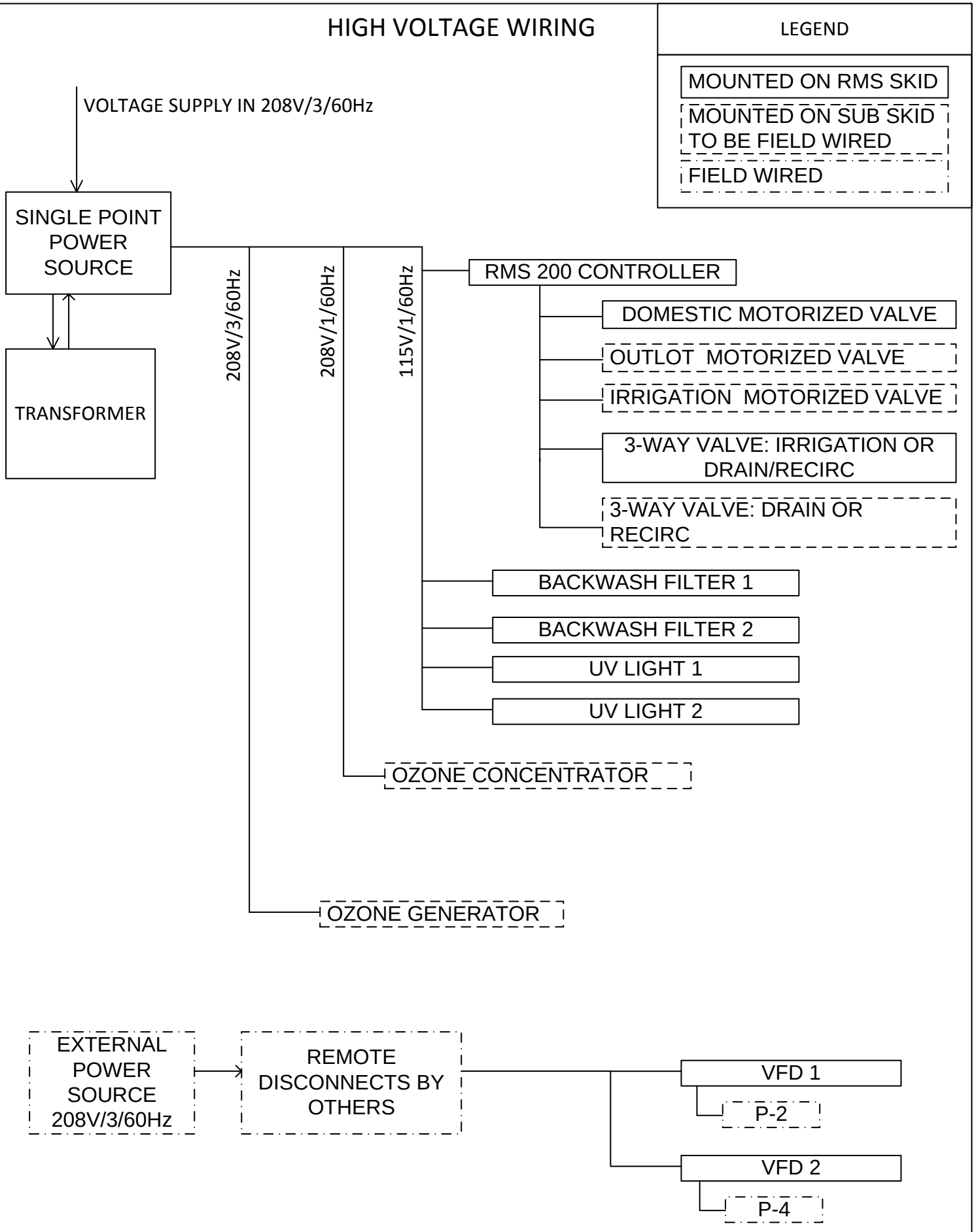
MOUNTED ON RMS SKID

MOUNTED ON SUB SKID TO BE FIELD WIRED

FIELD WIRED

RMS CONTROLS BASIC ELECTRICAL DIAGRAM
FOR MINNESOTA UNITED SOCCER STADIUM

HIGH VOLTAGE WIRING



RMS CONTROLS BASIC ELECTRICAL DIAGRAM
FOR MINNESOTA UNITED SOCCER STADIUM

Appendix D: MH 250 Pump Shop Drawing

4280 East 14th Street Des Moines, Iowa 50313
Phone – 800-383-7867 Fax – 515-265-8079

201 4th Avenue South West New Prague, MN 56071
Phone – 800-211-6432 Fax – 952-758-7778

St. Paul, MN – MLS Stadium – MH250
Pump/Hatch Submittal

Engineer

Loucks, Inc.

7200 Hemlock Ln. N. #300

Maple Grove, MN 55369

763-424-5505

Contractor

Carl Bolander & Sons

251 Starkey Street

St. Paul, MN 55107

651-224-6299

Supplier

Electric Pump

4280 East 14th Street

Des Moines, Iowa 50313

515-265-2222

Date: June 5, 2018

Please return submittals to:

4280 East 14th Street

Des Moines, Iowa 50313

Attention: Salina Godfrey

LHB SUBMITTAL REVIEW	
☒ Reviewed (Note any Comments)	☐ Rejected (Submit Specified Item)
☐ Resubmit (Make Corrections)	☐ Returned (No Review Required)

This review is only for general conformance with the design concept and the information in the Construction Documents. Comments do not relieve the contractor from compliance with the requirements of the plans and specifications. The Contractor is responsible for dimensions, fabrication, means, methods, sequences and procedures of construction including coordination of the Work.

By: DTW Date: 6/25/2018

Revise Project Head to 27.1 ft and required impeller to 7-11/16 inch as per correspondence between LHB and EP. No coordination items are affected by this change. See appended replacement technical data. No other remarks noted (except file name refers to St Cloud)..

Please note: Electric Pump will not order any product until we receive approved submittals back.

Table of Contents

St. Paul, MN – MLS Stadium – MH250

*160' of 2" SS Guide Rail will be provided – No Submittals

Storage guidelines

Storage location

The product must be stored in a covered and dry location free from heat, dirt, and vibrations.

NOTICE:

• Protect the product against humidity, heat sources, and mechanical damage.
• Do not place heavy weights on the packed product.

Freezing precautions

The unit is frost-proof while operating or immersed in liquid, but the impeller/propeller and the shaft seal may freeze if the unit is lifted out of the liquid into a surrounding temperature below freezing.

Follow these guidelines to avoid freezing damage:

Before storage

• The unit must be allowed to run for a short time after raising it to discharge remaining pumped liquid.
This does not apply to impeller/propeller units.

• The discharge opening must be covered in a suitable way, or placed facing down so that any still remaining pumped liquid runs out.

• If present, the cooling jacket must be drained manually by opening the air vent screws at the top of the cooling jacket.

After storage

•If the impeller/propeller is frozen, it must be thawed by immersing the unit in liquid before operating the unit.

NOTICE:

Never use a naked flame to thaw the unit.

Long-term storage

If the unit is stored more than 6 months, the following apply:

• Before operating the unit after storage, it must be inspected with special attention to the seals and the cable entry.

• The impeller/propeller must be rotated every other month to prevent the seals from sticking together.

WARRANTY
Xylem Water Solutions USA, Inc.

For the period defined, Xylem Water Solutions USA, Inc. offers a commercial warranty to the original End Purchaser against defects in workmanship and material on Flygt Products. Warranty covers Flygt parts and labor as outlined in **ADDENDUM – A**.

COVERAGE:
Xylem Water Solutions USA, Inc. will pay the cost of parts and labor during the warranty period, provided that the Flygt product, with cable attached, is returned prepaid to a Xylem Water Solutions USA, Inc. Authorized Service Facility for Flygt Product repairs. Coverage for Flygt parts and labor will be provided for the period shown in **ADDENDUM - A.** The warranty period will begin from date of shipment or date of a valid Start-up (For permanently installed pumps only). In cases where the Start-up date is used as the beginning of the warranty on a permanently installed Flygt pump, a Start-up Report completed by an approved service technician from a Xylem Water Solutions USA, Inc. Authorized Service Facility for Flygt products must be received by the Xylem Water Solutions USA, Inc. Area Service Manager for Flygt Products within thirty (30) days of the initial onset of the unit placed into service. If not received, the beginning of the warranty coverage will default to the Flygt product ship date. A Start-up for a permanently installed Flygt pump must occur within one (1) year from the date of shipment from a Xylem Water Solutions USA, Inc. authorized facility for Flygt Products or warranty will automatically default to ship date as start of warranty. (See **STORAGE** section) When using the start-up date as the beginning of the warranty, a copy of the Start-up Report will be required to support any Warranty Claims. Warranty on Flygt Dewatering pumps will begin with ship date only. No other date on Flygt Dewatering pumps will be considered.

Xylem Water Solutions USA, Inc.'s sole obligation under this Warranty for Flygt Products shall be to replace, repair or grant credit for Flygt Products upon Xylem Water Solutions USA, Inc.'s exclusive determination that the Flygt Product does not conform to the above warranty. In the event that the Flygt product is replaced, warranty on the replacement product will be equal to the balance remaining on the original product or ninety (90) days, which ever is greater.

MISUSE:
This Warranty shall not apply to any Flygt product or part of Flygt product which (i) has been subjected to misuse, misapplication, accident, alteration, neglect, or physical damage (ii) has been installed, operated, used and/or maintained in a manner which is in an application that is contrary to Xylem Water Solutions USA, Inc.'s printed instructions as it pertains to installation, operation and maintenance of Flygt Products, including but without limitation to (iii) operation of equipment without being connected to monitoring devices supplied with specific products for protection; or (iv) damaged due to a defective power supply, improper electrical protection, faulty installation or repair, ordinary wear and tear, corrosion or chemical attack, an act of God, an act of war or by an act of terrorism; or (v) has been damaged resulting from the use of accessory equipment not sold by Xylem Water Solutions USA, Inc. or not approved by Xylem Water Solutions USA, Inc. in connection with Flygt products.

WEAR PARTS:
This warranty does not cover costs for standard and/or scheduled maintenance performed, nor does it cover Flygt parts that, by virtue of their operation, require replacement through normal wear (aka: Wear Parts), unless a defect in material or workmanship can be determined by Xylem Water Solutions USA, Inc.. Wear Parts are defined as Cutters, Cutting Plates, Impellers, Agitators, Diffusers, Wear Rings (Stationary or Rotating), Volutes (when used in an abrasive environment), oil, grease, cooling fluids and/or any items deemed necessary to perform and meet the requirements of normal maintenance on all Flygt equipment.

WARRANTY
Xylem Water Solutions USA, Inc.

DISCLAIMERS:
(i) Xylem Water Solutions USA, Inc.'s warranties are null and void when Flygt Products are exported outside of the United States of America without the knowledge and written consent of Xylem Water Solutions USA, Inc.; (ii) Xylem Water Solutions USA, Inc. makes no independent warranty or representation with respect to parts or products manufactured by others and provided by Xylem Water Solutions USA, Inc. (however, Xylem Water Solutions USA, Inc. will extend to the Purchaser any warranty received from Xylem Water Solutions USA, Inc.'s supplier for such parts or products).

LIMITATIONS:
XYLEM WATER SOLUTIONS USA, INC. NEITHER ASSUMES, NOR AUTHORIZES ANY PERSON OR COMPANY TO ASSUME FOR XYLEM WATER SOLUTIONS USA, INC., ANY OTHER OBLIGATION IN CONNECTION WITH THE SALE OF ITS FLYGT EQUIPMENT. ANY ENLARGEMENT OR MODIFICATION OF THIS WARRANTY BY A FLYGT PRODUCT DISTRIBUTOR, OR OTHER SELLING AGENT SHALL BECOME THE EXCLUSIVE RESPONSIBILITY OF SUCH ENTITY.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ANY AND ALL OTHER EXPRESS OR IMPLIED WARRANTIES, GUARANTEES, CONDITIONS OR TERMS OF WHATEVER NATURE RELATING TO FLYGT PRODUCT(S), INCLUDING AND WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WHICH ARE HEREBY EXPRESSLY DISCLAIMED AND EXCLUDED. PURCHASER'S EXCLUSIVE REMEDY AND XYLEM WATER SOLUTIONS USA, INC.'S AGGREGATE LIABILITY FOR BREACH OF ANY OF THE FOREGOING WARRANTIES IS LIMITED TO REPAIRING OR REPLACING FLYGT PRODUCTS AND SHALL IN ALL CASES BE LIMITED TO THE AMOUNT PAID BY THE PURCHASER HEREUNDER. IN NO EVENT IS XYLEM WATER SOLUTIONS USA, INC. LIABLE FOR ANY OTHER FORM OF DAMAGES, WHETHER DIRECT, INDIRECT, LIQUIDATED, INCIDENTAL, CONSEQUENTIAL, PUNITIVE, EXEMPLARY OR SPECIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOSS OF USE, LOSS OF PROFIT, LOSS OF ANTICIPATED SAVINGS OR REVENUE, LOSS OF INCOME, LOSS OF BUSINESS, LOSS OF PRODUCTION, LOSS OF OPPORTUNITY OR LOSS OF REPUTATION.

XYLEM WATER SOLUTIONS USA, INC. WILL NOT BE HELD RESPONSIBLE FOR TRAVEL EXPENSES, RENTED EQUIPMENT, OUTSIDE CONTRACTOR'S FEES, OR ANY EXPENSES ASSOCIATED WITH A FLYGT PRODUCT REPAIR SHOP NOT AUTHORIZED BY XYLEM WATER SOLUTIONS USA, INC. U.S.A., INC. REIMBURSEMENT COSTS FOR CRANES AND/OR ANY SPECIAL EQUIPMENT USED IN CONJUNCTION FOR THE REMOVAL AND/OR REINSTALLATION OF ANY FLYGT EQUIPMENT IS NOT COVERED UNDER THIS WARRANTY.

ANY UNAUTHORIZED ALTERATIONS TO SUPPLIED FLYGT EQUIPMENT USED WITHOUT XYLEM WATER SOLUTIONS USA, INC. SUPPLIED FLYGT BRAND CABLE OR CONTROLS WILL NOT BE COVERED UNDER THIS WARRANTY, UNLESS IT CAN BE PROVEN SUCH ANCILLARY EQUIPMENT IS SUITABLE FOR THE PURPOSE AND EQUAL TO XYLEM WATER SOLUTIONS USA, INC. SUPPLIED FLYGT BRAND CABLES OR CONTROLS THAT WOULD ORIGINALLY HAVE BEEN SUPPLIED WITH THE TYPE OF EQUIPMENT IN USE.

REQUIREMENTS:
A copy of Electrical System Schematics of the Control used (including a Control's Bill of Material) could be required to support a Warranty Claim when a non Flygt Brand Control is used. In addition, a written record, hereby known as "the log", will be associated with each unit serial number and must be maintained by the organization having product maintenance responsibility. The log must record each preventative maintenance activity and any repair activity during the life of the warranty or verification that a Xylem Water Solutions USA, Inc. authorized Service Contract for Flygt Products is in force and must be available for review and/or auditing. Failure to meet these conditions could render this warrant null and void. Such logs could be required to determine warranty coverage.

WARRANTY
Xylem Water Solutions USA, Inc.

STORAGE:
Should a delay occur between ship date and the date of start-up, maintenance as outlined in Xylem Water Solutions USA, Inc.'s Care & Maintenance Manual for Flygt Products must be performed by the "CONTRACTOR" and/or "OWNER" during any such period of storage. Documentation providing proof and outlining what maintenance was performed must be provided to Xylem Water Solutions USA, Inc. or its Flygt Products representative within thirty (30) days of said maintenance, or the Xylem Water Solutions USA, Inc. warranty for Flygt Products could be considered void.

CONTROLS:
Warranty coverage for permanently installed controls will start for the end purchaser on the date of shipment. This warranty does not apply to controls that have been damaged due to a defective and/or improper input power supply, improper electrical protection, accidental damage, improper or unauthorized installation and/or repair, unauthorized alteration, negligence, environmental corrosion or chemical attack, improper maintenance or storage of control, any act of God, an act of war, an act of terrorism or damage resulting from the use of accessory equipment not approved by Xylem Water Solutions USA, Inc.. Further, this warranty does not apply in the event an adjustment is found to correct the alleged defect.

Solid state devices will be covered for a period of one (1) year. Electrical control panels containing controllers, PLC's, drives, soft starts, and other computerized equipment will require Transient Voltage Surge Suppression (TVSS) protection in order to satisfy the requirements of this warranty. The protection equipment associated with the control must be kept in working condition during the life of the warranty. Auxiliary equipment supplied with the control (air-conditioners etc.) is limited by the respective original equipment manufacturer's warranty offered. Consumable items such as: light bulbs, fuses, and relays are covered under normal operating conditions. Electrical surges experienced during startups and/or during normal operating use of the control panel will cause the consumable items not to be covered under this warranty policy. Components not supplied by Xylem Water Solutions USA, Inc. will not covered by this warranty.

TOP (The Optimum Pump Station)
Xylem Water Solutions USA, Inc. will warrant the Flygt TOP pre-engineered fiberglass pump station components against defects in material and workmanship for a period of one (1) year from date of start-up or eighteen (18) months from date of shipment and is valid only to the original owner of the station. Warranty shall cover the cost of labor and materials required to correct any warrantable defect, excluding any removal and reinstallation costs, FOB Xylem Water Solutions USA, Inc.'s authorized warranty service location for Flygt's TOP.

Flygt Products contained within a TOP pre-engineered fiberglass pump station will carry the standard Xylem Water Solutions USA, Inc. warranty for Flygt products and/or accessories installed in the TOP pre-engineered fiberglass pump station.

All Flygt Product restrictions and/or limitations as outlined and described within the context of this warranty are germane to all sections of this Xylem Water Solutions USA, Inc. Warranty document.

Xylem Water Solutions USA, Inc.
National Quality Assurance - US Corporate

FLYGT
a xylem brand

WARRANTY
Xylem Water Solutions USA, Inc.

ADDENDUM – WARRANTY COVERAGE BY PRODUCT

PRODUCT	PRODUCT SERIES AND CONFIGURATION	Months 1 - 12	Months 13 - 18	Months 19 - 24	Months 25 - 36	Months 37 - 39	Months 40 - 60
Axial Flow / Mixed Flow / Centrifugal Pumps & Mixers	3000 Series (CP, NP, DP, CT, NT, CZ, NZ, LL) 4000 Series (SR, PP) 7000 Series (PL)	100%		50%			25%
ETO Electrical Control Panels	Engineered to Order, Xylem Manufactured Control Panels (permanently installed) - 3 Years	100% - 1 YR	LIMITED - 2 - YR				
Grinder Pumps	3000 Series (MP, MF, MH)	100% - 2 YR (From Ship Date)			3 YR (From Date of Manufacture)		
Abrasion/Corrosion Resistant & Chopper Pumps	3000 Series (FP, FS, FT, HP, HS) 5000 Series (HP, HS) 8000.280 Series (DP, DZ, DT, DS, DF)	100%					
Centrifugal Pumps	1300 Series	100% (From Ship Date)					
Dew atering Pumps	2000 Series (BS, KS) 3000 Series (CS, NS, DS) 8000.280 Series (DS, DF)	100% (From Ship Date)					
TOPS	Fiberglass Pump Station	100% (From Ship Date)					
Accessories	Permanent / Portable	100% (From Ship Date)					
Hydro ejectors/ Aerators	HE, JA	100%					
Portable Pump Controls TOPS Control Panels	Control Boxes (Nolta, MSHA etc.) TOPS control panels (permanently installed)	100% (From Ship Date)					
Small Pumps	3045, 3057, SX	100% (From Ship Date)					
Parts - *	All new Flygt parts (mechanical & electrical)	100% (From Ship Date)					

* - Parts that fail where used in a repair are warranted for one (1) year from the date of the repair for the failed part only – no labor; This Includes Flygt pump controllers, Flygt supervision equipment, Flygt submersible level transducers, etc.

1

N-3127.070 SPECIFICATION

REQUIREMENTS
Furnish and install 2 submersible non-clog wastewater pumps. Each pump shall be equipped with a 10 HP submersible electric motor connected for operation on 208 volts, 3 phase, 60 hertz, with 50 feet of submersible cable (SUBCAB) suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards and have P-MSHA Approval.

PUMP DESIGN CONFIGURATION (Wet pit installation)
The pump shall be supplied with a mating cast iron 6 inch discharge connection and be capable of delivering 792 GPM at 22.5 FT. TDH. The pump(s) shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet-well. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable. No portion of the pump shall bear directly on the sump floor. Each pump shall be fitted with 39 feet of stainless steel lifting chain or stainless steel cable. The working load of the lifting system shall be 50% greater than the pump unit weight.

PUMP CONSTRUCTION
Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. The lifting handle shall be of stainless steel. All exposed nuts or bolts shall be AISI type 316 stainless steel construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

Sealing design shall incorporate **metal-to-metal contact** between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or optional Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

COOLING SYSTEM
Motors are sufficiently cooled by the surrounding environment or pumped media. A water jacket is not required.

CABLE ENTRY SEAL
The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal. **The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the interior from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.**

MOTOR
The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the

trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31.The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be designed for continuous duty handling pumped media of 40°C (104°F) and capable of no less than 30 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches set to open at 125°C (260°F) shall be embedded in the stator end coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The junction chamber containing the terminal board, shall be hermetically sealed from the motor by an elastomer compression seal. Connection between the cable conductors and stator leads shall be made with threaded compression type binding posts permanently affixed to a terminal board. The motor and the pump shall be produced by the same manufacturer.

The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C. A performance chart shall be provided upon request showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics.

The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

BEARINGS

The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces. **Single row lower bearings are not acceptable.** The minimum L_{10} bearing life shall be 50,000 hours at any usable portion of the pump curve.

MECHANICAL SEAL

Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in a lubricant reservoir that hydro-dynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating, corrosion and abrasion resistant **tungsten-carbide** ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary and one positively driven rotating, corrosion and abrasion resistant tungsten-carbide seal ring.

Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment nor **depend on direction of rotation for sealing**. The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the impeller hub will not be acceptable. For special applications, other seal face materials shall be available.

The following seal types shall not be considered acceptable or equal to the dual independent seal specified: shaft seals without positively driven rotating members, or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces. No system requiring a pressure differential to offset pressure and to effect sealing shall be used.

Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. **The motor shall be able to operate dry without damage while pumping under load**.

Where a seal cavity is present in the seal chamber, the area about the exterior of the lower mechanical seal in the cast iron housing shall have cast in an integral concentric spiral groove. This groove shall protect the seals by causing abrasive particulate entering the seal cavity to be forced out away from the seal due to centrifugal action.

Seal lubricant shall be non-hazardous.

PUMP SHAFT
Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The shaft shall be stainless steel – ASTM A479 S43100-T. If a shaft material of lower quality than stainless steel – ASTM A479 S43100-T is used, a shaft sleeve of stainless steel – ASTM A479 S43100-T is used to protect the shaft material. However, shaft sleeves only protect the shaft around the lower mechanical seal. No protection is provided in the oil housing and above. Therefore, the use of stainless steel sleeves will not be considered equal to stainless steel shafts.

IMPELLER (Adaptive)
The impeller shall be of Hard-Iron™ (ASTM A-532 (Alloy III A) 25% chrome cast iron), dynamically balanced, semi-open, multi-vane, back-swept, non-clog design. The impeller vane leading edges shall be mechanically self-cleaned upon each rotation as they pass across a spiral groove located on a replaceable insert ring.

The impeller shall have vanes hardened to Rc 45 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in waste water. The screw shape of the impeller inlet shall provide an inducing effect for the handling of sludge and rag-laden wastewater. The impeller shall be capable of momentarily moving axially upwards a distance of 15mm/0.6-in. to allow larger debris to pass through and immediately return to normal operating position.

VOLUTE / SUCTION COVER
The pump volute shall be a single piece grey cast iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The volute shall have a replaceable suction cover insert ring in which are cast spiral-shaped, sharp-edged groove(s). The spiral groove(s) shall provide trash release pathways and sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The insert ring shall be cast of Hard-Iron™ (ASTM A-532 (Alloy III A) 25% chrome cast iron) and provide effective sealing between the multi-vane semi-open impeller and the volute housing.

PROTECTION
All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. The thermal switches shall open at 125°C (260°F), stop the motor and activate an alarm.

A leakage sensor shall be available as an option to detect water in the stator chamber. The Float Leakage Sensor (FLS) is a small float switch used to detect the presence of water in the stator

chamber. When activated, the FLS will stop the motor and send an alarm both local and/or remote. **USE OF VOLTAGE SENSITIVE SOLID STATE SENSORS AND TRIP TEMPERATURE ABOVE 125°C (260°F) SHALL NOT BE ALLOWED.**

The thermal switches and FLS shall be connected to a Mini CAS (Control and Status) monitoring unit. The Mini CAS shall be designed to be mounted in any control panel.

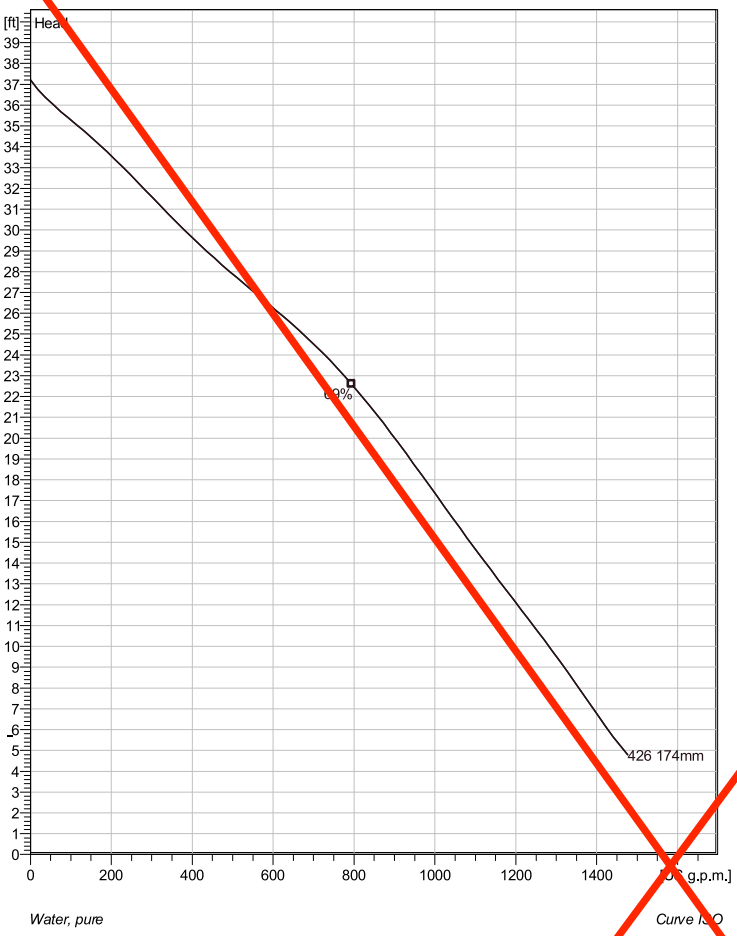
MODIFICATIONS

1. Explosion-proof Pumps (.070 denotes explosion proof).

See revised sheets dated 6/25/2018.

NP 3127 LT 3~ Adaptive 426

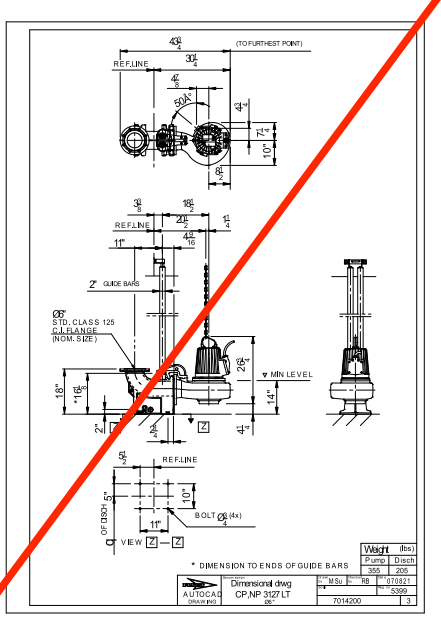
Technical specification



Water, pure *Curve ISO*

Note: Picture might not correspond to the current configuration.

Installation: P - Semi permanent, Wet



General

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

Impeller

Impeller material	Hard-Iron ™
Discharge Flange Diameter	5 7/8 inch
Suction Flange Diameter	7 7/8 inch
Impeller diameter	174 mm
Number of blades	2

Motor

Motor #	N3127.070 21-12-4AL-W 10hp FM
Stator variant	28
Frequency	60 Hz
Rated voltage	208 V
Number of poles	4
Phases	3~
Rated power	10 hp
Rated current	28 A
Starting current	169 A
Rated speed	1740 rpm
Power factor	
1/1 Load	0.88
3/4 Load	0.85
1/2 Load	0.78
Motor efficiency	
1/1 Load	84.6 %
3/4 Load	85.5 %
1/2 Load	84.5 %

Configuration

Project	Project ID	Created by	Created on	Last update
			5/22/2018	

ELECTRIC PUMP

FLYGT

NP 3127 LT 3~ Adaptive 426

Performance curve

Pump

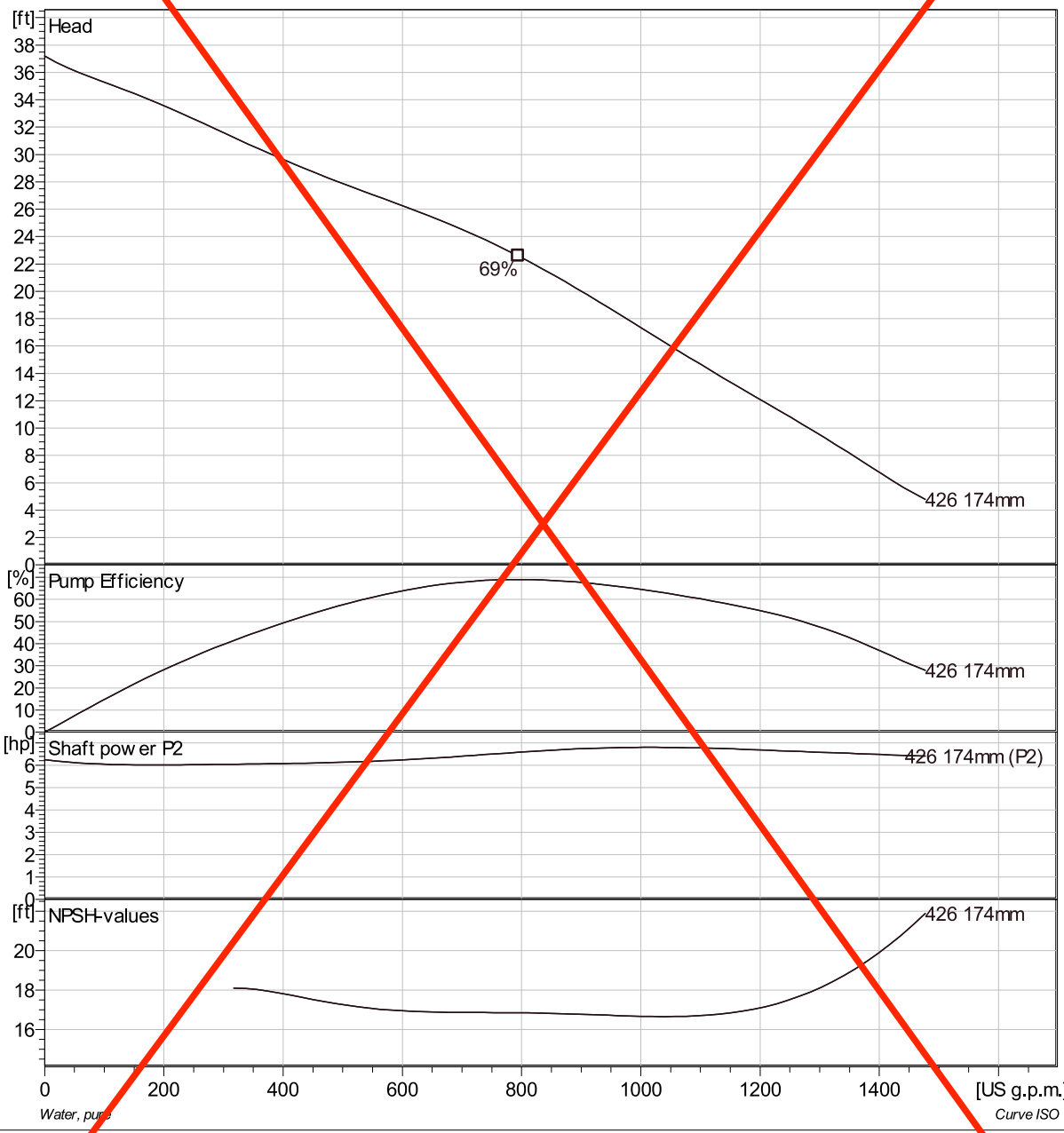
Discharge Flange Diameter	5 7/8 inch
Suction Flange Diameter	200 mm
Impeller diameter	$6^{7}/_{8}$"
Number of blades	2

Motor

Motor #	N3127.070 21-12-4AL-W 10hp
Stator variant	28
Frequency	60 Hz
Rated voltage	208 V
Number of poles	4
Phases	3~
Rated power	10 hp
Rated current	28 A
Starting current	169 A
Rated speed	1740 rpm

Power factor	
1/1 Load	0.88
3/4 Load	0.85
1/2 Load	0.78

Motor efficiency	
1/1 Load	84.6 %
3/4 Load	85.5 %
1/2 Load	84.5 %



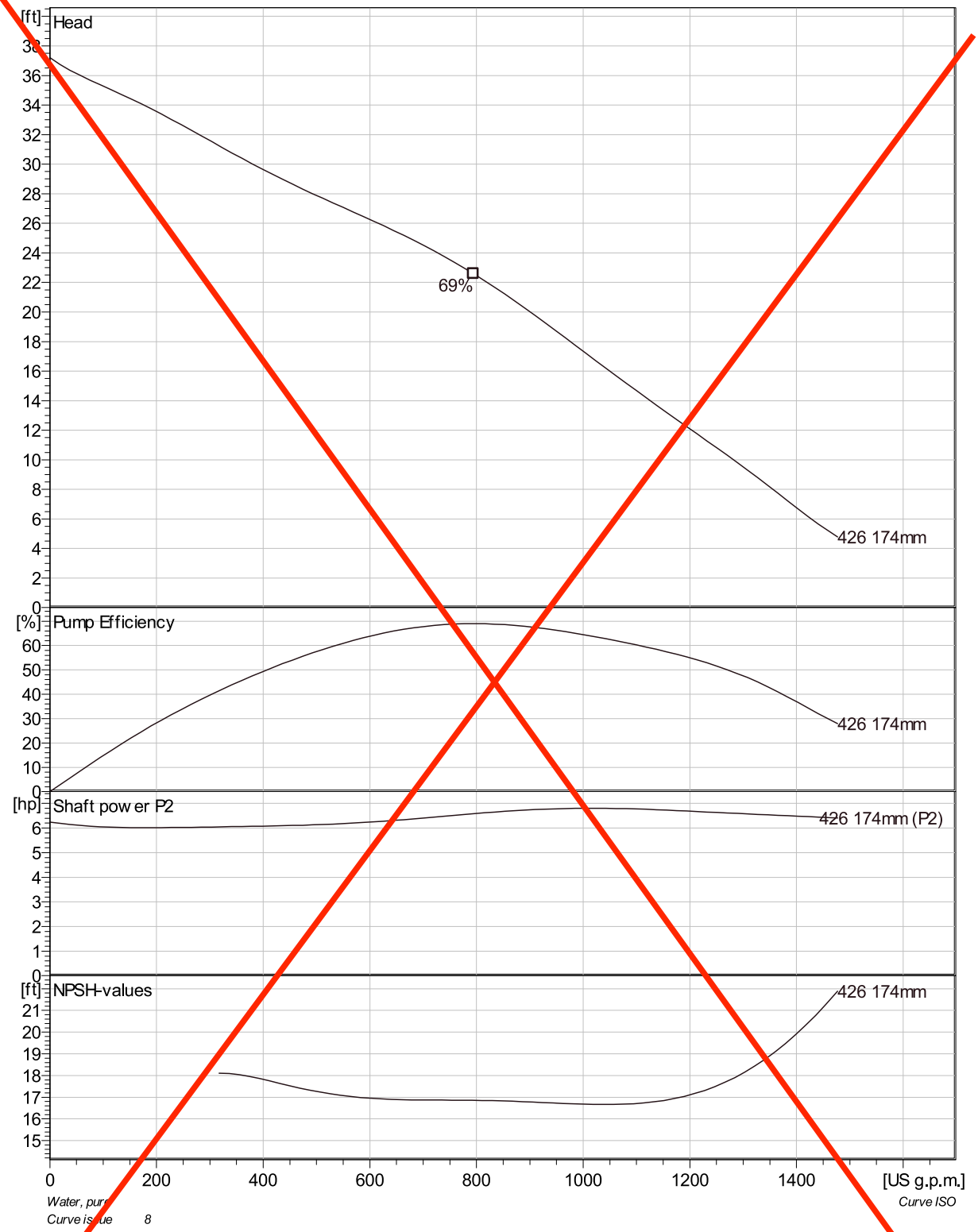
Project	Project ID	Created by	Created on	Last update
			5/22/2018	

ELECTRIC PUMP

FLYGT

NP 3127 LT 3~ Adaptive 426

Duty Analysis



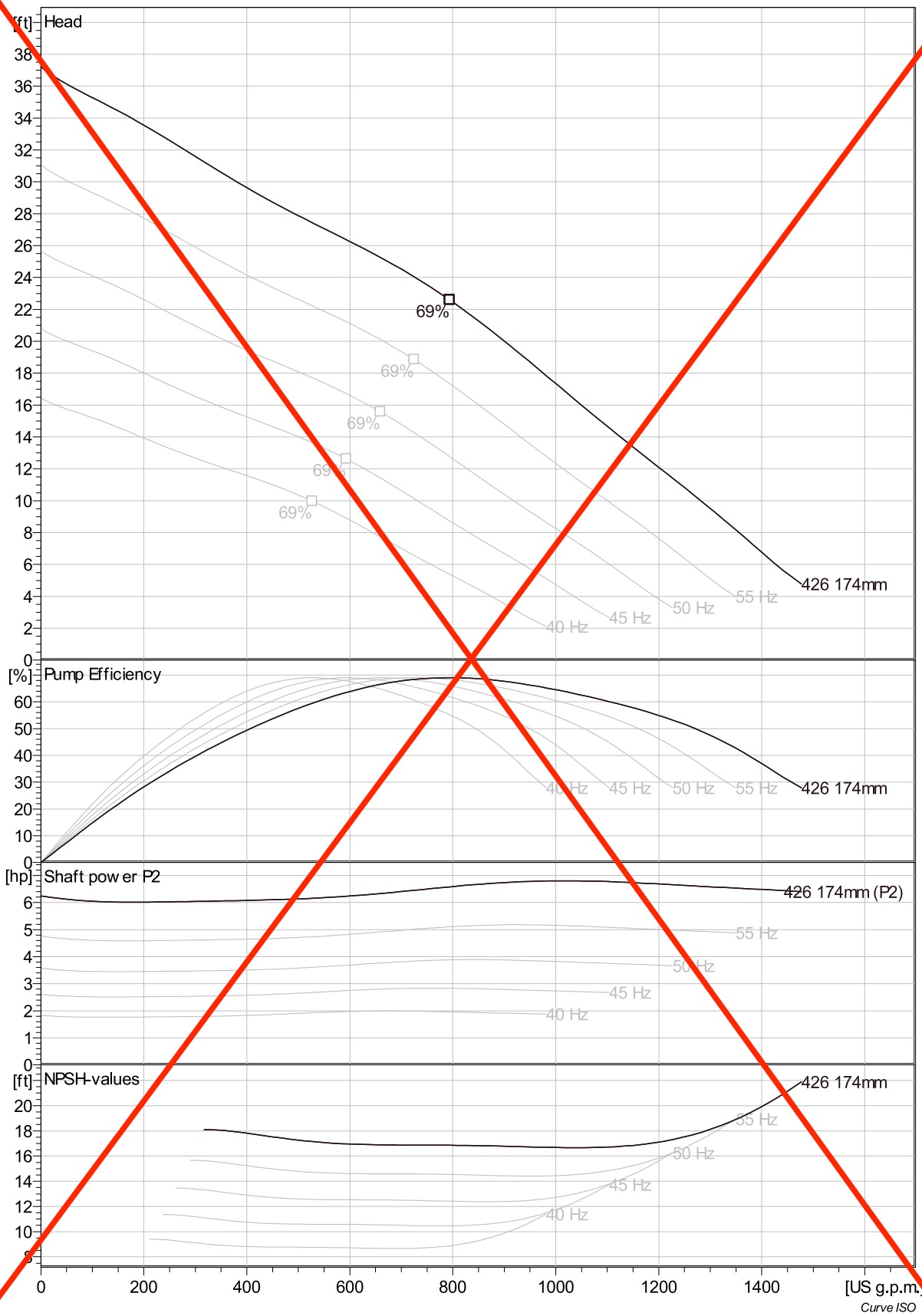
Project	Project ID	Created by	Created on	Last update
			5/22/2018	

ELECTRIC PUMP

FLYGT

NP 3127 LT 3~ Adaptive 426

VFD Curve



Curve ISO

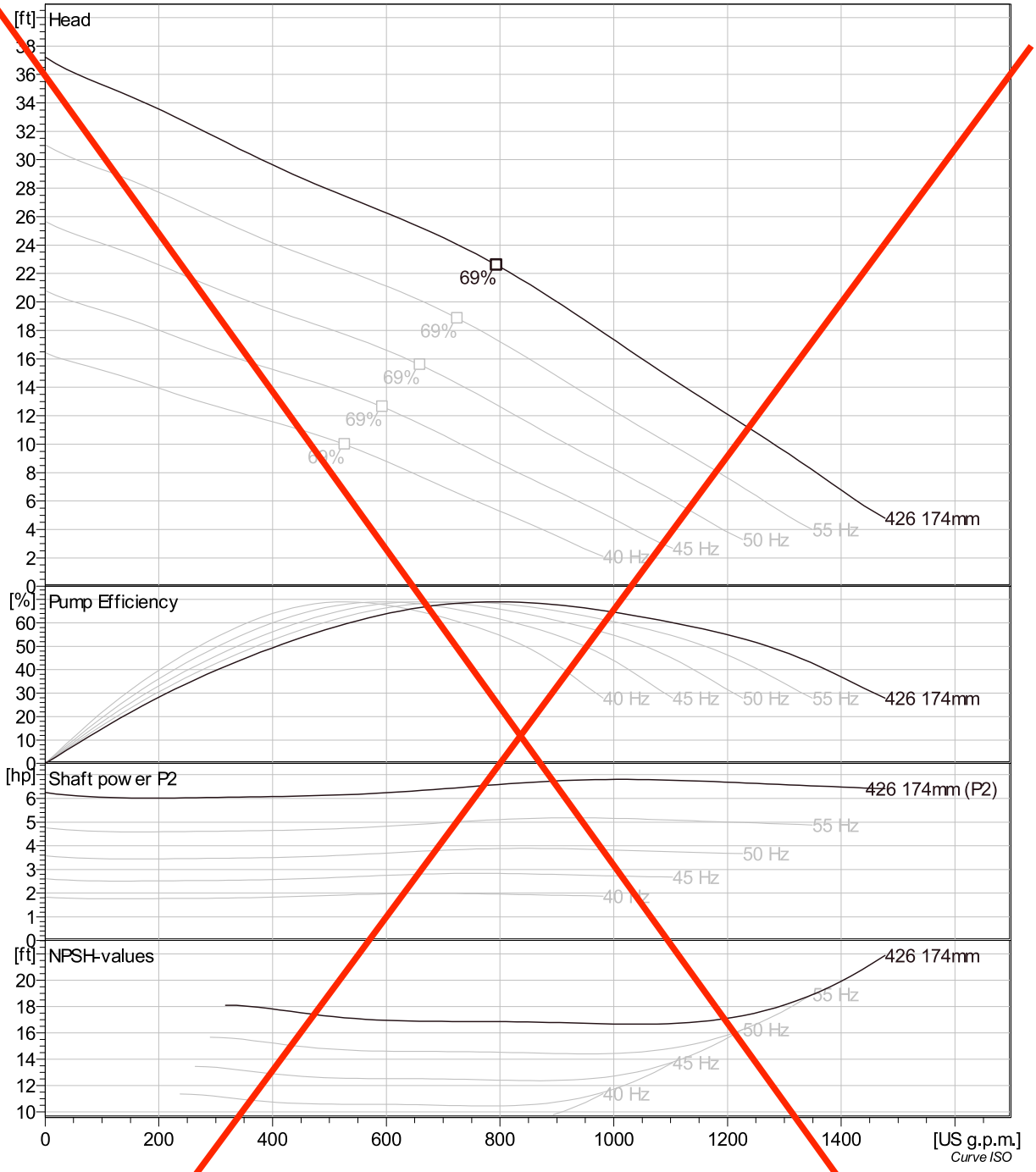
Project	Project ID	Created by	Created on	Last update
			5/22/2018	

ELECTRIC PUMP

FLYGT

NP 3127 LT 3~ Adaptive 426

VFD Analysis



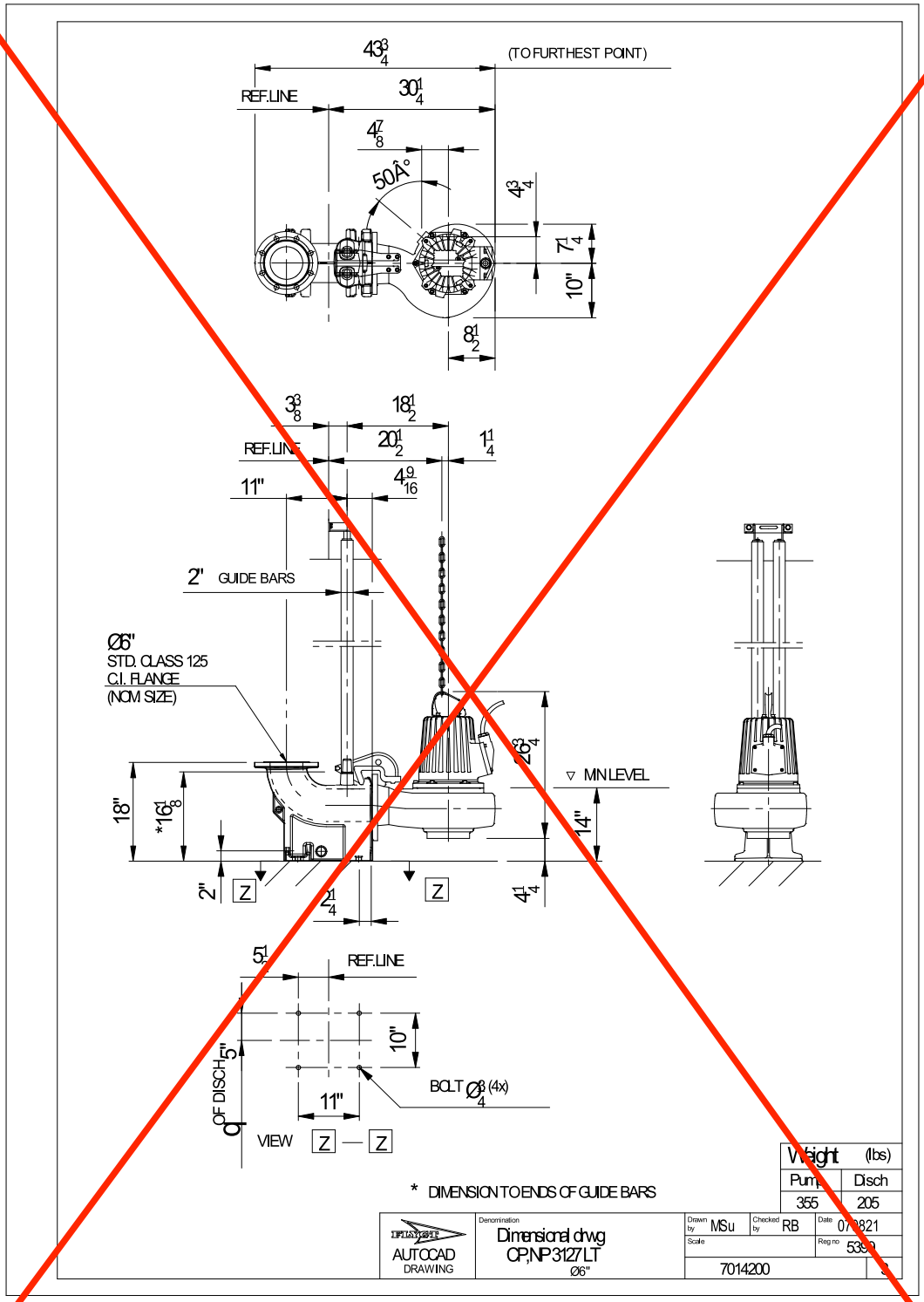
Project	Project ID	Created by	Created on	Last update
			5/22/2018	

ELECTRIC PUMP

FLYGT

NP 3127 LT 3~ Adaptive 426

Dimensional drawing



Project	Project ID	Created by	Created on	Last update
			5/22/2018	

FLYGT
a xylem brand

Issued: 11/11 Supersedes: 1/11

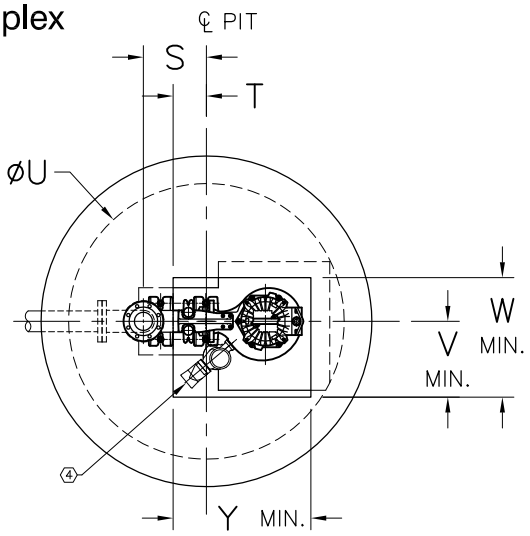
6820180

CP/DP/FP/NP-3127

NOTES:

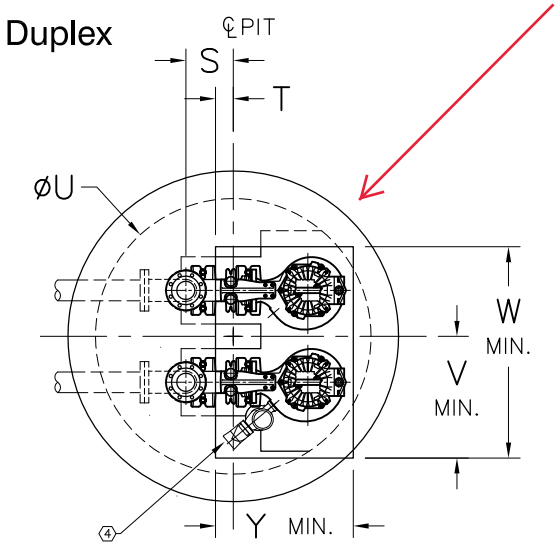
1. CONFIGURATION AND DIMS. SHOWN ARE SUGGESTED REQUIREMENTS ONLY. ALL DETAILS, INCLUDING SIZING OF PIT, TYPE, LOCATION AND ARRANGEMENT OF VALVES AND PIPING, ETC. ARE TO BE SPECIFIED BY THE CONSULTING ENGINEER AND ARE SUBJECT TO THEIR APPROVAL.
2. REFERENCE GENERIC DUPLEX LIFT STATION LAYOUT FOR ELEVATION VIEW.
3. LOCATE ANCHOR BOLTS USING INSIDE EDGE OF CLEAR OPENING AND PUMP CENTERLINE AS REFERENCE POINT. BOLT LOCATIONS MUST BE HELD TO MAINTAIN EXACT POSITION OF PUMP TO CLEAR OPENING.
4. FLYGT MIX-FLUSH VALVE.

Simplex

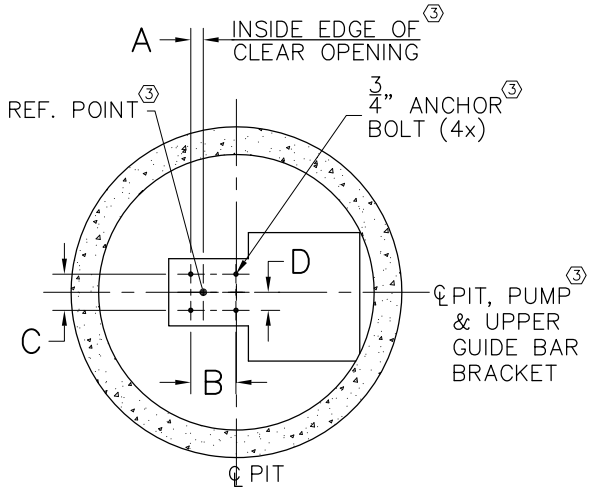


TOP VIEW

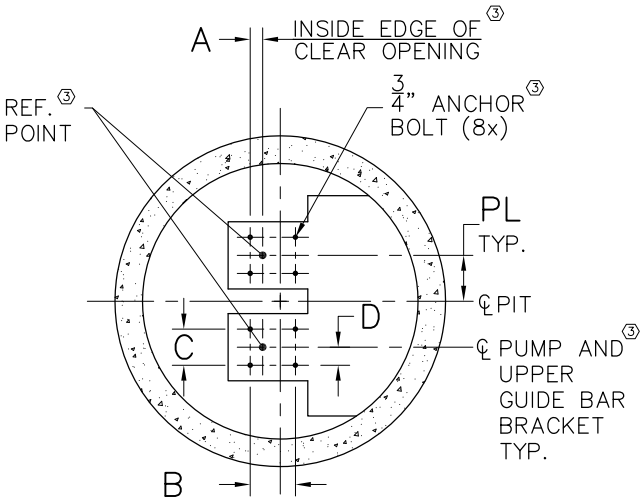
Duplex



TOP VIEW



BASE SECTION



BASE SECTION

ALL DIMENSIONS ARE IN INCHES

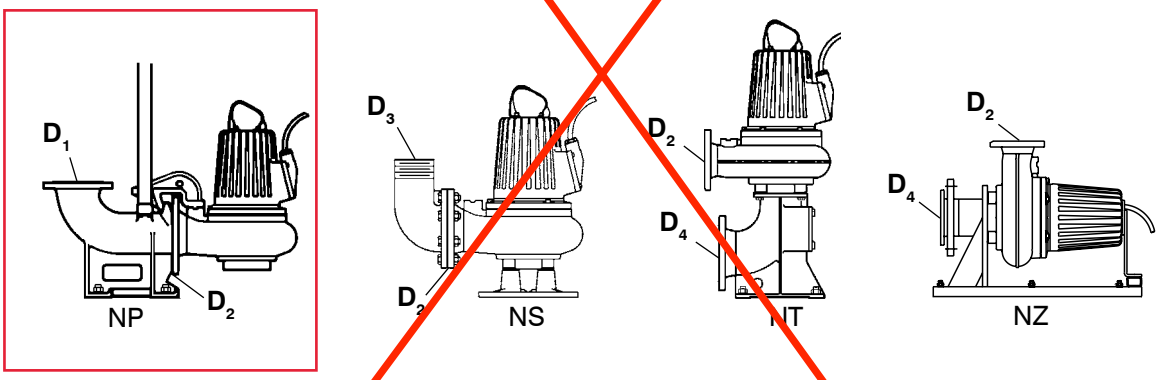
	MODEL	NOM. SIZE	VERSION	A	B	C	D	SIMPLEX S	T	U	V	W	Y	DUPLEX S	T	U	PL	V	W	Y
	FP/NP	3"	SH	2 3/8	9 7/8	8	4	15 1/4	9 1/4	60	17 1/2	26	30	19 3/8	13 3/8	72	8 1/2	26	43	30
***	CP	4"	HT	2 3/4	9 7/8	8	4	13 3/4	7 1/4	60	18 1/2	28	30	17	10 1/2	72	10	28 1/2	48	30
****	CP/NP	4"	HT	2 3/4	9 7/8	8	4	13 3/4	7 1/4	60	18 1/2	28	30	17	10 1/2	72	10	28 1/2	48	30
	DP	4"	MT	2 3/4	9 7/8	8	4	13 3/4	7 1/4	60	10 1/4	29	29	17	10 1/2	72	10	20 1/4	49	29
	CP/NP	4"	MT	2 3/4	9 7/8	8	4	13 3/4	7 1/4	60	16 1/2	26	30	17	10 1/2	72	10	28 1/2	46	30
*	CP/NP	6"	MT	4 3/8	11	10	5	11	3 3/8	60	16 1/4	26	30	13 1/4	5 5/8	72	11	28 1/2	48	30
**	CP/NP	6"	MT	4 3/8	11	10	5	11	3 3/8	60	17 1/2	26 1/2	30	13 1/2	5 7/8	72	11	28 1/2	48 1/2	30
	CP/NP	6"	LT	5 1/2	11	10	5	16	8 3/8	72	11 1/2	26 1/2	32	15 1/4	8 1/4	72	11	22 1/2	48 1/2	32
	CP/NP	8"	MT	5 1/2	11	10	5	14 3/8	5 1/2	72	17 1/2	26 1/2	30	10 1/4	1 3/8	72	11	28 1/2	48 1/2	30
	CP/NP	8"	LT	5 1/2	11	10	5	14 3/8	5 1/2	72	11 1/2	27 1/2	32	10 1/4	1 3/8	72	11	22 1/2	49 1/2	32

* WITH 4" VOLUTE OUTLET
** WITH 6" VOLUTE OUTLET
*** WITH 462 OR 463 IMPELLER
**** WITH 481, 483-485, 487-489 IMPELLER

N-3127.070

PUMP MODEL	IMPELLER CODE	HP RATING				VAC	D1	D2	D3	D4
		NP	NS	NT	NZ					
3127 3Ø	425 LT	10.0	10.0	--	--	208 230/460 575	6,8"	6"	6,8"	--
	426 LT	7.5,10	7.5,10	7.5	7.5		6,8"	6"	6,8"	*6,8"
	438 MT	10.0	10.0	--	--		4,6,8	4,6"	4,6"	6"
	439 MT	7.5,10	7.5,10	7.5	7.5		4,6,8	4,6"	4,6"	6"
	487 HT	10.0	10.0	--	--		4"	4"	4"	--
	488 HT	10.0	10.0	--	--					--
	489 HT	7.5,10	7.5,10	7.5	7.5					4"
	247 SH 248 SH 249 SH	11.0	11.0	11.0	11.0		3"	3"	3"	4"

LT = High Volume MT = Standard HT = High Head SH = Super High Head *NZ only



PUMP MODEL	IMPELLER CODE	HP RATING				VAC	D1	D2	D3	D4
		NP	NS	NT	NZ					
3127 1Ø	426 LT	7.5	7.5	--	--	230	6,8"	6"	6,8"	--
	439 MT	7.5	7.5	--	--		4,6,8	4,6"	4,6"	--
	489 HT	7.5	7.5	--	--		4"	4"	4"	--

FLYGT
a xylem brand

Issued: 9/14 Supersedes: 9/13

3127 Standard Pump Cable

Pump Model	HP	Volts	Ø	Cable Size/ Nominal O.D.	Part Number	No. of Cables	Max. Cable Length (Ft)
3127	10.0 Δ	208	3	4G10+S(2x0.5) 0.98"-(25.0 mm)	94 19 81	1	160
				*S3x10+3x10/3+S(4x0.5) 1.00"-(25.0mm)	94 19 92		
	Y//	230	3	4G6+2x1.5 0.94"-(24.0 mm)	94 20 56	1	135
	Y/SER	460	3	*S3x6+3x6/3+S(4x0.5) 0.83"-(21.0mm)	94 19 91	1	520
	Δ	575	3	4G2.5+2x1.5 0.69"-(17.5 mm)	94 20 59	1	345
				*S3x2.5+3x2.5/3+S(4x0.5) 0.75"-(19.0mm)	94 19 90		
	11.0						
	Δ	200	3	4G10+S(2x0.5) 0.98"-(25.0 mm)	94 19 81	1	145
	Y//	230	3			1	195
	Y/SER	460	3	*S3x10+3x10/3+S(4x0.5) 1.00"-(25.0mm)	94 19 92	1	790
	Δ	575	3	4G2.5+2x1.5 0.69"-(17.5 mm)	94 20 59	1	295
				*S3x2.5+3x2.5/3+S(4x0.5) 0.75"-(19.0mm)	94 19 90		
	12.0						
	Δ	200	3	4G10+S(2x0.5) 0.98"-(25.0 mm)	94 19 81	1	145
	Y//	230	3			1	195
	Y/SER	460	3	*S3x10+3x10/3+S(4x0.5) 1.00"-(25.0mm)	94 19 92	1	780
	Δ	575	3	4G2.5+2x1.5 0.69"-(17.5 mm)	94 20 59	1	305
				*S3x2.5+3x2.5/3+S(4x0.5) 0.75"-(19.0mm)	94 19 90		

50' of cable will be provided per pump

*Optional Shielded Cable - Use with **SmartRun™** intelligent controls.

See last page for break down of conductors used in one cable.

Note: Shielded cable max. lengths and number of cables are the same as standard cable.

N-3127.070

Materials of Construction

Components	Cast Iron Pump
Major Castings	Cast iron, A48, Class 35B
Pump Lifting Handle	Stainless steel
Motor Cable	Chloroprene rubber jacketed
Cable Entry Grommets	Nitrile rubber
Shaft	Stainless steel ASTM A479 S43100-T
Impeller (Adaptive)	Hard Iron™ (25 ASTM A-532 (Alloy III A) 25% chrome cast iron).
Insert Ring	Hard Iron™ (25 ASTM A-532 (Alloy III A) 25% chrome cast iron)
O-Rings	Nitrile rubber or optional Viton
Lubricant Plug	316 Stainless steel
Screws, studs and nuts	316 Stainless steel
Inner Mechanical Shaft Seal	*Tungsten carbide/ *Tungsten carbide
Outer Mechanical Shaft Seal	*Tungsten carbide/ *Tungsten carbide

*All corrosion and abrasion resistant

2

FLYGT
a xylem brand

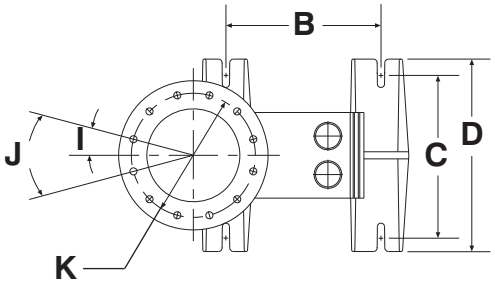
Issued: 2/12 Supersedes: 12/11

Standard NP Discharge Connections (Cast Iron)

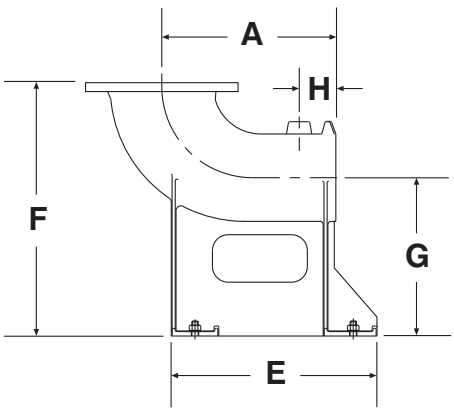
All dimensions (inches)

Pump Model	Part Number	Disch. Inlet	Disch. Outlet	A	B	C	D	E	F	G	H	I	J	K
2" - 3045, 3057, CP/FP-3068.	486 55 01	2"	2"-11 1/2 NPT	3 13/16	4	4 1/2	5 1/2	7 1/4	6 3/4	3 15/16	7/8	---	---	---
2 1/2" - DP/FP-3068.	493 17 06	2 1/2"	2 1/2"	11 5/8	7 7/8	4 3/4	7 7/8	11 7/16	9 7/8	6 1/2	4 9/16	45°	90° x 4	5 5/8
3" - 3045, 3057, CP-3068.	555 48 01	2"	3-8 NPT	6 3/4	5 1/2	4 1/8	5 1/2	10 3/4	6 3/4	3 15/16	7/8	---	---	---
3" - DP-3068, 3080, 3085, 3102, 3127, 3153.	444 68 05	3"	3"	14	9 7/8	8	10 5/8	15 3/8	15 3/4	7 7/8	4 9/16	45°	90° x 4	6
4" - 3080, 3085, 3102, 3127, 3153, 3171, 3202.	540 13 05	4"	4"	14 3/8	9 7/8	8	10 5/8	15 3/8	15 3/4	7 7/8	4 9/16	22.5°	45° x 8	7 1/2
6" - 3102, 3127(MT), 3153, 3171.	444 70 06	5 1/2"	6"	15 9/16	11	10	12 3/16	15 3/8	17 3/4	9 7/8	4 9/16	22.5°	45° x 8	9 1/2
6" - 3153, 3171, 3202.	602 33 06	5 1/2"	6"	15 9/16	11	10	12 3/16	15 15/16	17 3/4	9 7/8	4 9/16	22.5°	45° x 8	9 7/16
6" - R3231	388 25 06	6"	6"	20 11/16	19 3/4	15 3/4	19 3/4	23 5/8	15 3/4	7 7/8	6 7/8	22.5°	45° x 8	9 7/16
6" - 3127(LT), 3301, 3315.	604 56 06	6"	6"	15 9/16	11 1/8	10	12 3/16	15 15/16	18	10 1/8	4 9/16	22.5°	45° x 8	9 7/16

Note: Alternative discharge connections may be available, contact Flygt Application Engineering.



Caution:
Contact Flygt applications engineering department when making a pump/ discharge connection combination other than those paired in the chart above.



Note:
The discharge connection shown here is typical in appearence for most pumps.

3

FLYGT
a xylem brand

Issued: 6/13 Supersedes: 4/12

MiniCAS

Features

- 120 VAC, 24 VAC, or 24 VDC Powered
- Durable Plastic Enclosure with Flange for Mounting
- Leakage & Temperature Alarm Indication
- Power Applied Indication
- Temperature Alarm Reset Mode Select Switch
- Temperature Alarm Reset Push-button
- Sensor Input Transient & Short Circuit Protection

c UL us

UL FILE # 222351

MADE IN THE U.S.A.

Operation

The MiniCAS provides Motor Over Temperature and Seal Leakage protection for Flygt Submersible Pumps equipped with FLS or CLS sensors. The unit supplies 12 VDC to the sensor and measures the current through the sensor using protected, noise-filtered electronic circuitry. When sensor current is in the normal range, the Temperature Alarm Relay is activated to allow normal pump operation.

High Temperature Condition

In a motor High Temperature condition, the pump thermal contacts open and the current becomes zero. The Overtemp Indication is turned on and the Temperature Alarm Relay is deactivated, preventing pump operation. When the motor High Temperature condition has cleared, the unit will reset based on the position of the Alarm Reset Mode Select Switch (Auto or Manual). In the Auto position, the Overtemp Alarm resets automatically. In the Manual position, the Overtemp Reset Push-button must be pushed to clear the alarm.

Seal Leakage Condition

In a Seal Leakage condition, the Flygt FLS or CLS sensor decreases its internal resistance. The increased current is sensed, the Leakage Indication is turned on, and the Leakage Alarm Relay is activated.

Shorted Sensor Condition

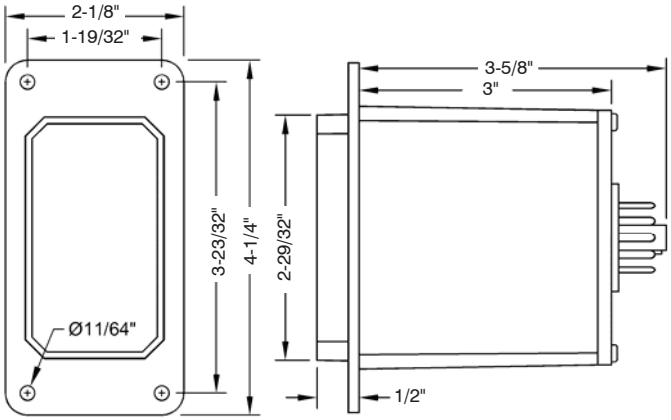
If the sensor wires are shorted, a Shorted Sensor condition is indicated by activating the Leakage Alarm Relay and alternately flashing both the Leakage and Overtemp LED together with the Power LED. If the short is removed, the fault will automatically reset within 30 seconds.

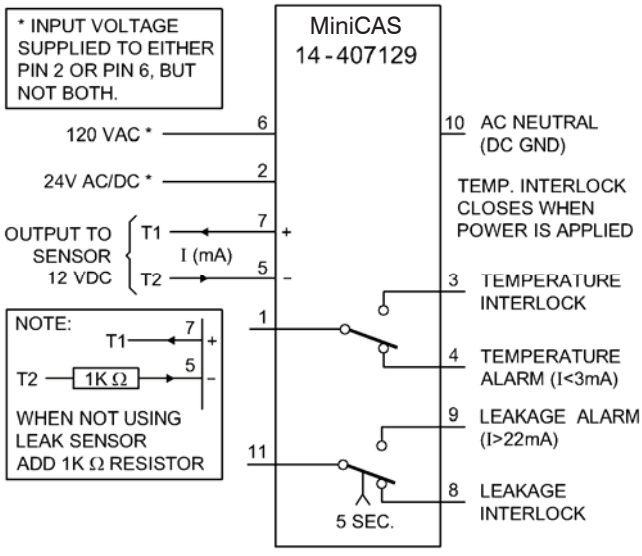
Cleared Fault Indication

For both Overtemp and Seal Leakage conditions, a cleared fault indication is provided. If either condition has occurred, but has been automatically cleared, then the corresponding Indication will slowly flash. The flashing indication may be manually removed by pressing the Overtemp Reset Push-button.

Specifications

Input Power:	120 VAC ± 10% 3.5 VA max. 24 VAC ± 10% 3.5 VA max. 24 VDC ± 10% 125 mA max.
Output Rating:	NEMA B300 Pilot Duty, 1/6th HP, 3A @ 240 VAC Form C
Operating Temp:	-20°C to 60°C
Storage Temp:	-40°C to 80°C
Sensor Voltage:	12 VDC ± 10%
Temp. Alarm Trip Point:	<3.0 mA ± 5%
Leak Alarm Trip Point:	>22 mA ± 5%
Shorted Sensor Trip Point:	>64 mA ± 5%
Enclosure:	Lexan
Base:	Phenolic





ORDERING INFORMATION

Part Number – **14-407129**

MiniCAS

Description:

The Flygt MiniCAS modules are relays especially designed to simultaneously supervise pump motor thermal switches and Flygt pump leakage detectors FLS (Stator housing) and/or CLS (Water-in-oil) installed in each small to medium Flygt pump (Models 3085 through 3300) or mixer (Series 4600).

The MiniCAS is using only two wires for two or more sensors connected in series and actually includes two current sensitive mini-relays. The principle of operation is: a 12 VDC voltage is sent to the pump sensors and the current through the input circuit is fed through the current mini-relays. One mini-relay is an overcurrent relay, the other is an undercurrent relay.

• If a normally closed thermal switch, installed into the stator winding, opens due to overheating, or one of the connecting leads is broken, the undercurrent relay will de-energize, changing its contacts status. The MiniCAS will shut down the pump.

• If the Flygt leakage sensor (FLS or CLS) is activated, the current through the sensor will increase and the overcurrent relay will be energized, changing the status of its contacts . The MiniCAS will send a "Leakage" signal or shut down the pump, depending on the MiniCAS external connections.

Flygt MiniCAS relays are available in two interchangeable variants:

• CURRENT PRODUCT - MiniCAS/FUS produced in the U.S. with a “Manual/Auto Reset” selector switch, which allows the pump to restart in “Auto Reset” position after the stator cools down and the thermal switches re-close. (See Technical Data next page).

14-40 71 29 (MiniCAS/FUS -120VAC / 24 VAC / 24 VDC)
14-40 70 97 (Socket, 11-pin) – optional

• LEGACY PRODUCT - MiniCAS II produced in Sweden with external manual reset after an overtemperature tripping.

83 58 57 (MiniCAS II - 24VAC)
40-50 10 98 (MiniCAS II - 120VAC)
14-40 70 97 (Socket, 11-pin) – optional

MiniCAS FUS Technical Data (US version)

Operation Principle:	Current sensing
Environment:	-20 to 60°C (-4 to 140°F)
Supply Voltage:	120 VAC 50-60 Hz ±10%, 24 VAC ±10%, 24 VDC ±10%
Relay Contact Rating:	3 A @ 240 VAC Form C
Voltage to Sensor:	12 VDC ±10%
Values of Operation:	3.0 mA<I<22 mA = OK conditions. I ≤ 3.0 mA = High temp. ±5%(or interrupt). I ≥ 22.0 mA = Leakage ±5% (or short circuit). (I = current measured by the MiniCAS/FUS). I > 64 mA ± 5% = Shorted Sensor Green LED On = Supply Voltage present. Green LED Off = No Supply Voltage present.

Leakage

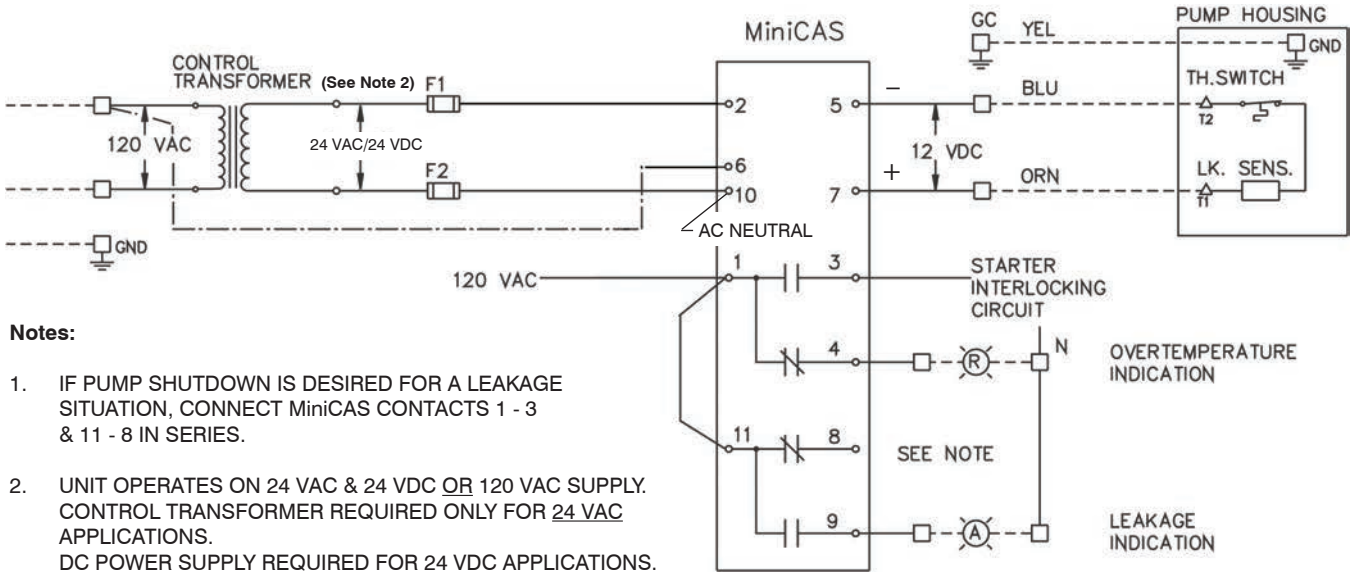
Contact:	3 A @ 240 VAC Form C (N.C. contact for interlocking)
Reset:	Automatic (N.O. contact for alarm)
LED Indicators:	Red LED On = Leakage indicated Red LED Off = No leakage indicated

Temperature

Contact:	3 A @ 240 VAC Form C (N.C. contact for interlocking, N.O. contact for alarm)
Reset:	Manual - by interrupting the supply for 1 sec. or by setting the toggle switch in the "Manual" mode. Automatic - by setting the toggle switch in the "Auto Reset" mode.
LED Indicators:	Red LED On = Over-temperature indicated. Red LED Off = No Over-temperature indicated
Physical Size:	Width: 2-1/8" Height: 4-1/4" Depth: 3-1/2" (+ socket depth)
Part Number:	14-40 71 29 (MiniCAS/FUS) 14-40 70 97 (Socket, 11-pin) - optional
Approvals:	UL - File 222351

Wiring Diagram MiniCAS FUS (US version)

Wiring Diagram (MiniCAS/FUS)



Notes:

1. IF PUMP SHUTDOWN IS DESIRED FOR A LEAKAGE SITUATION, CONNECT MiniCAS CONTACTS 1 - 3 & 11 - 8 IN SERIES.

2. UNIT OPERATES ON 24 VAC & 24 VDC OR 120 VAC SUPPLY. CONTROL TRANSFORMER REQUIRED ONLY FOR 24 VAC APPLICATIONS.
   DC POWER SUPPLY REQUIRED FOR 24 VDC APPLICATIONS.

Operation
The MiniCAS provides Motor Over Temperature and Seal Leakage protection for Flygt Submersible Pumps equipped with FLS or CLS sensors. The unit supplies 12 VDC to the sensor and measures the current through the sensor using protected, noise-filtered electronic circuitry. When sensor current is in the normal range, the Temperature Alarm Relay is activated to allow normal pump operation.

High Temperature Condition
In a motor High Temperature condition, the pump thermal contacts open and the current becomes zero. The Overtemp Indication is turned on and the Temperature Alarm Relay is deactivated, preventing pump operation. When the motor High Temperature condition has cleared, the unit will reset based on the position of the Alarm Reset Mode Select Switch (Auto or Manual). In the Auto position, the Overtemp Alarm resets automatically. In the Manual position, the Overtemp Reset Push-button must be pushed to clear the alarm.

Seal Leakage Condition
In a Seal Leakage condition, the Flygt FLS or CLS sensor decreases its internal resistance. The increased current is sensed, the Leakage Indication is turned on, and the Leakage Alarm Relay is activated.

Shorted Sensor Condition
If the sensor wires are shorted, a Shorted Sensor condition is indicated by activating the Leakage Alarm Relay and alternately flashing both the Leakage and Overtemp LED together with the Power LED. If the short is removed, the fault will automatically reset within 30 seconds.

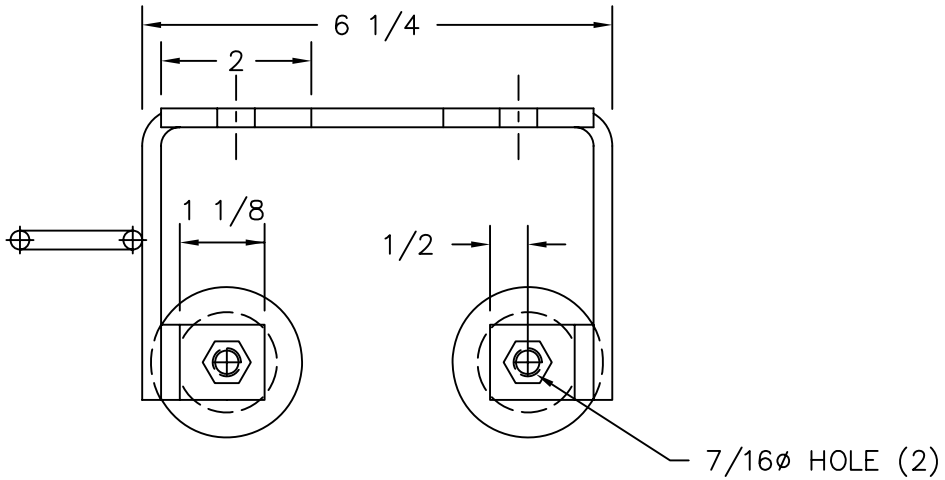
Cleared Fault Indication
For both Overtemp and Seal Leakage conditions, a cleared fault indication is provided. If either condition has occurred, but has been automatically cleared, then the corresponding Indication will slowly flash. The flashing indication may be manually removed by pressing the Overtemp Reset Push-button.

MiniCAS Specifications

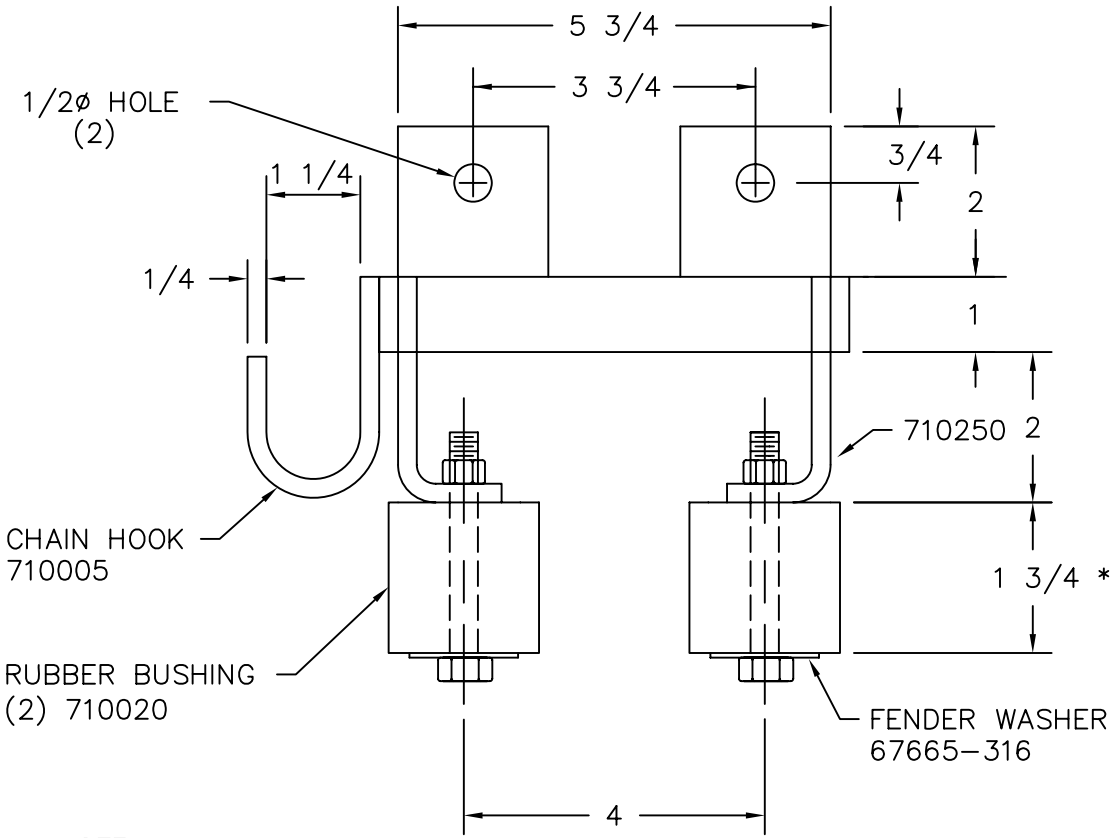
Furnish and install one Flygt MiniCAS (Mini Control and Status) module to monitor the temperature and leakage detectors installed in each Flygt pump or mixer. The MiniCAS shall be capable of monitoring the thermal switches embedded in the stator end coils, the Flygt FLS (float switch type) water-in-stator-housing sensor, and the Flygt CLS (capacitive type) water-in-oil sensor. The MiniCAS shall monitor both the series connected thermal switches and leakage sensor(s) by outputting 12 VDC on a single two wire circuit. When both CLS and FLS leakage sensors are specified they shall be connected in parallel with each other and then in series with the thermal switches.

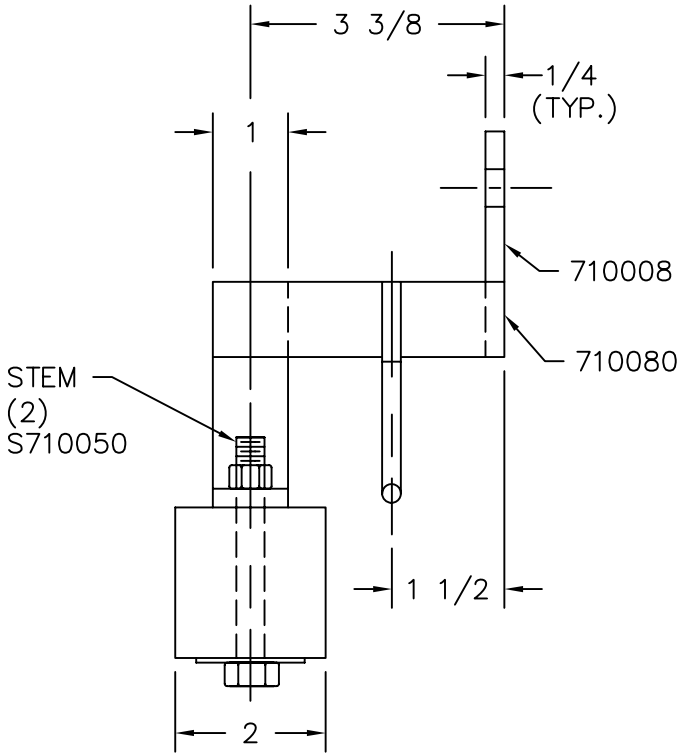
The MiniCAS circuitry shall operate on the current sensing principle whereby a change in temperature or leakage condition shall change the resistance of the associated sensor and thus alter the current in the sensing circuit. The MiniCAS shall contain two sets of form C dry contacts, one for overtemperature and one for leakage. The dry contacts shall change status upon occurrence of an over temperature or leakage condition so as to indicate that condition to other control components in the pump control panel. In the case of an overtemperature, and in keeping with Flygt's warranty policy, the overtemperature dry contacts shall be used to trip the pump off line. The MiniCAS shall be designed to be plugged into a standard 11-pin circular socket. Detailed technical data and wiring connections shall be found in the MiniCAS Manual.

4



QUA.	DESCRIPTION	LENGTH
2	1/4 X 2 PLATE	2
1	1/4 X 1 F.B.	13
2	1/4 X 1 F.B.	3 7/8
2	3/8–16 X 2 1/2 S.STL. BOLT	
2	3/8ø NUT & LOCK WASHER	
2	3/8 X 1 1/2 FENDER WASHER	
2	2 DIA. R. B.	1 3/4
1	1/4ø ROD	5



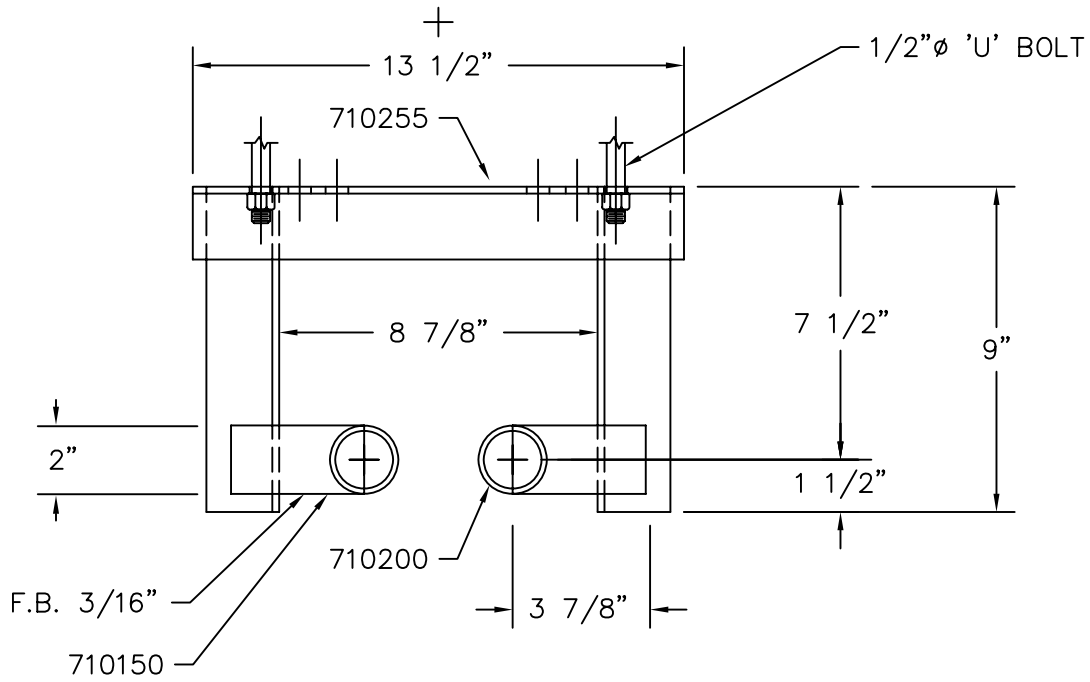


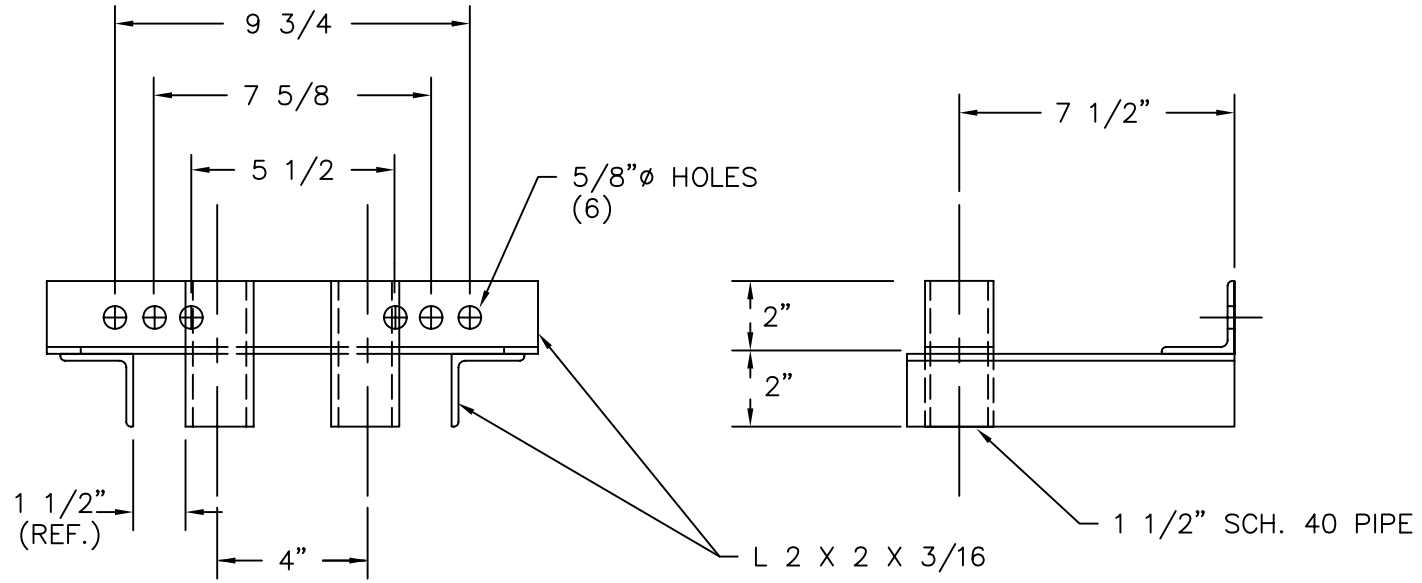
NOTE:
1) * = N.T.S.

HALLIDAY PRODUCTS
ORLANDO FL.

SCALE 3/8	2" UPPER GUIDE RAIL BRACKET FLYGT	STANDARD
DATE 9/14/92		APPROVED BY
REVISED 8/2/01	MATERIAL: STAINLESS STEEL	DWG. NO. U4CEAAFA

QUA.	DESCRIPTION	LENGTH
2	L 2 X 2 X 3/16	9"
1	L 2 X 2 X 3/16	13 1/2"
2	TRUE F.B. 3/16 X 2	3 7/8"
2	1 1/2 SCH 40 PIPE	4"
1	'U' BOLT W/	
NUTS & LOCK WASHERS		





HALLIDAY PRODUCTS
ORLANDO FL.

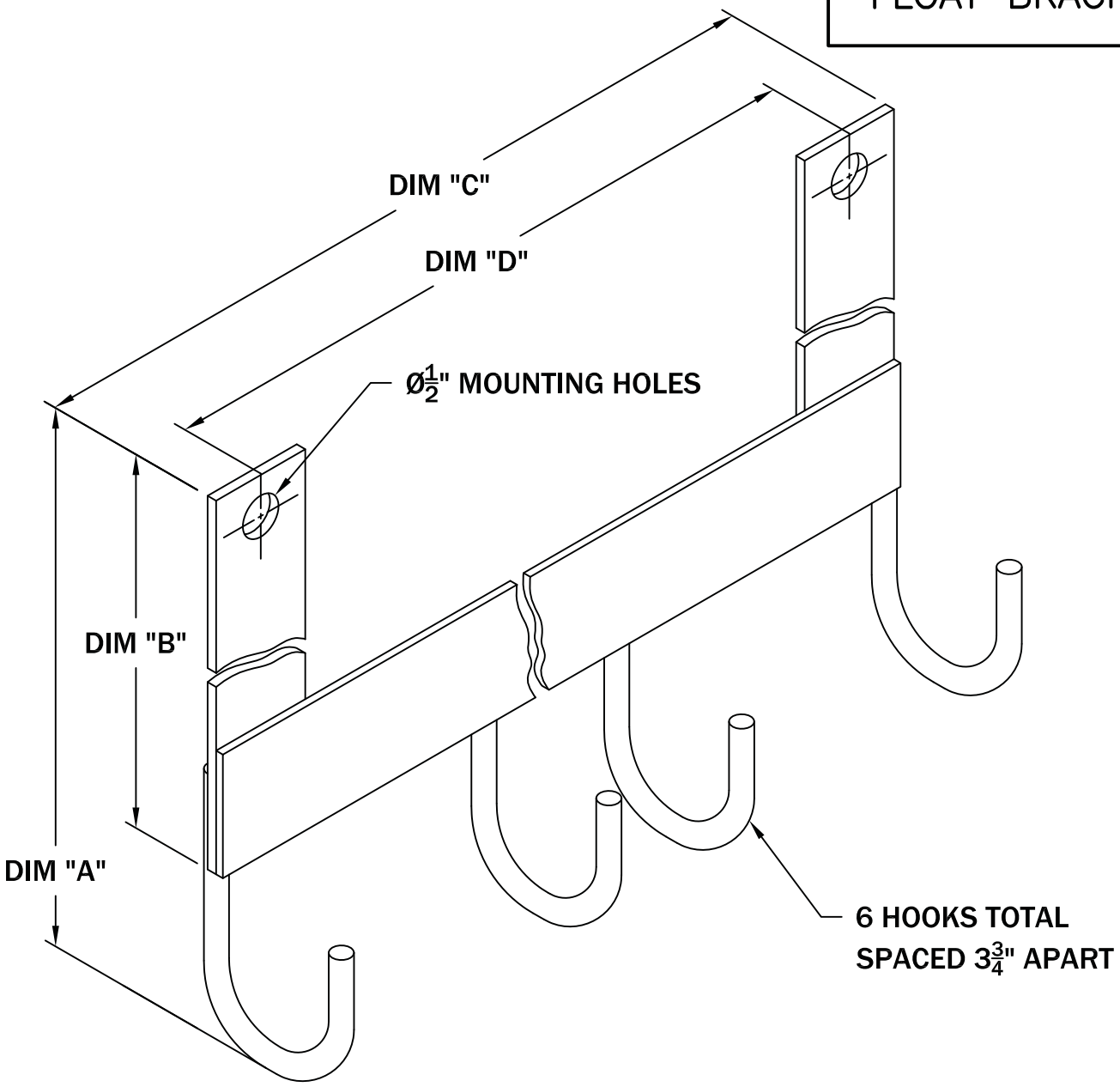
SCALE NONE	2" DOUBLE RAIL INTERMEDIATE GUIDE	STANDARD
DATE 4/14/92	RAIL BRACKET 4, 6, & 8 D.I.P.FLYGT	APPROVED BY
REVISED 8/3/01	MATERIAL: STAINLESS STEEL (T-304)	DWG. NO. U4DE-AFD

5

6AHB MODEL

FLOAT BRACKET

PAGE 1



MODEL NO.	DIA. "A"	DIM "B"	DIM "C"	DIM "D"	HOOK SPACING
6AHB	9”	7”	19 1/4”	18”	3 3/4”

CONERY MFG INC

CHANGES	TOLERANCES	DRAWN BY	DATE
F	DECIMALS .XXX = ±.005 .XX = ±.010 FRACTIONAL X/X = ±.1/64 ANGLES X° = ±1/2°	D. MIDDLETON	03/22/04
E		MATERIAL SPECIFICATION: 300 SERIES SST	
D			
C			
B			
A			

SPECIFICATION SHEET
DIMENSIONAL DATA

SCALE:	PART NO.
HALF	6AHB

6

STAINLESS STEEL PROOF COIL CHAIN

STAINLESS STEEL CHAIN TYPE 304

STAINLESS STEEL CHAIN TYPE 316

STOCK NUMBER		SIZE	FEET/DRUM	WEIGHT/FOOT (LBS.)	WORKING LOAD LIMIT (LBS.)
SS 304	SS 316				
SSPC125T304	SSPC125T316	1/8”	1,000’	0.20	375
SSPC187T304	SSPC187T316	3/16”	1,000’	0.35	800
SSPC250T304	SSPC250T316	1/4”	400’	0.60	1,400
SSPC312T304	SSPC312T316	5/16”	275’	0.88	1,800
SSPC375T304	SSPC375T316	3/8”	200’	1.40	2,800
SSPC500T304	SSPC500T316	1/2”	100’	2.43	4,500
SSPC625T304	SSPC625T316	5/8”	75’	3.90	6,800
SSPC750T304	SSPC750T316	3/4”	100’	5.51	9,500

Note: Stainless Steel proof coil chain is not suitable for overhead lifting.

STAINLESS STEEL HIGH TEST CHAIN

STAINLESS STEEL HIGH TEST CHAIN

SIZE	STOCK NUMBER	WEIGHT/FOOT (LBS.)	WORKING LOAD LIMIT (LBS.)
3/16”	SSHT187	0.35	1,200
1/4”	SSHT250	0.60	2,000
5/16”	SSHT312	0.88	2,850
3/8”	SSHT375	1.40	3,550
1/2”	SSHT500	2.43	6,500
5/8”	SSHT625	3.60	9,800
3/4”	SSHT750	5.50	14,000

Note: High test chain is not suitable for overhead lifting.

STAINLESS STEEL SPECIALTY CHAINS

STAINLESS STEEL SINGLE JACK CHAIN

STAINLESS STEEL DOUBLE LOOP CHAIN

STAINLESS STEEL SASH CHAIN

STRAIGHT LINK MACHINE CHAIN

STRAIGHT LINK COIL CHAIN

SIZE	TYPE	STOCK NUMBER	REEL SIZES
# 18	Single Jack	SSSJ18	100/Box
# 16	Single Jack	SSSJ16	100/Box
# 14	Single Jack	SSSJ14	100/Box
# 12	Single Jack	SSSJ12	100/Box
# 10	Single Jack	SSSJ10	100/Box
# 3	Double Loop	SSDL3	100/Box
2/0	Double Loop	SSDL2/0	100/Box
# 35	Sash	SSSASH#35	100/Box
# 25	Sash	SSSASH#25	100/Box
# 8	Sash	SSSASH#8	100/Box
2/0	Straight Link Machine Chain	SSPC2/0T304	100/Box

STAINLESS STEEL 316 SCREW PIN ANCHOR SHACKLES
With Oversized Pin

SIZE	STOCK NUMBER	PIN DIAMETER	WORKING LOAD LIMIT (LBS.)	WEIGHT/PIECE (LBS.)
3/16”	SSPA187	1/4”	650	0.11
1/4”	SSPA250	5/16”	1,000	0.12
5/16”	SSPA312	3/8”	1,300	0.18
3/8”	SSPA375	7/16”	1,500	0.31
7/16”	SSPA437	1/2”	2,000	0.48
1/2”	SSPA500	5/8”	3,000	0.68
5/8”	SSPA625	3/4”	4,000	1.26
3/4”	SSPA750	7/8”	6,000	2.10
7/8”	SSPA875	1”	8,000	3.32
1”	SSPA100	1 1/8”	10,000	4.80

STAINLESS STEEL SCREW PIN ANCHOR SHACKLE

STAINLESS STEEL 316 SCREW PIN BOW SHACKLES

SIZE	STOCK NUMBER	PIN DIAMETER	WORKING LOAD LIMIT (LBS.)	WEIGHT/PIECE (LBS.)
5/32”	SSPA156BOW	5/32”	200	0.02
3/16”	SSPA187BOW	3/16”	500	0.04
1/4”	SSPA250BOW	1/4”	750	0.06
5/16”	SSPA312BOW	5/16”	1,000	0.12
3/8”	SSPA375BOW	3/8”	1,200	0.25
1/2”	SSPA500BOW	1/2”	2,500	0.56
5/8”	SSPA625BOW	5/8”	3,000	1.05
3/4”	SSPA750BOW	3/4”	4,000	1.68
7/8”	SSPA875BOW	7/8”	5,000	2.52
1”	SSPA100BOW	1”	6,000	3.80
1 1/4”	SSPA1250BOW	1 1/4”	9,000	9.50

STAINLESS STEEL SCREW PIN BOW SHACKLE

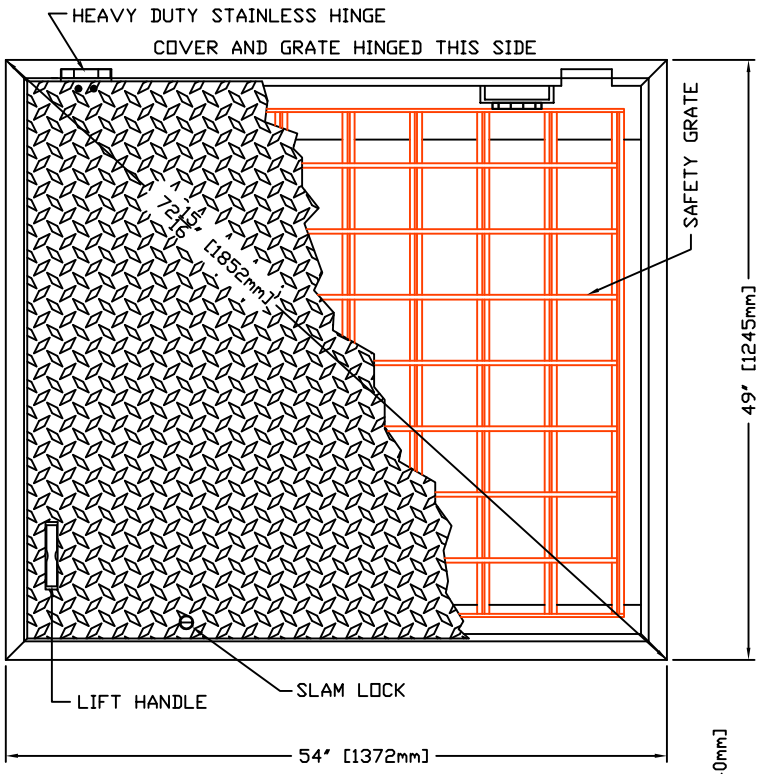
STAINLESS STEEL 316 SAFETY BOLT ANCHOR SHACKLES
With Oversized Pin

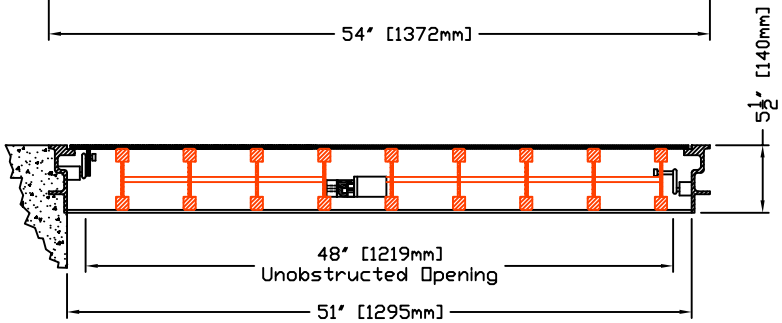
SIZE	STOCK NUMBER	PIN DIAMETER	WORKING LOAD LIMIT (LBS.)	WEIGHT/PIECE (LBS.)
1/4”	SSAS250	5/16”	1,000	0.12
5/16”	SSAS312	3/8”	1,500	0.18
3/8”	SSAS375	7/16”	2,000	0.31
7/16”	SSAS437	1/2”	3,000	0.48
1/2”	SSAS500	5/8”	4,000	0.68
5/8”	SSAS625	3/4”	6,000	1.26
3/4”	SSAS750	7/8”	8,000	2.10
7/8”	SSAS875	1”	10,000	3.32
1”	SSAS100	1 1/8”	12,000	4.80

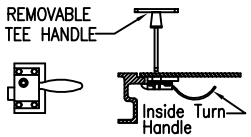
STAINLESS STEEL SAFETY BOLT ANCHOR SHACKLE

7

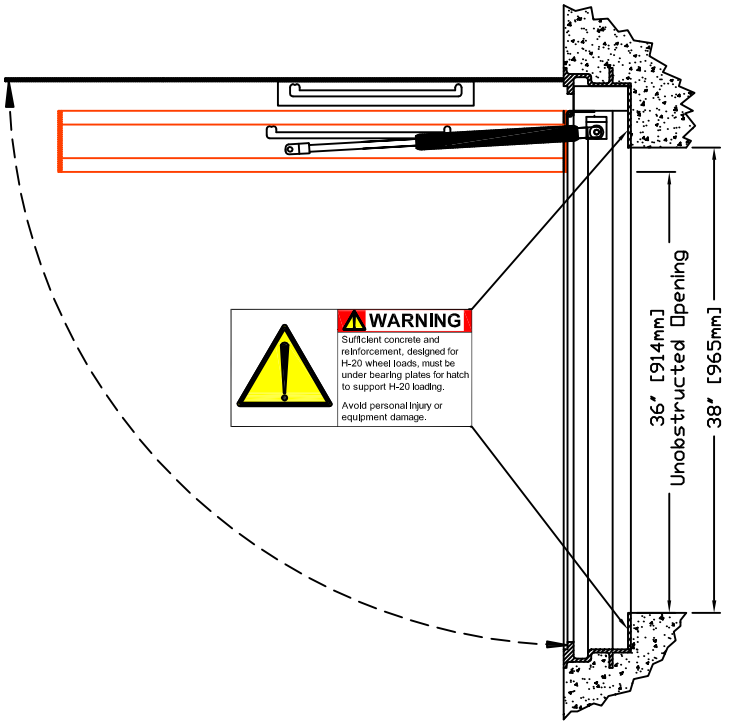
AHS1 Heavy Duty H-20 Rated SAFE HATCH®







STAINLESS STEEL SLAM LOCK



STYLE "AHS1" ACCESS HATCH, AS MANUFACTURED BY EJ.

MATERIAL SHALL BE 6061-T6 ALUMINUM FOR BARS, ANGLES, AND EXTRUSIONS. 1/4" DIAMOND PLATE SHALL BE 5086 ALUMINUM.

UNIT DESIGNED HEAVY DUTY, FOR 16,000 LBS + 30% IMPACT H-20 WHEEL LOADS, OVER A 10" X 20" CONTACT AREA. FRAME AND BEARING PLATE MUST BE CAST INTO AND SUPPORTED BY CONCRETE DESIGNED FOR H-20 WHEEL LOADS.

UNIT NOT SUITABLE FOR WHEEL LINE PLACEMENT.

UNIT SUPPLIED WITH A HEAVY DUTY PNEU-SPRING, FOR EASE OF OPERATION WHEN OPENING SAFETY GRATE. GRATE SHALL BE COUNTERBALANCED, SO ONE PERSON CAN EASILY OPEN THE SAFETY GRATE.

EACH DOOR SHALL BE EQUIPPED WITH A GRADE 316 STAINLESS STEEL HOLD OPEN ARM. DOOR SHALL LOCK OPEN IN THE 90 DEGREE POSITION. HOLD OPEN ARM SHALL BE FASTENED TO THE FRAME WITH A 1/2" GRADE 316 STAINLESS STEEL BOLT.

ANGLE FRAME SHALL BE OF EXTRUDED ALUMINUM, WITH A CONTINUOUS 1-1/2" ANCHOR FLANGE.

COVER HINGES SHALL BE OF HEAVY DUTY DESIGN. MATERIAL SHALL BE GRADE 316 STAINLESS STEEL. EACH HINGE SHALL HAVE A GRADE 316 STAINLESS STEEL, 3/8" DIAMETER HINGE PIN. HINGE SHALL BE FASTENED TO ANGLE AND DIAMOND PLATE WITH GRADE 316 STAINLESS STEEL BOLTS AND NY-LOCK NUTS.

ALL HARDWARE SHALL BE STAINLESS STEEL.

EACH HATCH SHALL BE SUPPLIED WITH A GRADE 316 STAINLESS STEEL SLAM LOCK, WITH KEY WAY PROTECTED BY A THREADED REMOVABLE PLUG. PLUG SHALL BE FLUSH WITH THE TOP OF THE 1/4" DIAMOND PLATE. SLAM LOCK SHALL BE FASTENED WITH FOUR GRADE 316 STAINLESS STEEL BOLTS AND WASHERS.

EACH HATCH SHALL BE EQUIPPED WITH A STAINLESS STEEL LIFT HANDLE. THE LIFT HANDLE SHALL BE FLUSH WITH THE TOP OF THE 1/4" DIAMOND PLATE.

UNIT SHALL BE SUPPLIED WITH HINGED SAFETY GRATES TO PROVIDE PROTECTION AGAINST FALL THROUGH AND TO CONTROL ACCESS TO THE CONFINED SPACE.

Product Number

H36481291

Design Features

-Materials
Aluminum
-Design Load
Heavy Duty (Not in Driving Lane)

AHS1
-Coating
Mill Finish

Certification

WT 243 lbs

Country of Origin: Made in USA

Drawing Revision

11/01/12 Designer: TJM
Revised By:

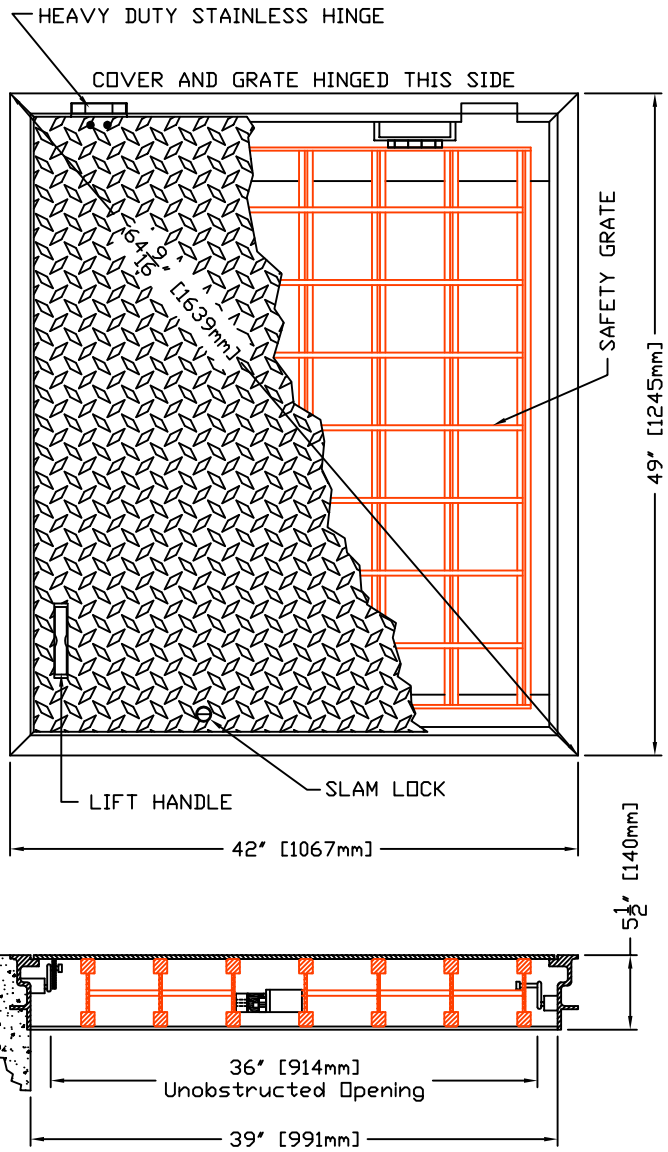
Disclaimer

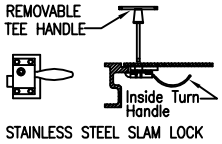
Weights (lbs/kg), dimensions (inches/mm) and drawings provided for your guidance. We reserve the right to modify specifications without prior notice.

Contact

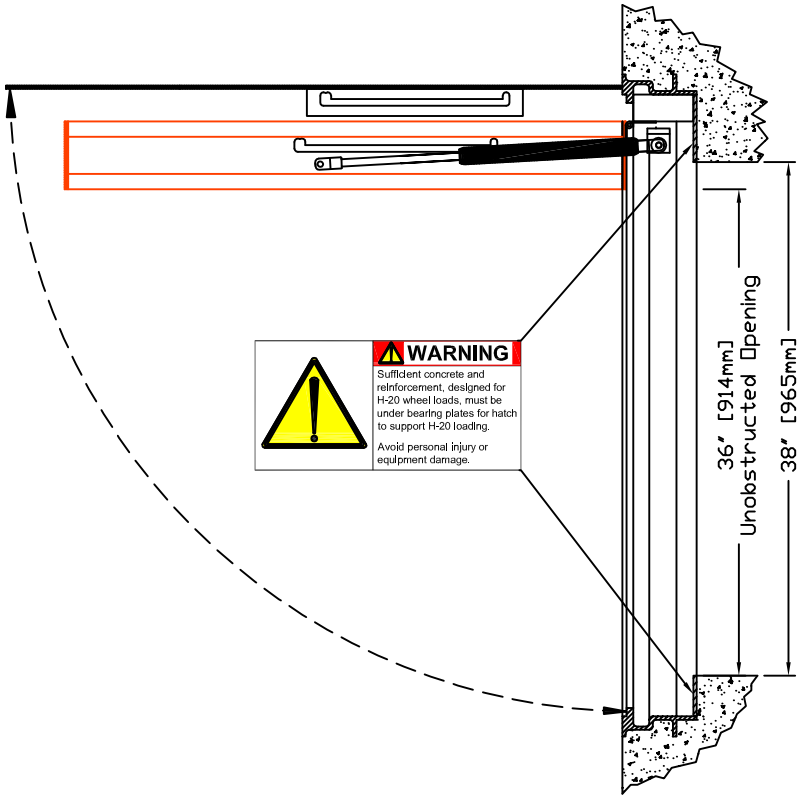
800 626 4653
ejco.com

AHS1 Heavy Duty H-20 Rated SAFE HATCH®





STAINLESS STEEL SLAM LOCK



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MATERIAL SHALL BE 6061-T6 ALUMINUM FOR BARS, ANGLES, AND EXTRUSIONS. 1/4" DIAMOND PLATE SHALL BE 5086 ALUMINUM.

UNIT DESIGNED HEAVY DUTY, FOR 16,000 LBS + 30% IMPACT H-20 WHEEL LOADS, OVER A 10" X 20" CONTACT AREA. FRAME AND BEARING PLATE MUST BE CAST INTO AND SUPPORTED BY CONCRETE DESIGNED FOR H-20 WHEEL LOADS.

UNIT NOT SUITABLE FOR WHEEL LINE PLACEMENT.

UNIT SUPPLIED WITH A HEAVY DUTY PNEU-SPRING, FOR EASE OF OPERATION WHEN OPENING SAFETY GRATE. GRATE SHALL BE COUNTERBALANCED, SO ONE PERSON CAN EASILY OPEN THE SAFETY GRATE.

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UNIT SHALL BE SUPPLIED WITH HINGED SAFETY GRATES TO PROVIDE PROTECTION AGAINST FALL THROUGH AND TO CONTROL ACCESS TO THE CONFINED SPACE.

Product Number

H36361291

Design Features

-Materials
Aluminum
-Design Load
Heavy Duty (Not in Driving Lane)

AHS1
-Coating
Mill Finish

Certification

WT 196 lbs

Country of Origin: Made in USA

Drawing Revision

11/01/12 Designer: TJM
Revised By:

Disclaimer

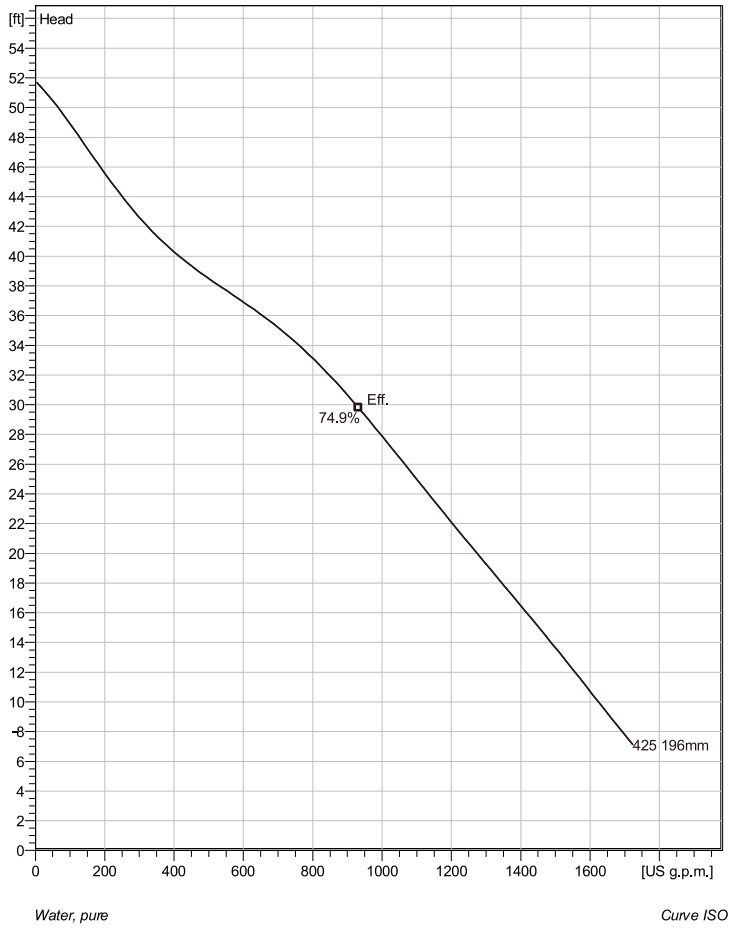
Weights (lbs/kg), dimensions (inches/mm) and drawings provided for your guidance. We reserve the right to modify specifications without prior notice.

Contact

800 626 4653
ejco.com

NP 3127 LT 3~ Adaptive 425

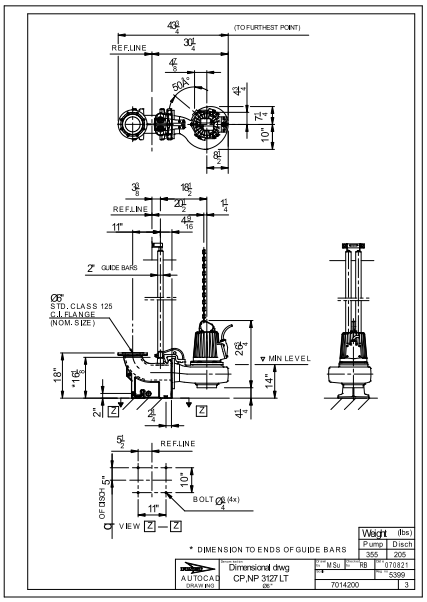
Technical specification



Water, pure *Curve ISO*

Note: Picture might not correspond to the current configuration.

Installation: P - Semi permanent, Wet



General

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

Impeller

Impeller material	Hard-Iron
Discharge Flange Diameter	5 7/8 inch
Suction Flange Diameter	5 7/8 inch
Impeller diameter	196 mm
Number of blades	2

Motor

Motor #	N3127.070 21-12-4AL-W 10hp FM
Stator variant	28
Frequency	60 Hz
Rated voltage	208 V
Number of poles	4
Phases	3~
Rated power	10 hp
Rated current	28 A
Starting current	169 A
Rated speed	1740 rpm
Power factor	
1/1 Load	0.88
3/4 Load	0.85
1/2 Load	0.78
Motor efficiency	
1/1 Load	84.6 %
3/4 Load	85.5 %
1/2 Load	84.5 %

Configuration

Project	Project ID	Created by	Created on	Last update
			6/25/2018	

NP 3127 LT 3~ Adaptive 425

Performance curve

Pump

Discharge Flange Diameter	5 7/8 inch
Suction Flange Diameter	150 mm
Impeller diameter	$7^{11}/_{16}$"
Number of blades	2

Motor

Motor #	N3127.070 21-12-4AL-W 10hp
Stator variant	28
Frequency	60 Hz
Rated voltage	208 V
Number of poles	4
Phases	3~
Rated power	10 hp
Rated current	28 A
Starting current	169 A
Rated speed	1740 rpm

Power factor	
1/1 Load	0.88
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1/2 Load	0.78

Motor efficiency	
1/1 Load	84.6 %
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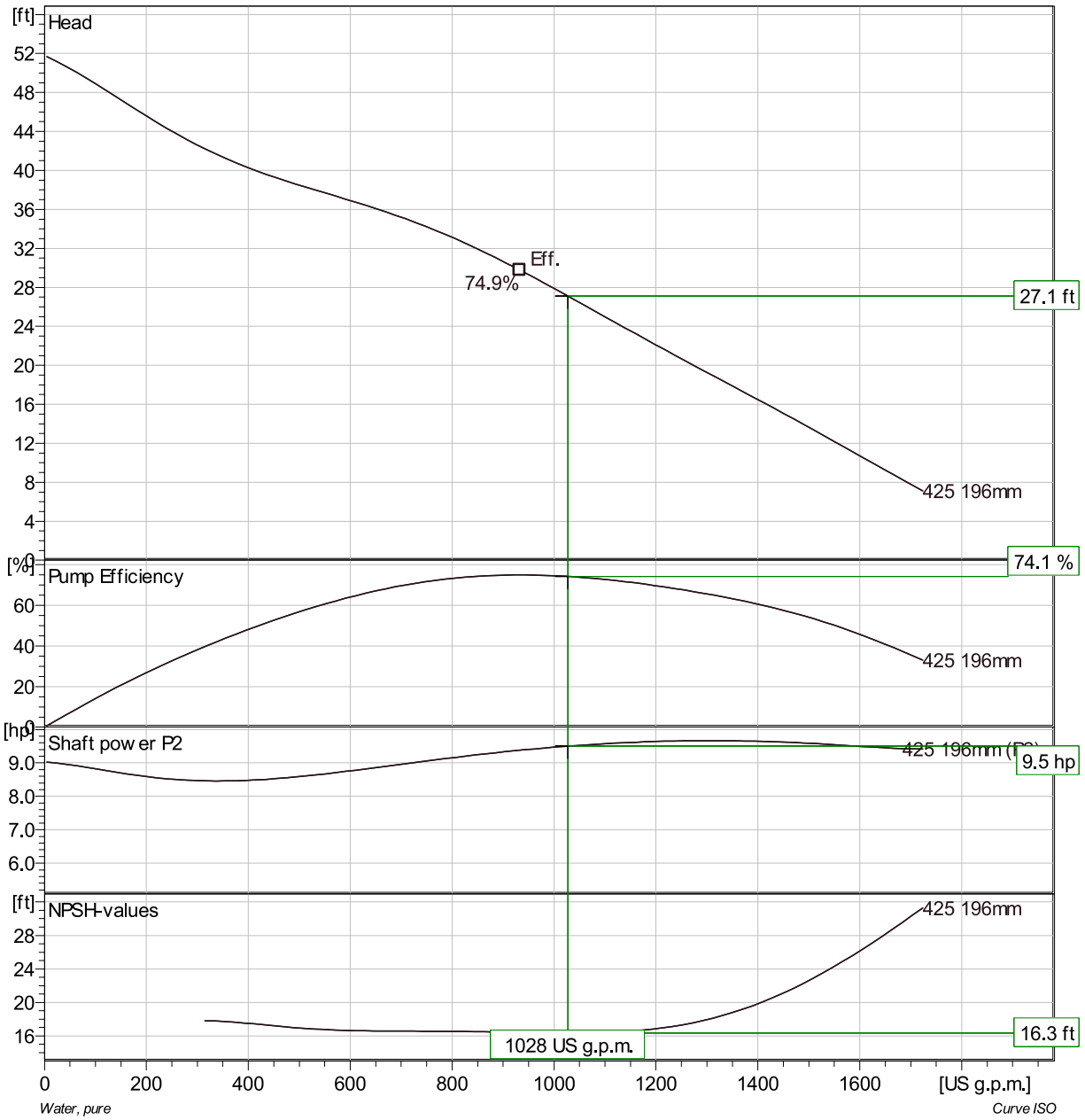
1/2 Load	84.5 %

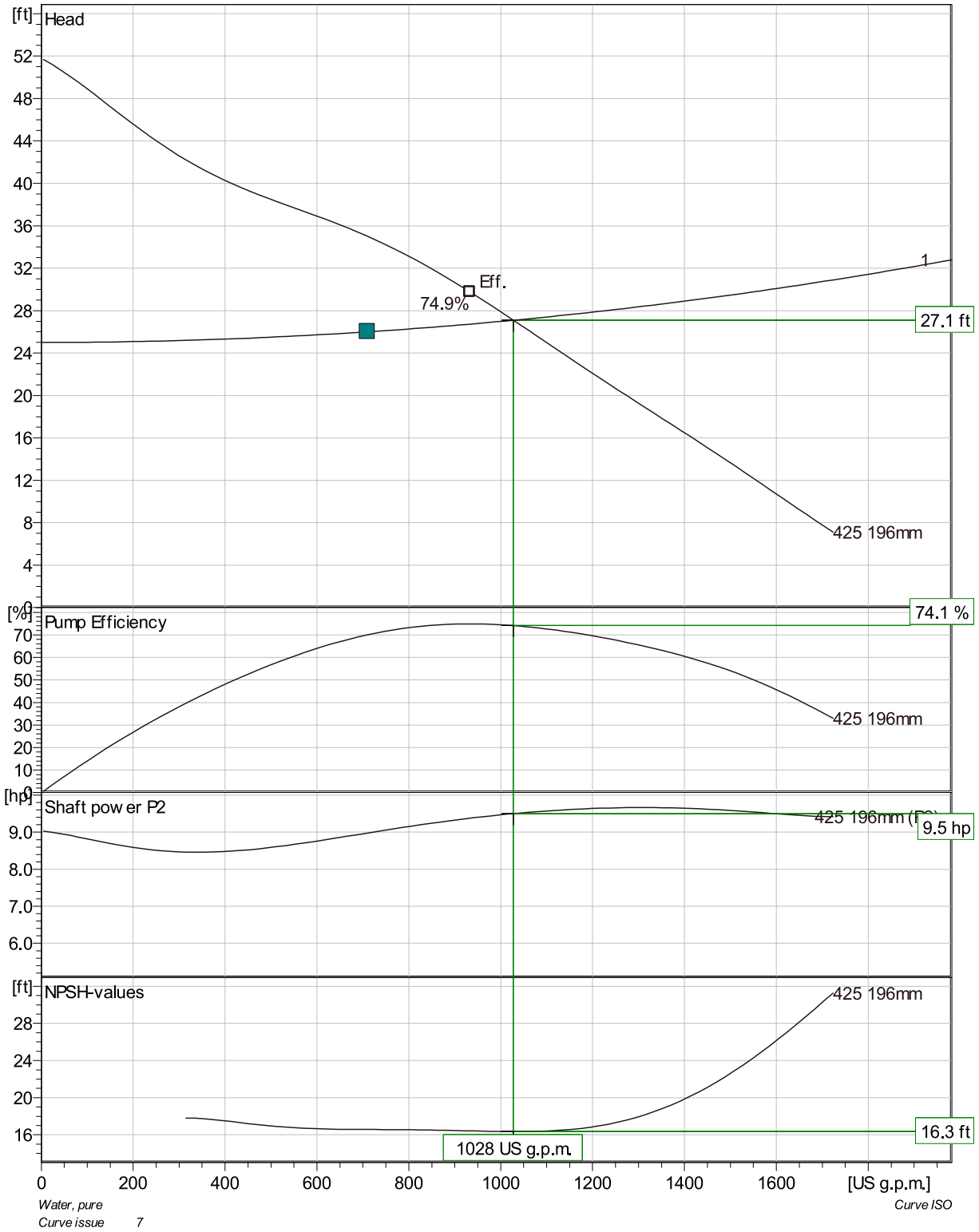


Duty point		Guarantee
Flow	Head	
710 US g.p.m.	26 ft	No

Project	Project ID	Created by	Created on	Last update
			6/25/2018	

NP 3127 LT 3~ Adaptive 425

Duty Analysis

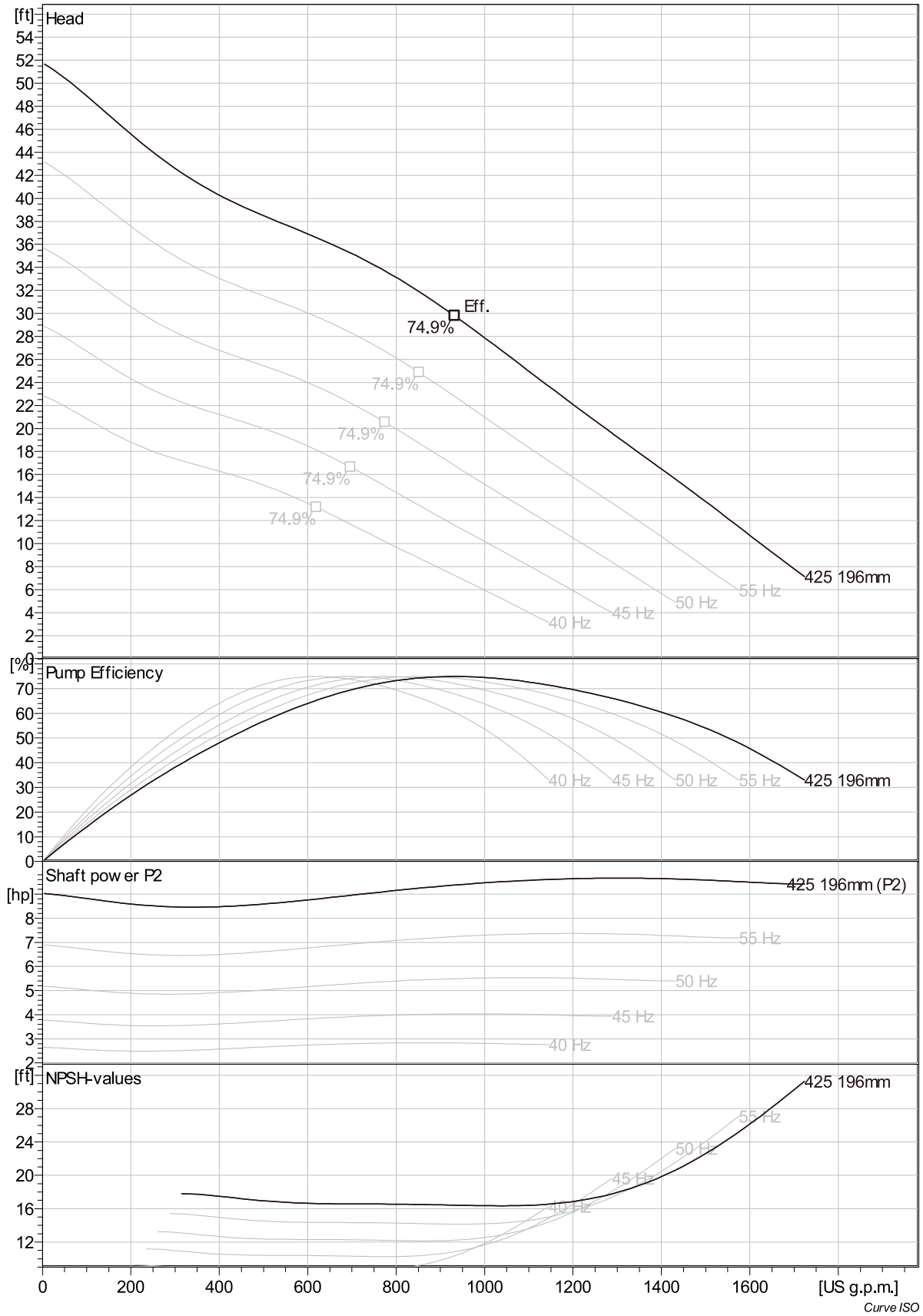


Pumps running /System	Individual pump			Total					
	Flow	Head	Shaft power	Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
1	1030 US g.p.m.	27.1 ft	9.5 hp	1030 US g.p.m.	27.1 ft	9.5 hp	74.1 %	135 kWh/US MG	16.3 ft

Project	Project ID	Created by	Created on	Last update
			6/25/2018	

NP 3127 LT 3~ Adaptive 425

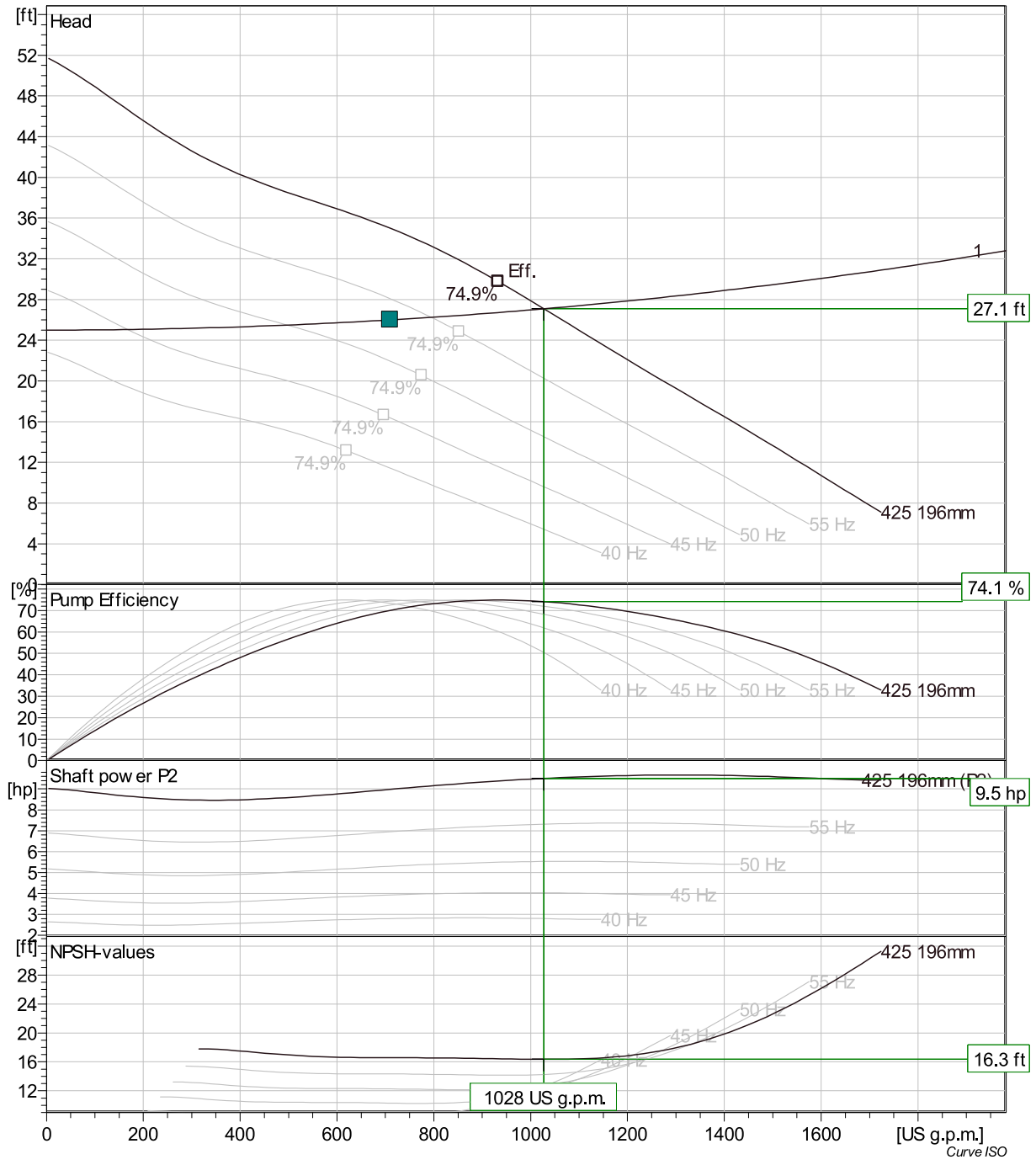
VFD Curve



Project	Project ID	Created by	Created on	Last update
			6/25/2018	

NP 3127 LT 3~ Adaptive 425

VFD Analysis

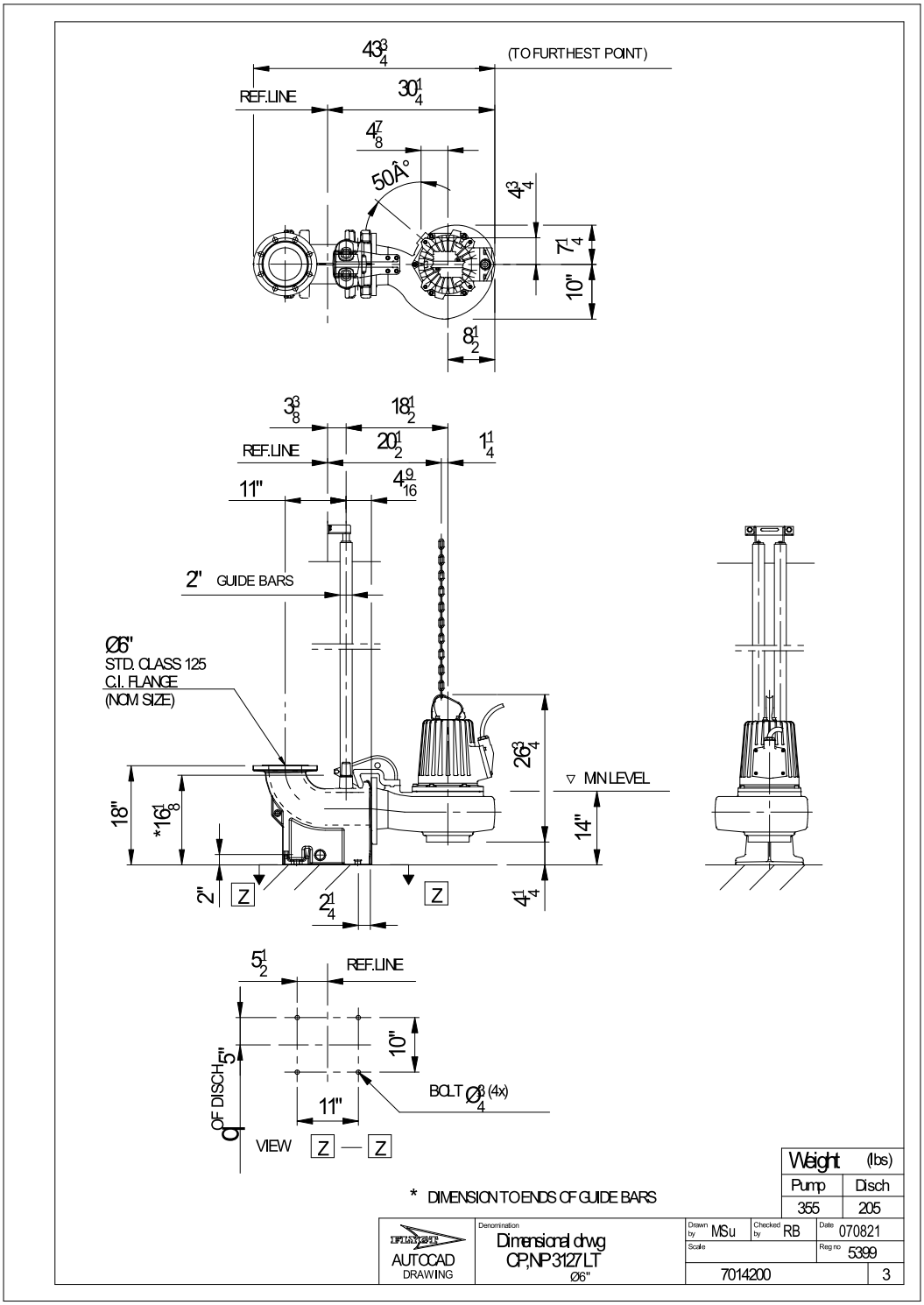


Pumps running /System	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSHre
1	58.2 Hz	1030 US g.p.m.	27.1 ft	9.5 hp	1030 US g.p.m.	27.1 ft	9.5 hp	74.1 %	135 kWh/US MG	16.3 ft
1	55 Hz	795 US g.p.m.	26.3 ft	7.08 hp	795 US g.p.m.	26.3 ft	7.08 hp	74.5 %	129 kWh/US MG	14.3 ft
1	50 Hz	497 US g.p.m.	25.5 ft	5.02 hp	497 US g.p.m.	25.5 ft	5.02 hp	63.9 %	148 kWh/US MG	12.4 ft
1	45 Hz	168 US g.p.m.	25.1 ft	3.57 hp	168 US g.p.m.	25.1 ft	3.57 hp	29.7 %	320 kWh/US MG	
1	40 Hz									

Project	Project ID	Created by	Created on	Last update
			6/25/2018	

NP 3127 LT 3~ Adaptive 425

Dimensional drawing



Project	Project ID	Created by	Created on	Last update
			6/25/2018	

Appendix E: Control Panel for MH 250 Shop Drawing.

Appendix F: Ventilation Fan

Appendix G: Dehumidifier

Appendix H: Unit Heater

Submittal #22 14 50-004.0
22 14 50 - Rainwater Harvesting System

Mortenson Construction
700 Meadow Lane North
Minneapolis, Minnesota 55422
Phone: (763) 522-2100
Fax: (763) 287-5457

Project: 16030010 - MN United-MN Soccer Stadium
400 Snelling Ave N
St. Paul, Minnesota 55104

Exhaust Fan for Vault 200

SPEC SECTION:	22 14 50 - Rainwater Harvesting System	**SUBMITTAL MANAGER:**	Dan Kimlinger **(Harris Companies)**
STATUS:	Open	**DATE CREATED:**	08/3/2018
ISSUE DATE:		**REVISION:**	0
RESPONSIBLE CONTRACTOR:	Harris Companies	**RECEIVED FROM:**	
RECEIVED DATE:		**SUBMIT BY:**	
FINAL DUE DATE:	08/22/2018	**LOCATION:**	
TYPE:	Product Data	**COST CODE:**	
APPROVERS:	Populous CA **(Populous Group Llc)**, Maria Bumgarner **(Mortenson Construction - Minneapolis Office)**		

BALL IN COURT:
Maria Bumgarner **(Mortenson Construction - Minneapolis Of)**

DISTRIBUTION:
Maria Bumgarner **(Mortenson Construction - Minneapolis Off)** , Taylor Decker **(Mortenson Construction - Minneapolis Off)**

DESCRIPTION:
This submittal contains the product data sheet for the FanTech Proair Exhaust fan for the Rainwater management system in Vault 200

ATTACHMENTS:
221450-PD-004.0 Vault 200 Exhaust Fan.pdf

SUBMITTAL WORKFLOW

NAME	SUBMITTER/ APPROVER	SENT DATE	DUE DATE	RETURNED DATE	RESPONSE	ATTACHMENTS	COMMENTS
Maria Bumgarner	Approver		8/16/2018		Pending		
Populous CA	Approver		8/22/2018		Pending		

CHECKED
By: MCB
M.A. Mortenson Company
08/08/2018

This check is only for conformance to and compliance with the Contract documents, and does not in any way relieve the Subcontractor or Supplier of the responsibility to verify accuracy of details, quantities and dimensions. The Subcontractor or Supplier remains responsible for dimensions to be confirmed and correlated at the Project Site, for information that pertains solely to fabrication process or to techniques of construction and for cordination of its work with others.

221450-PD-004.0 Vault 200 Exhaust Fan.pdf

LHB SUBMITTAL REVIEW

☒ Reviewed (Note any Comments) ☐ Rejected (Submit Specified Item)
☐ Resubmit (Make Corrections) ☐ Returned (No Review Required)

This review is only for general conformance with the design concept and the information in the Construction Documents. Comments do not relieve the contractor from compliance with the requirements of the plans and specifications. The Contractor is responsible for dimensions, fabrication, means, methods, sequences and procedures of construction including coordination of the Work.

By: DTW Date: 8/15/18

BY **DATE** **COPIES TO**

HARRIS

Date: 8/3/2018

Submittal

Submittal Number: 221450-PD-004.0

Project:	MN United Stadium
Address:	400 Snelling Ave N St. Paul, Minnesota
Contractor:	Harris
Equipment:	FanTech Proair 8 EC Exhaust Fan
	Tag: N/A
Specification Section:	22 14 50 B
Supplier:	Enter Name of Supplier
	Street Address
	City, State, Zip
Equipment Manufacturer:	FantTech
Date Issued:	8/3/2018
Date Requested By:	8/17/2018

Note:

This submittal includes the FanTech Proair exhaust fan for the Vault 200 rainwater management system.

fantech®
a systemair company

PRIOAIR 8 EC

Item no. 49316

Document type: **Product card**
Document date: **2018-08-03**
Generated by: **Systemair Online Catalogue**

Description

Application
The prio**Air** series is designed for installation in ducts. Extremely efficient, prio**Air** fans are perfect for a wide assortment of powerful, quiet air-moving applications.
Design
Compact size, low noise, very high efficiency and air tight casing. Aerodynamically optimized impellers and guide vanes with integrated external rotor motors. Includes a mounting bracket. Special composite material is corrosion-proof and light weight.
Speed control
The prio**Air** EC fan motor's speed is controlled via a 0-10Vdc signal. The motor provides a +10V reference that can be used by a remotely-mounted potentiometer (such as MTP 10). The motor can also be controlled by an externally-provided 0-10Vdc signal that can come from any device or a Building Management System (BMS). The fan's motor also provides operational speed (tachometer pulse) output that can be used to verify fan operation. These control features allow the prio**Air** EC to be integrated into and play an active role in smart HVAC systems in buildings.
Motor protection
Thermal overload protection with automatic reset.

Technical parameters

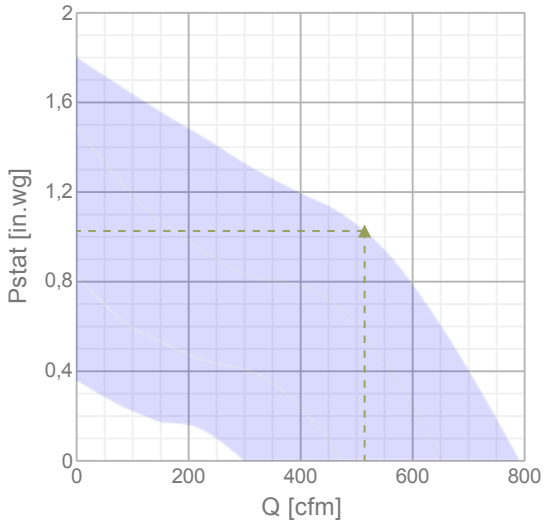
Nominal data		
Voltage	120	V
Frequency	60	Hz
Phase	1	~
Input power (P1)	123	W
Current	1,58	A
Max. airflow	790	cfm
Fan impeller speed	3619	r.p.m.
Weight	3,4	kg

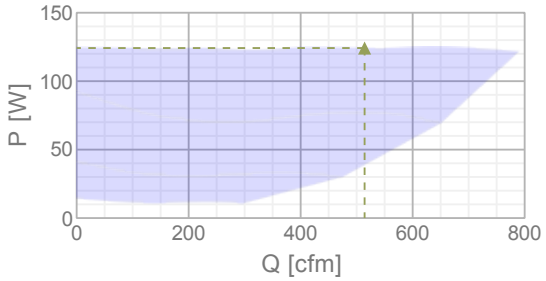
Temperature data		
Max. temperature of transported air	55	°C

Protection / Classification		
Insulation class	B	
Enclosure class, motor	IP44	

Performance

Diagrams





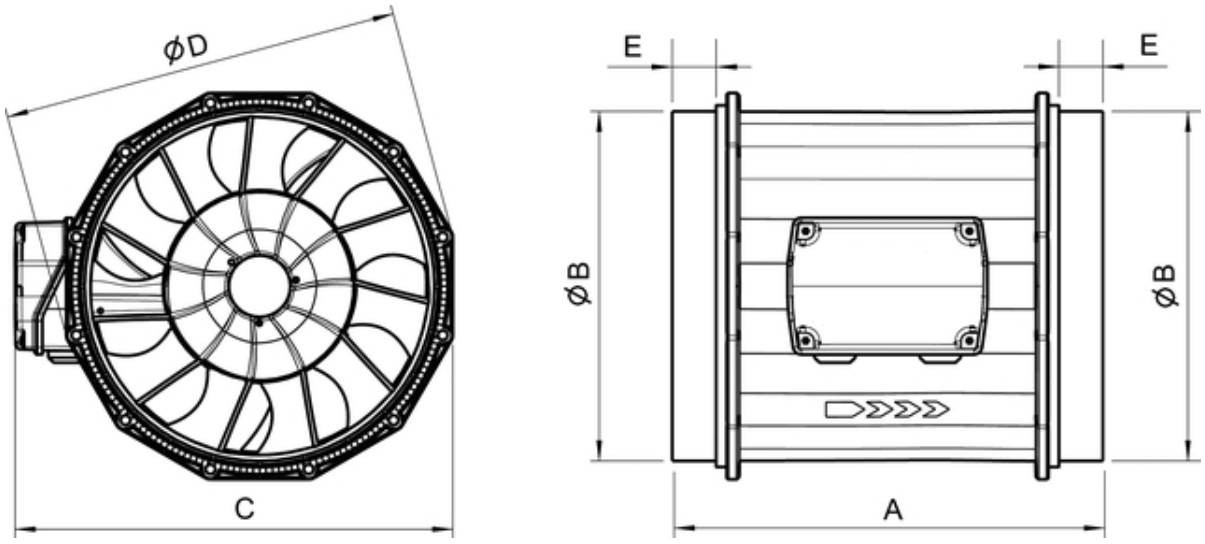
Max efficiency

Hydraulic data		
Working air flow	514	cfm
Working static pressure	1,03	in.wg
Power	124	W
Speed	3530	r.p.m.
Current	1,6	A
SFP	0,512	kW/(m³/s)
Voltage	120	V

Sound power level		63	125	250	500	1k	2k	4k	8k	Tot
Inlet	dB(A)	45	59	68	71	70	70	63	55	76
Outlet	dB(A)	48	61	63	73	70	69	62	55	76

Loudness

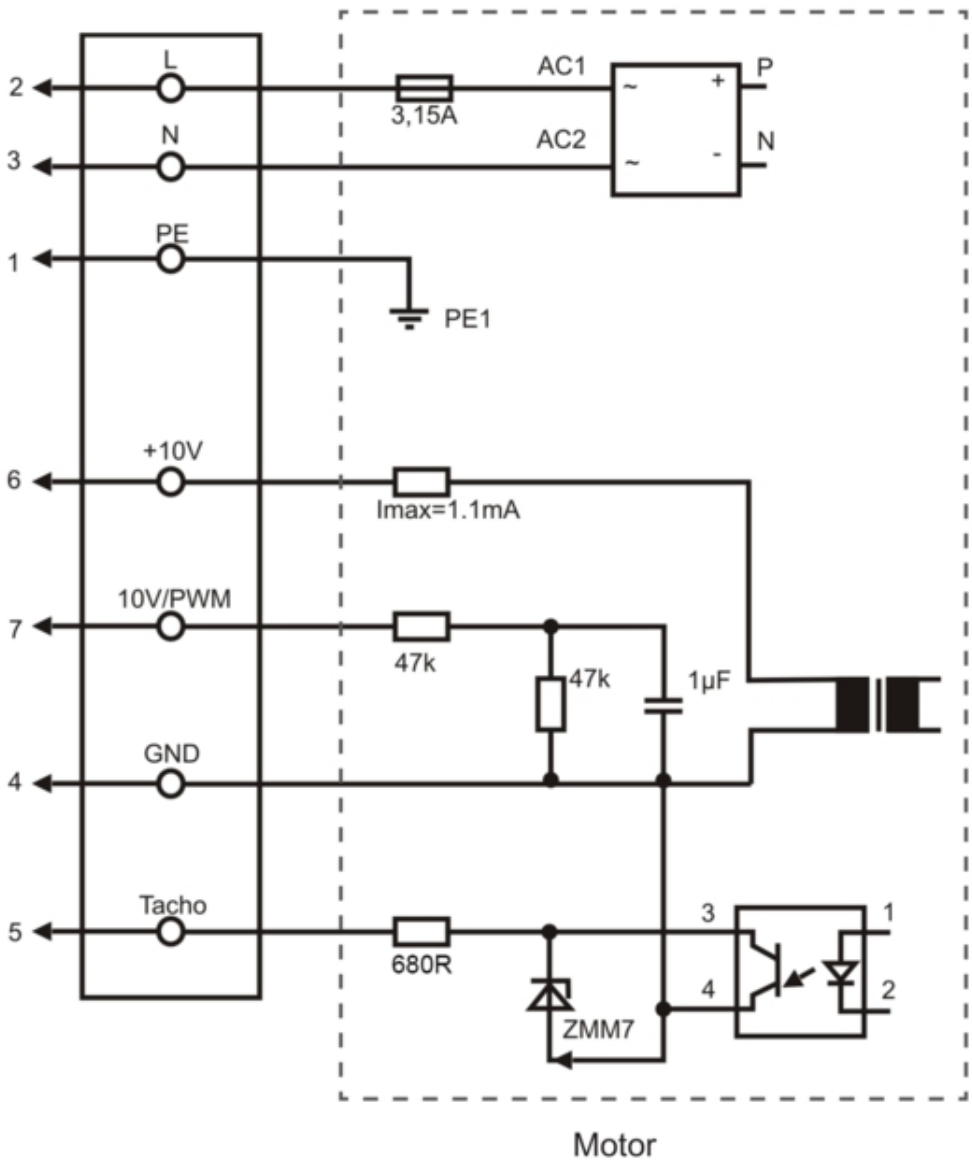
Dimensions



	A	B	C	D	E
prioAir 8/ 8EC	9 11/16 (246)	7 7/8 (200)	9 3/4 (248)	9 (229)	1 (25)
prioAir 10/ 10EC	11 11/16 (297)	9 13/116 (249)	11 15/16 (303)	11 1/16 (281)	1 3/16 (30)

All dimension in inches (mm).

Wiring



Motor Wiring Color	Terminal Marking	Field marking (to be completed by installer) Function
Brown	L	Power supply 120VAC, 50/60Hz
Blue	N	Neutral Conductor
Green/Yellow	PE	Protective Conductor
Red	+10V	Voltage Output 10V/1.1 mA, Electrically Isolated
Yellow	10V / PWM	Controller Input 0..10V or PWM, Electrically Isolated
White	Tacho	Speed Output: Open Controller, 1 Impulse per revolution, Electrically Isolated Isink_max=10mA

Accessories

Electric accessories

MTP 10, 10K, Speed control (32731)

Accessories

FC 8 Mounting Clamps (411121)
LD 8 Silencer (411125)
IR8 Iris Damper (411237)
RSK 8 Backdraft Damper (411115)
FML 8 Metal Hood Supply Air (45148)
ADC 8 Shut-off Damper w Motor (44690)

Documentation

484065 prioAir OIPM.PDF (1,52MB)

prioAir 200EC_8EC.rfa (248,00kB)

Submittal #22 14 50-2.0
22 14 50 - Rainwater Harvesting System

Mortenson Construction
700 Meadow Lane North
Minneapolis, Minnesota 55422
Phone: (763) 522-2100
Fax: (763) 287-5457

Project: 16030010 - MN United-MN Soccer Stadium
400 Snelling Ave N
St. Paul, Minnesota 55104

Dehumidifier for Vault 200

SPEC SECTION:	22 14 50 - Rainwater Harvesting System	**SUBMITTAL MANAGER:**	Dan Kimlinger **(Harris Companies)**
STATUS:	Open	**DATE CREATED:**	07/30/2018
ISSUE DATE:		**REVISION:**	0
RESPONSIBLE CONTRACTOR:	Harris Companies	**RECEIVED FROM:**	
RECEIVED DATE:		**SUBMIT BY:**	
FINAL DUE DATE:	08/22/2018	**LOCATION:**	
TYPE:	Product Data	**COST CODE:**	
APPROVERS:	Populous CA **(Populous Group Llc)**, Maria Bumgarner **(Mortenson Construction - Minneapolis Office)**		

BALL IN COURT:
Maria Bumgarner **(Mortenson Construction - Minneapolis Of)**

DISTRIBUTION:
Taylor Decker **(Mortenson Construction - Minneapolis Off)**

DESCRIPTION:
Submittal for the dehumidifier in Vault 200

ATTACHMENTS:
221450-PD-002.0-Dehumidifier.pdf

SUBMITTAL WORKFLOW

NAME	SUBMITTER/ APPROVER	SENT DATE	DUE DATE	RETURNED DATE	RESPONSE	ATTACHMENTS	COMMENTS
Maria Bumgarner	Approver		8/16/2018		Pending		
Populous CA	Approver		8/22/2018		Pending		

LHB SUBMITTAL REVIEW

☒ Reviewed (Note any Comments) ☐ Rejected (Submit Specified Item)
☐ Resubmit (Make Corrections) ☐ Returned (No Review Required)

This review is only for general conformance with the design concept and the information in the Construction Documents. Comments do not relieve the contractor from compliance with the requirements of the plans and specifications. The Contractor is responsible for dimensions, fabrication, means, methods, sequences and procedures of construction including coordination of the Work.

By: DTW Date: 8/15/18

CHECKED
By: MCB
M.A. Mortenson Company
08/08/2018

This check is only for conformance to and compliance with the Contract documents, and does not in any way relieve the Subcontractor or Supplier of the responsibility to verify accuracy of details, quantities and dimensions. The Subcontractor or Supplier remains responsible for dimensions to be confirmed and correlated at the Project Site, for information that pertains solely to fabrication process or to techniques of construction and for cordination of its work with others.

221450-PD-002.0-Dehumidifier.pdf

DATE **COPIES TO**

HARRIS

Date: 7/30/2018

Submittal

Submittal Number: 221450-PD-002.0

Project:	MN United Stadium
Address:	400 Snelling Ave N St. Paul, Minnesota
Contractor:	Harris
Equipment:	Dehumidifier
	Tag: DH-1
Specification Section:	22 14 50
Supplier:	Sylvane
	245 Hembree Park Drive, Suite 124
	Roswell, GA 30076
Equipment Manufacturer:	Hi-E Dry
Date Issued:	7/30/2018
Date Requested By:	8/13/2018

Note:

This submittal contains the Hi-E Dry humidifier for the rainwater treatment system located in Vault 200.

HI-E *DRY* 195

Installation, Operation and Maintenance Instructions

– Read and Save These Instructions –

This manual is provided to acquaint you with the dehumidifier so that installation, operation and maintenance can proceed successfully. Ultimate satisfaction depends on the quality of installation and a thorough understanding of this equipment. The dehumidifier is built around tested engineering principles and has passed a thorough inspection for quality of workmanship and function.

HI-E *Dry* 195*:*

- Controlled by a dehumidistat with settings from 20 to 80 percent relative humidity and a positive “on” and “off” setting.
- Contains a blower switch that permits continuous blower operation independent of dehumidification.
- Portable and provided with four casters.
- Contains an internal condensate pump capable of lifting condensate 17 feet and 20 feet of condensate hose.
- Wiring is through a factory installed six foot power cord; 115 volt with ground.
- Environmentally friendly R410A refrigerant.

Water Removal Rates (Pints/Day)	
320 pints	90˚F, 90%
245 pints	80˚F, 80%
192 pints	**80˚F, 60% (AHAM)**
205 pints	70˚F, 80%
150 pints	70˚F, 60%
162 pints	60˚F, 80%
91 pints	60˚F, 60%
81 pints	50˚F, 80%
40 pints	50˚F, 60%

QUEST

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4201 Lien Rd
Madison, WI 53704
www.QuestProtect.com

Phone 608-237-8400
Toll-Free 1-800-533-7533
sales@QuestProtect.com

Table of Contents

Serial No. _____

Purchase Date _____

Dealer's Name _____

Safety Precautions

Read the installation, operation and maintenance instructions carefully ***before*** installing and using this unit. Proper adherence to these instructions is essential to obtain maximum benefit from your HI-E *Dry* 195 dehumidifier.

READ AND SAVE THESE INSTRUCTIONS

- It is designed to be installed **INDOORS ONLY**.
- If used near a pool or spa, be certain there is **NO** chance the unit could roll into the water or be splashed and that it is plugged into a **GROUND FAULT INTERRUPTER**.
- **DO NOT** use the HI-E Dry 195 as a bench or table.
- Avoid discharging the air directly at people, especially in pool areas.

1. Specifications

Part Number	4030060
Power	115 VAC 12 amps
Kilowatts	1.25 (80° 60%)
Blower	540 CFM
Capacity (24 hrs.)	192 pints (80°, 60%)
Temp. Range	33°F–110°F
Warranty	5 Year Limited

Dimensions

	Unit	Shipping
Width	36.6″	39.25″
Height	40″	48.75″
Depth	19″	30″
Weight	180 Lb	214 Lb

Minimum Performance at Set Conditions

Intake Air	70° 60%	80° 60%
Water removal/day	156 Lbs	200 Lbs
Pints/KWH	5.4	5.9

2 Installation

2.1 Location

The HI-E *Dry* 195 can be installed in a variety of locations to meet the owner's needs as listed below. In all cases keep the following cautions in mind:

- It is designed to be installed **INDOORS ONLY.**
- If used near a pool or spa, be certain there is **NO** chance the unit could roll into the water or be splashed and that it is plugged into a **GROUND FAULT INTERRUPTER.**
- **DO NOT** use the HI-E *Dry* 19 as a bench or table.
- Avoid discharging the air directly at people, especially in pool areas.

2.1A In Humid Area, No Ducting

The simplest installation is to place the HI-E *Dry* 195 in the humid area with no ducting. The air inlet on top & outlet on the side must be at least 1' from walls and other obstructions to air flow.

2.1B In Humid Area, Duct inlet and/or Outlet

If the humid area is very large or has high ceilings, dehumidification can be improved by adding an inlet and/or outlet duct to circulate and destratify stagnant areas. For a large area, add inlet or outlet ducting to create flow across the area's greatest length.

For areas with ceilings higher than 12', use an inlet duct to draw warm, moist air from near the ceiling. See section 2.4 for attaching duct collars & ducting.

2.1C In Remote Area, Duct Inlet & Outlet

It is often desirable, especially in pool rooms and finished areas, to install the HI-E *Dry* 195 in an adjacent equipment room or unfinished area. Air is transferred between the humid room and the unit via ducting.

The factory mounted humidity control on the HI-E *Dry* 195 cabinet may not sense the humidity in the humid room accurately enough with this installation method. If so, an additional humidity control can be mounted in the humid room and wired to the HI-E *Dry* 195. Local electrical codes must be followed when wiring the control.

2.1D In Remote Area, Duct Outlet Only

A simpler remote installation method than the one above uses ducting only between the HI-E *Dry* 195 discharge and the humid room; the HI-E *Dry* 195 inlet draws air from the room in which it's located. This works well if there is an adequate air flow path between the two rooms; e.g., high door undercut, louvered door or wall grill. This eliminates the need to remote mount the humidity control. There are several potential disadvantages to using this method. First, humid air is drawn into the room where the HI-E *Dry* 195 is located. Second, to accurately sense humidity, the blower in the HI-E *Dry* 195 may need to run continuously to draw air from the humid room into the HI-E *Dry* 195 room. Third, a slight negative pressure is created in the room with the HI-E *Dry* 195 which could back draft open combustion devices located there. If such devices are present, call the factory for specific instructions before using this installation method or consider the option below.

2.1E In Remote Area, Duct Inlet Only

When the HI-E *Dry* 195 is located in a room separate from the main area to be dehumidified, it may be desirable to dehumidify and/or slightly pressurize that room. Pressurization assures that open combustion devices do not back draft as would be the case if the room was sufficiently de-pressurized. This can be accomplished by installing a duct from the humid room to the HI-E *Dry* 195 inlet and by allowing the HI-E *Dry* 195 to discharge the dehumidified air into the room in which it's located. An adequate air flow path must exist between the two rooms for this method to work well. An additional humidity control may need to be mounted in the humid area and wired to the HI-E *Dry* 195 to accurately maintain the desired humidity. Local electrical codes must be followed when wiring the control.

2.2 Electrical Requirements

The HI-E *Dry* 195 plugs into a common grounded outlet on a 15 Amp circuit. It draws between 6 and 7 Amps under normal operating conditions. If used in a wet area (pool, spa room, or basement prone to flooding), a ground fault interrupter protected circuit is required.

If an extension cord is required, it must have a minimum of 16 gauge conductors if less than 25 feet long and 14 gauge if greater than 25 feet.

2.3 Condensate Removal

The HI-E Dry 195 is equipped with an internal condensate pump to remove the water that is condensed during dehumidification. This allows the condensate to be pumped 20′ with the attached hose. If the condensate must be pumped more than 20 feet above the unit, a second pump must be added to relay the condensate. The condensate pump is mounted inside the HI-E Dry 195 as a permanent, integral part of the unit. It includes a safety switch feature that prevents flooding by turning off the HI-E Dry 195 if the pump fails.

2.4 Ducting

2.4A Optional Ducting

Two twelve-inch collars are available as a kit from the factory that will allow ducting to be attached to the inlet and outlet of the HI-E Dry 195. Attach the inlet collar to the top of the unit by cutting the eight tabs that support the 12″ round opening in the top. The 12″ collar with three tabs can be attached via the holes provided in the front of the unit, and the other 12″ collar can be affixed to the top opening.

2.4B Ducting for Dehumidification

Ducting the HI-E Dry 195 as mentioned in sections 2.1B-2.1E requires consideration of the following points:

Duct Sizing: For total duct lengths up to 25′, use a minimum 10″ diameter round or equivalent rectangular. For longer lengths, use a minimum 12″ diameter or equivalent. Grills or diffusers on the duct ends must not excessively restrict airflow.

Isolated Areas: Effective dehumidification may require that ducting be branched to isolated, stagnant areas. Use 8″ diameter branch ducting to each of two or three areas; use 6″ to each of four or five areas; use 4″ to each of six or more areas.

2.4C Ducting for Fresh Air

Fresh air can be brought into the structure continuously by connecting a duct from outside to the HI-E *Dry* 195 inlet and by turning on the fan switch. Advantages of this form of ventilation include:

1. Outside air is filtered before entering the building.
2. Outside air will be dehumidified before entering if the HI-E *Dry* 195 is running.
3. Drawing air from outside and blowing inside aids in pressurizing the structure. This helps prevent unfiltered and undehumidified air from entering elsewhere. It also reduces the potential for carcinogenic radon gas to enter.
4. The need for an alternate ventilation device may be eliminated.

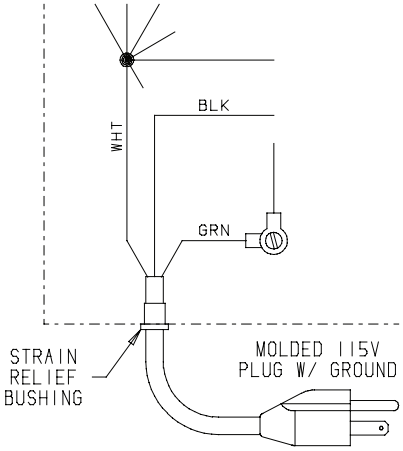
An insulated 4″ diameter duct is generally sufficient to provide up to 70 CFM of outside air. A 6″ duct with an adjustable damper is recommended for higher flows. Large quantities of outside air will impact HI-E Dry 195 performance positively or negatively, depending upon the difference between inside and outside air conditions. Consult the factory by calling 1-800-533-7533 for recommendations regarding the use of higher flows with your specific application.

The outside air duct should be connected into the main inlet duct close to the unit. If no other inlet duct is used, it may be necessary to obstruct the inlet of the HI-E Dry 195 to ensure adequate ventilation.

2.5 Optional Remote Humidity Control

A 120Vac remote humidity control is available from the factory. This control can be wired in parallel with the internal humidity control. Unplug the unit and remove the cabinet front. Remove the four screws securing the control box to the blower end of the HI-E Dry 195. Pull the control box away from the blower end to allow access. Conduit can be connected to the knockout in the blower end. Wire the two leads from the remote humidity control to the two orange leads provided inside the control box.

Now you can control the HI-E Dry 195 with the internal or remote humidity control. If you wish to use only the remote humidity control, turn the internal humidity control counter-clockwise until it stops. This will turn the internal humidity control off.



2.6 Hard Wiring the HI-E Dry 195

1. Remove the cabinet front to the left of the cord mount.
2. Cut the cord near the strain relief bushing and remove the cord and the strain relief bushing.
3. Trim and strip the wire ends for wire nuts.
4. Use a 1/2″ connector to attach the hard wiring to the HI-E Dry 195. Use a minimum of #3-14 wire. Comply with all state and local code requirements.
5. Use wire nuts to attach the appropriate wire leads.

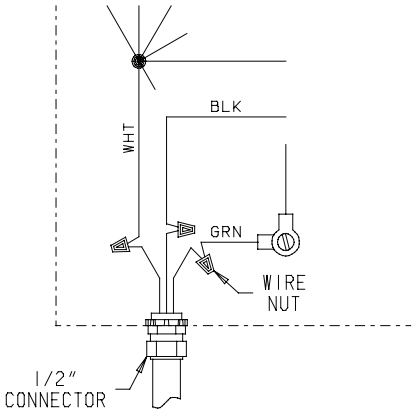


Figure 1: Hard Wiring the HI-E Dry 195

3. Operation

3.1 Humidity Control Adjustment

The dehumidifier will run continuously until the relative humidity (RH) is reduced to the humidity control dial setting. Setting the humidity control to lower RH levels will NOT increase the unit's dehumidification rate, it will simply run longer to reduce the area's RH to the setting. The HI-E *Dry* 195 100 unit (and refrigerant based dehumidifiers in general) will reduce a warm space's RH to a lower level than that of a cool space. It is therefore pointless to set the humidity control to excessively low levels in cool rooms. Doing so will result in long periods of ineffective dehumidifier run time.

A quality humidity meter is recommended to accurately monitor humidity levels. For a quote on a quality humidity meter, call the factory.

3.2 Fan Switch

Turning the fan switch ON will cause the unit's internal blower to run continuously, whether the unit is dehumidifying or not. This function is desirable if the unit is used for air circulation or fresh air ventilation.

3.3 Defrost Control Adjustment

When the HI-E *Dry* 195 is used in a cool area, frost will form on the cooling coil as it dehumidifies. When enough frost forms, the defrost thermostat will initiate the timed defrost cycle. The cycle periodically turns off the compressor while allowing the blower to run. The air that the blower draws through the cooling coil melts the frost.

The defrost cycle is automatic and designed for optimum performance above 50°F.

3.4 Low Pressure Control

If the low side refrigerant pressure drops to 35 PSIG, the low pressure control opens and shuts off the compressor and blower. It is an automatically reset control that will close when the pressure rises to 60 PSIG. Its primary function is to prevent damage to the compressor if a leak develops in the refrigeration system. It may also open if the unit is A) used in a cool area (below 50°F) and the defrost timer is not adjusted (see Sec. 3.3) or B) stored where it is below 40°F and then started. Under these conditions, the unit will restart within several minutes. Until the unit warms up, it may cycle several times.

4.Maintenance

4.1 Air Filter

The HI-E Dry 195 is equipped with two 2" thick, MERV 8 pleated fabric air filters that must be checked regularly. Operating the unit with dirty filters will reduce the dehumidifier's capacity and efficiency and may cause the compressor to cycle off and on unnecessarily on the defrost control.

The filter can generally be vacuumed clean several times before needing replacement. Replacement filters can be ordered from the factory or purchased locally if available. DO NOT operate the unit without the filter or with a less effective filter as the heat exchange coils inside the unit could become clogged and require disassembly to clean.

5. Service

CAUTION: Servicing the HI-E *Dry* 195 with its high-pressure refrigerant system and high voltage circuitry presents a health hazard which could result in death, serious bodily injury, and/or property damage. Only qualified service people should service this unit.

5.1 Warranty

A warranty certificate has been enclosed with this unit. Read it before any repair is initiated. If a warranty repair is required, call the factory first at 1-800-533-7533 for warranty claim authorization and technical assistance.

5.2 Technical Description

Refer to Figure 3. The HI-E *Dry* 195 uses a refrigeration system similar to an air conditioner's to remove heat and moisture from incoming air, and add heat to the air that is discharged.

Hot, high-pressure refrigerant gas is routed from the compressor to the condenser coil. The refrigerant is cooled and condensed by giving up its heat to the air that is about to be discharged from the unit. The refrigerant liquid then passes through two capillary tubes, which cause the refrigerant pressure and temperature to drop. It next enters the evaporator coil where it absorbs heat from the incoming air and evaporates.

The evaporator operates in a flooded condition, which means that it should always be full of liquid refrigerant during normal operation. A flooded evaporator should maintain constant pressure and temperature across the entire coil, from inlet to outlet.

The mixture of gas and liquid refrigerant enter the accumulator after leaving the evaporator coil. The accumulator prevents any liquid refrigerant from reaching the compressor. The compressor evacuates the cool refrigerant gas from the accumulator and compresses it to a high pressure and temperature to repeat the process.

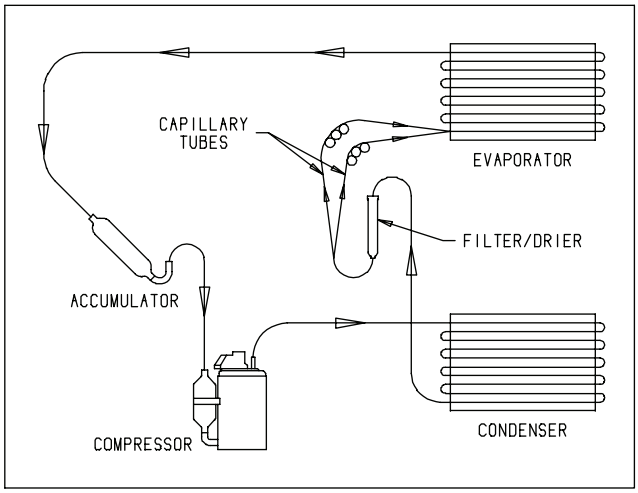


Figure 3: Refrigeration system of HI-E *Dry* 195

5.3 Troubleshooting

No dehumidification, neither blower nor compressor run with fan switch OFF.

1. Unit unplugged or no power to outlet.
2. Humidity control set too high or defective (Sec. 3.1 & 5.9)
3. Loose connection in internal wiring.
4. Open low pressure control (Sec. 3.4 & 5.7)

Some dehumidification, blower runs continuously but compressor only runs sporadically with fan switch OFF.

1. Unit is in defrost cycle (Sec. 3.3 & 5.10).
2. Defrost thermostat defective or loose (Sec. 3.3 & 5.10).
3. Loose connection in compressor circuit (see Fig. 4).
4. Defective compressor overload (Sec. 5.6A).
5. Defective compressor (Sec. 5.6).
6. Defective relay (Sec. 5.8).
7. Defective defrost timer (Sec. 5.10).

No dehumidification. Blower runs but compressor does not with fan switch OFF.

1. Bad connection in compressor circuit (Fig. 4).
2. Defective compressor capacitor (Sec. 5.6A).
3. Defective compressor overload (Sec. 5.6A).
4. Defective compressor (Sec. 5.6).
5. Defective relay (Sec. 5.8).
6. Defective defrost timer (Sec. 5.10).

7. Bad connection in pump circuit (Fig. 4).
8. Pump float switch or safety switch open (Sec. 5.11).
9. Pump motor defective (Sec. 5.11).

Blower does not run. Compressor runs briefly but cycles on & off.

1. Loose connection in blower circuit (Fig. 4).
2. Obstruction prevents impeller rotation.
3. Defective blower (Sec. 5.5).

Unit removes some water but not as much as expected.

1. Air temperature and/or humidity have dropped.
2. Humidity meter and/or thermometer used are out of calibration.
3. Unit has entered defrost cycle (Sec. 3.3 & 5.10).
4. Air filter dirty (Sec. 4.1).
5. Defective defrost thermostat (Sec. 5.10).
6. Low refrigerant charge (Sec. 5.4).
7. Air leak such as loose cover.
8. Defective compressor (Sec. 5.6).
9. Restrictive ducting (Sec. 2.4).

Pump does not pump water.

1. Hose kinked or plugged.
2. Pump check valve plugged (Sec. 5.11).
3. Bad connection in pump circuit (Fig. 4).
4. Hose disconnected internally.

Evaporator coil frosted continuously, low dehumidifying capacity.

1. Defrost thermostat loose or defective (Sec. 3.3 & 5.10).
2. Low refrigerant charge (Sec. 5.4).
3. Dirty air filters or airflow restricted. (Sec. 4.1).

5.4 Refrigerant Charging

If the refrigerant charge is lost due to service or a leak, a new charge must be accurately weighed in. If any of the old charge is left in the system, it must be removed before weighing in the new charge. Refer to the unit nameplate for the correct charge weight and refrigerant type. Add the refrigerant through the low side service port (See Fig. 5).

5.5 Blower Replacement

The centrifugal blower has a PSC motor and internal thermal overload protection. If defective, the complete assembly must be replaced.

1. Unplug the power cord.
2. Remove the cabinet front (6 screws).
3. If an outlet duct is connected to the unit, remove it.
4. Disconnect the blower leads: white from the compressor run capacitor, and black connected to the fan switch.
5. Remove the nuts & bolts holding the blower outlet flange to the cabinet end and remove the blower.
6. Reassembling with the new blower is the above procedure reversed.

5.6 Compressor/Capacitor Replacement

This compressor is equipped with a two terminal external overload, run capacitor, but no start capacitor or relay (see Fig. 4).

CAUTION-ELECTRICAL SHOCK HAZARD: Electrical power must be present to perform some tests; these tests should be performed by a qualified service person.

5.6A Checking Compressor Motor Circuits

Perform the following tests if the blower runs but the compressor does not with the humidity control ON.

1. Turn the humidity control OFF and unplug the unit, remove the cabinet front (6 screws).
2. Plug in the unit and turn the humidity control ON. Use a voltmeter to check for 110 to 120 volts between (a) the relay terminal that the black wire from the compressor connects to and (b) the capacitor terminal with the (2) white wires, (1) red wire & (1) brown wire connected. If voltage is present, go to step 3. If no voltage, the low pressure control, the defrost thermostat, the relay or the condensate pump safety switch are open or there is a loose connection in the compressor circuit. Test each component for continuity; see the appropriate section if a defect is suspected
3. Turn the humidity control OFF and unplug the unit, then disconnect the red and yellow wires from compressor terminals R & S. Using an ohmmeter check continuity between the points listed below.
4. Compressor terminals C and S: No continuity indicates an open start winding; the compressor must be replaced.
5. Compressor terminals C and R: No continuity indicates an open run winding; the compressor must be replaced.
6. Compressor terminal C and overload terminal 1: No continuity indicates a defective overload lead.
7. Overload terminals 1 and 3: If there is no continuity, the overload may be tripped; wait 10 minutes and try again. If there is still no continuity, it is defective and must be replaced.
8. Compressor terminal C and compressor case: Continuity indicates a grounded motor; the compressor must be replaced.
9. Disconnect the wires from the capacitor. Set the ohmmeter to the Rx1 scale; the capacitor is shorted and must be replaced if continuity exists across its terminals. If there is no needle movement with the meter set on the Rx100000 scale, the capacitor is open and must be replaced.

10. Reconnect the wires to the compressor and capacitor; plug in and turn on the unit. If the compressor fails to start, replace the run capacitor.
11. If the unit still does not start, adding a hard-start kit will provide greater starting torque. If this does not work, the compressor has an internal mechanical defect and must be replaced.

5.6B Replacing a Burned Out Compressor

The refrigerant and oil mixture in a compressor is chemically very stable under normal operating conditions. However, when an electrical short occurs in the compressor motor, the resulting high temperature arc causes a portion of the refrigerant oil mixture to break down into carbonaceous sludge, a very corrosive acid, and water. These contaminants must be carefully removed otherwise even small residues will attack replacement compressor motors and cause failures.

The following procedure is effective only if the system is monitored after replacing the compressor to insure that the clean up was complete.

1. This procedure assumes that the previously listed compressor motor circuit tests revealed a shorted or open winding. If so, cautiously smell the refrigerant from the compressor service port for the acid odor of a burn out.

   WARNING: The gas could be toxic and highly acidic. If no acid odor is present, skip down to the section on changing a non-burn out compressor.

2. Remove and properly dispose of the system charge. DO NOT vent the refrigerant or allow it to contact your eyes or skin.
3. Remove the burned out compressor. Use rubber gloves if there is any possibility of coming in contact with the oil or sludge.
4. To facilitate subsequent steps, determine the type of burn out that occurred. If the discharge line shows no evidence of sludge and the suction line is also clean or perhaps has some light carbon deposits, the burn out occurred while the compressor was not rotating. Contaminants are therefore largely confined to the compressor housing. A single installation of liquid and suction line filter/driers will probably clean up the system.

   If sludge is evident in the discharge line, it will likely be found in the suction line; this indicates the compressor burned out will running. Sludge and acid have been pumped throughout the system. Several changes of the liquid and suction filter/driers will probably be necessary to cleanse the system.
5. Correct the system fault that caused the burn out. Consult the factory for advice.
6. Install the replacement compressor with a new capacitor and an oversized liquid line filter.

   In a running burn out, install an oversized suction line filter/drier between the accumulator and compressor. Thoroughly flush the accumulator with refrigerant to remove all trapped sludge and to prevent the oil hole from becoming plugged. A standing burn out does not require a suction line filter/drier.
7. Evacuate the system with a good vacuum pump and accurate vacuum gauge. Leave the pump on the system for at least an hour.
8. Operate the system for a short period of time, monitoring the suction pressure to determine that the suction filter is not becoming plugged. Replace the suction filter/drier if pressure drop occurs. If a severe running burn out has occurred, several filter/driers may have to be replaced to remove all of the acid and moisture.

NOTE: NEVER use the compressor to evacuate the system or any part of it.

5.6C Replacing a Compressor- Non-Burn Out

Remove the refrigerant from the system. Replace the compressor and liquid line filter/drier. Charge the system to 50 PSIG and check for leaks. Remove the charge and weigh in the refrigerant quantity listed on the nameplate. Operate the system to verify performance.

5.7 Relay

The contacts of the single pole, single throw relay complete the power circuit to the compressor. The contacts are closed when power is provided to the relay coil via the control circuit. The control circuit includes the humidity control, low pressure control, defrost thermostat and timer.

5.8 Humidity Control

The humidity control is an adjustable switch that closes when the relative humidity of the air in which it is located rises to the dial set point. It opens when the RH drops 4 to 6% below the set point.

5.9 Defrost Thermostat & Timer

The defrost thermostat is attached to the refrigerant suction tube between the accumulator and compressor. If the low side refrigerant temperature drops due to excessive frost formation on the evaporator coil, the thermostat opens. The compressor is then cycled off and on by the defrost timer. The blower will continue to run, causing air to flow through the evaporator coil and melt the ice when the compressor is off. When the air temperature and/or humidity increase, the evaporator temperature will rise and the thermostat will close to end the defrost cycle.

5.10 Condensate Pump

Condensate is automatically pumped when the water level in the pump's reservoir rises to close the float switch.

If the pump is unable to empty its reservoir due to a pump failure or blocked condensate hose, a pump safety float switch is triggered before the reservoir overflows. The switch turns off the compressor via its relay.

To replace the condensate pump:

1. Unplug the unit & remove the front cover.
2. Disconnect the 2 hoses from the pump.
3. Cut the pump lead wires near the old pump.
4. Remove the 2 nuts from the unit side that hold the pump to the side.
5. Attach the new pump with 2 nuts.
6. Connect the new pump wiring.
7. Connect the hoses to the new pump. Carefully route the hoses so they do not contact the copper refrigerant lines or the compressor shell.

6. Wiring Diagram

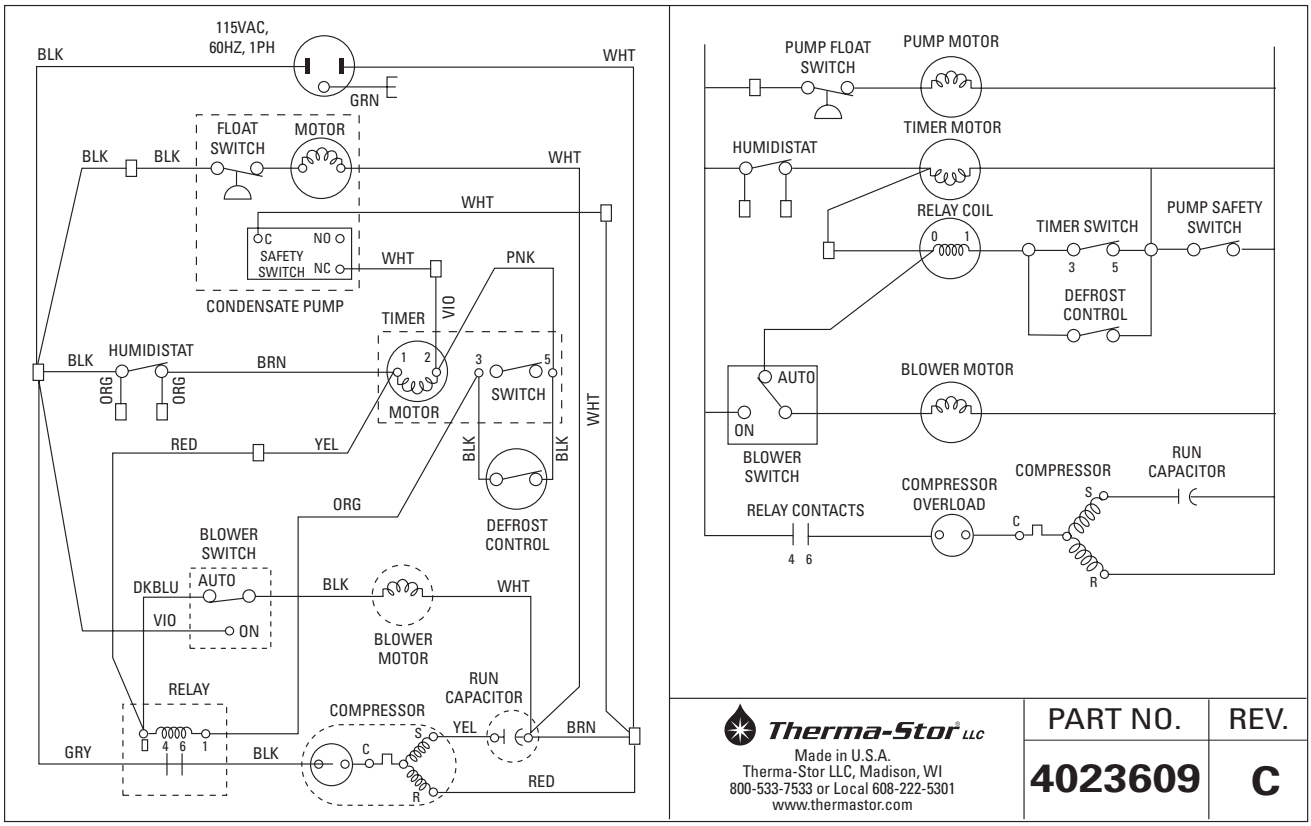
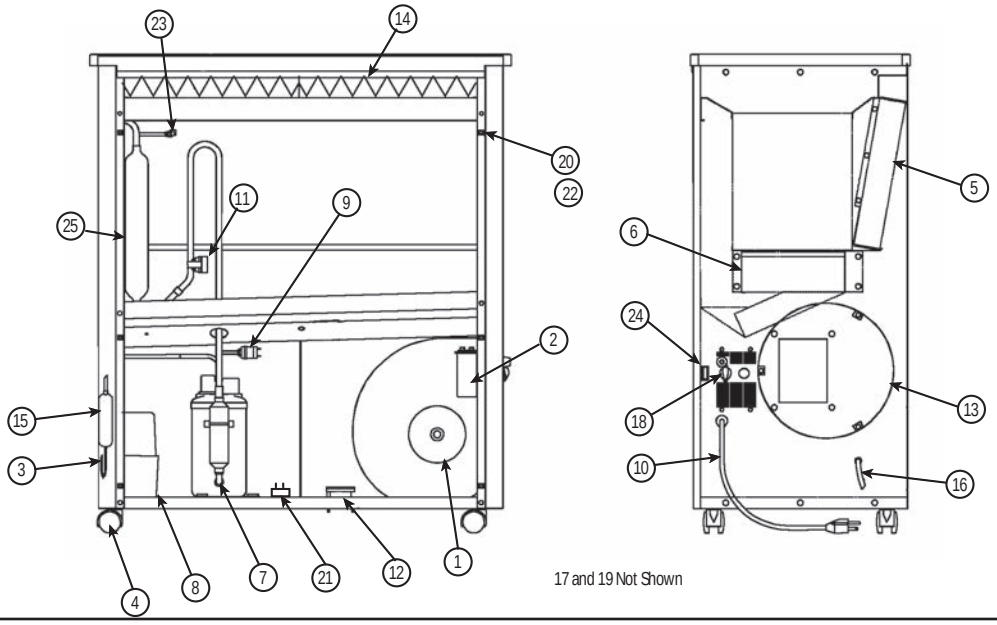


Figure 4: Electrical Schematic of HI-E *Dry* 195

7. Service Parts: HI-E *Dry* 195 Dehumidifier

ITEM	PART NO.	QTY.	DESCRIPTION
1	4021083	1	Blower with Capacitor
2	4033032-06	1	Capacitor, Run, 50MFD, 370v
3	4021589	2	Capillary Tubes
4	4023604	4	Caster, 2″, Plastic, Swivel
5	4028246	1	Coil, Condenser
6	4028245-02	1	Coil, Evaporator E-Coat
7	4030131	1	Compressor
	4030121	1	Compressor Overload
8	4023649	1	Condensate Pump
9	4029508	1	Control, Low Pressure
10	4023495	1	Cord & Wire Harness
11	4025741	1	Defrost Thermostat
	4021648	1	Defrost Thermostat Mounting Clip
12	4021823	1	Defrost Timer (4021823)
13	4023603	1	Duct Collar Kit, Optional
14	4021799	2	Filter, Air (2″ X 16″ X 16″), (Grainger P/N 6B958)
15	4025087	1	Filter/Drier
16	4017152	1	Hose, Drain, .38″ x 20′ long
17	4021503	1	Hose, Drain Pan, .56″ ID x 16″ long (not shown)
18	4027172	1	Humidity Controller
	4021495	1	Knob
19	4020175		Humidity Controller, Remote, Optional, (Honeywell H46C1000)
20	1096010	6	Machine Screw, Stainless Steel, ¼-20 X 1″ (for Front Cover)
21	1970010	1	Relay, SPDT (Omron G7L-1A-TUB-CB-AC100/120)
22	4023549	6	Self-Retaining Nut, ¼-20
23	4020988	1	Service Valve Assembly w/ Core & Cap
24	4025560	1	Switch, SPDT, On-Off, for Fan
25	4021818	1	Accumulator
	4023609	1	Wiring Diagram (not shown)



17 and 19 Not Shown

8. ACCESSORIES: HI-E Dry 195 Dehumidifier

PART NO.	DESCRIPTION
4023684	Duct Collar Kit
4020175	Humidity Controller
4021799	Filter (2 Required)
4024750	12″ x 25′ Flex Duct

HI-E *Dry* 195 Dehumidifier Limited Warranty

Warrantor:

Therma-Stor LLC
4201 Lien Rd
Madison, WI 53704
Telephone: 1-800-533-7533

Who Is Covered: This warranty extends only to the original end-user of the HI-E *Dry* 195 dehumidifier, and may not be assigned or transferred.

Year One: Therma-Stor warrants that, for one (1) year the HI-E *Dry* 195 dehumidifier will operate free from any defects in materials and workmanship, or Therma-Stor will, at its option, repair or replace the defective part(s), free of any charge.

Year(s) Two Through Five: Therma-Stor further warrants that for a period of five (5) years, the condenser, evaporator, and compressor of the HI-E *Dry* 195 dehumidifier will operate free of any defects in material or workmanship, or Therma-Stor, at its option, will repair or replace the defective part(s), provided that all labor and transportation charges for the part(s) shall be borne by the end-user.

End-User Responsibilities: Warranty service must be performed by a Servicer authorized by Therma-Stor. If the end-user is unable to locate or obtain warranty service from an authorized Servicer, he should call Therma-Stor at the above number and ask for the Therma-Stor Service Department, which will then arrange for covered warranty service. Warranty service will be performed during normal working hours.

The end-user must present proof of purchase (lease) upon request, by use of the warranty card or other reasonable and reliable means. The end-user is responsible for normal care. This warranty does not cover any defect, malfunction, etc. resulting from misuse, abuse, lack of normal care, corrosion, freezing, tampering, modification, unauthorized or improper repair or installation, accident, acts of nature or any other cause beyond Therma-Stor's reasonable control.

Limitation and Exclusions: If any HI-E *Dry* 195 Dehumidifier part is repaired or replaced, the new part shall be warranted for only the remainder of the original warranty period applicable thereto (but all warranty periods will be extended by the period of time, if any, that the HI-E *Dry* 195 Dehumidifier is out of service while awaiting covered warranty service).

UPON THE EXPIRATION OF THE WRITTEN WARRANTY APPLICABLE TO THE HI-E *Dry* 195 DEHUMIDIFIER OR ANY PART THEREOF, ALL OTHER WARRANTIES IMPLIED BY LAW, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, SHALL ALSO EXPIRE. ALL WARRANTIES MADE BY THERMA-STOR ARE SET FORTH HEREIN, AND NO CLAIM MAY BE MADE AGAINST THERMA-STOR BASED ON ANY ORAL WARRANTY. IN NO EVENT SHALL THERMA-STOR, IN CONNECTION WITH THE SALE, INSTALLATION, USE, REPAIR OR REPLACEMENT OF ANY HI-E *Dry* 195 DEHUMIDIFIER OR PART THEREOF BE LIABLE UNDER ANY LEGAL THEORY FOR ANY SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES INCLUDING WITHOUT LIMITATION WATER DAMAGE (THE END-USER SHOULD TAKE PRECAUTIONS AGAINST SAME), LOST PROFITS, DELAY, OR LOSS OF USE OR DAMAGE TO ANY REAL OR PERSONAL PROPERTY.

Some states do not allow limitations on how long an implied warranty lasts, and some do not allow the exclusion or limitation of incidental or consequential damages, so one or both of these limitation may not apply to you.

Legal Rights: This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Submittal #22 14 50-3.0
22 14 50 - Rainwater Harvesting System

Mortenson Construction
700 Meadow Lane North
Minneapolis, Minnesota 55422
Phone: (763) 522-2100
Fax: (763) 287-5457

Project: 16030010 - MN United-MN Soccer Stadium
400 Snelling Ave N
St. Paul, Minnesota 55104

Cabinet Unit Heater for Vault 200

SPEC SECTION:	22 14 50 - Rainwater Harvesting System	**SUBMITTAL MANAGER:**	Dan Kimlinger **(Harris Companies)**
STATUS:	Open	**DATE CREATED:**	07/30/2018
ISSUE DATE:		**REVISION:**	0
RESPONSIBLE CONTRACTOR:	Harris Companies	**RECEIVED FROM:**	
RECEIVED DATE:		**SUBMIT BY:**	
FINAL DUE DATE:	08/22/2018	**LOCATION:**	
TYPE:	Product Data	**COST CODE:**	
APPROVERS:	Populous CA **(Populous Group Llc)**, Maria Bumgarner **(Mortenson Construction - Minneapolis Office)**		

BALL IN COURT:
Maria Bumgarner **(Mortenson Construction - Minneapolis Of)**

DISTRIBUTION:
Maria Bumgarner **(Mortenson Construction - Minneapolis Off)** , Taylor Decker **(Mortenson Construction - Minneapolis Off)**

DESCRIPTION:
This submittal contains the cabinet unit heater for the rainwater management system in Vault 200

ATTACHMENTS:
221450-PD-003.1 Electric Unit Heater.pdf

SUBMITTAL WORKFLOW

NAME	SUBMITTER/ APPROVER	SENT DATE	DUE DATE	RETURNED DATE	RESPONSE	ATTACHMENTS	COMMENTS
Maria Bumgarner	Approver		8/16/2018		Pending		
Populous CA	Approver		8/22/2018		Pending		

CHECKED
By: MCB
M.A. Mortenson Company
08/08/2018

This check is only for conformance to and compliance with the Contract documents, and does not in any way relieve the Subcontractor or Supplier of the responsibility to verify accuracy of details, quantities and dimensions. The Subcontractor or Supplier remains responsible for dimensions to be confirmed and correlated at the Project Site, for information that pertains solely to fabrication process or to techniques of construction and for cordination of its work with others.

221450-PD-003.1 Electric Unit Heater.pdf

LHB SUBMITTAL REVIEW

☒ Reviewed (Note any Comments) ☐ Rejected (Submit Specified Item)
☐ Resubmit (Make Corrections) ☐ Returned (No Review Required)

This review is only for general conformance with the design concept and the information in the Construction Documents. Comments do not relieve the contractor from compliance with the requirements of the plans and specifications. The Contractor is responsible for dimensions, fabrication, means, methods, sequences and procedures of construction including coordination of the Work.

By: DTW Date: 8/15/18

Include Thermostat.

DATE **COPIES TO**

HARRIS

Date: 8/3/2018

Submittal

Submittal Number: 221450-PD-003.1

Project:	MN United Stadium
Address:	400 Snelling Ave N St. Paul, Minnesota
Contractor:	Harris
Equipment:	Electric Unit Heater
	Tag: UH-1
Specification Section:	22 14 50
Supplier:	Marley Engineered Products
	470 Beauty Spot Road East
	Bennettsville, South Carolina 29512-2700
Equipment Manufacturer:	Berko
Date Issued:	8/3/2018
Date Requested By:	8/17/2018

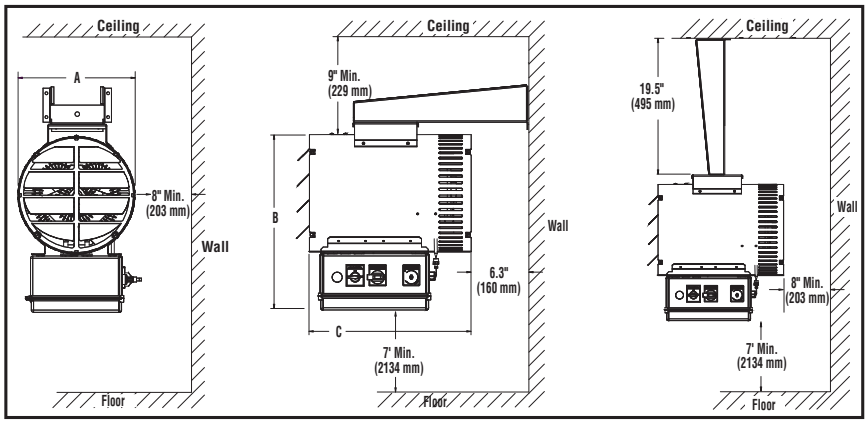
Note:

This submittal contains the Berko electric unit heater for the rainwater management system in vault 200.

BERKO®
A Marley Engineered Products Brand

470 Beauty Spot Rd. E, Bennettsville, SC 29512

SUBMITTAL SHEET
TYPE BWD
WASH-DOWN UNIT HEATERS



See unit dimensions on back page

CAPACITIES

2, 3, 5, 7.5, 10, 12.5, 15, 20 KW
120, 208, 240, 277, 480, 600*V
1Ø or 3Ø
(Varies with Model)

25, 30, 39 KW 208,
240, 480V
3Ø only

*Only for 5-10kw

JOB NAME: MN United Stadium

LOCATION: 400 Snelling Ave N

ARCHITECT:

ENGINEER:

CONTRACTOR: Harris

SUBMITTED BY: Dan Kimlinger

DATE: 7/30/2018

ITEM	QTY.	CATALOG NUMBER	TAG	KW	VOLTS	Ø	AMPS

ACCESSORIES AND CONTROLS

ITEM	QTY.	CAT. NO.	TAG	DESCRIPTION

SUBMITTED BY:	DATE

APPROVED BY:	DATE

BERKO®
A Marley Engineered Products Brand

SELECTION CHART

MODEL NUMBER	KW	VOLTS	PHASE	OUTPUT BTU/HR	HEATER AMPS	MOTOR VOLTS	MOTOR PHASE	MOTOR AMPS	TEMP RISE	CFM	SHIP WEIGHT LBS (KG)
BWD02112	2	120	1	6,824	16.7	120	1	1.554	9	700	60 (27.2)
BWD02812	2	208	1	6,824	9.6	208	1	0.896	9	700	60 (27.2)
BWD02212	2	240	1	6,824	8.3	240	1	0.777	9	700	60 (27.2)
BWD03112	3	120	1	10,236	25.0	120	1	1.554	14	700	60 (27.2)
BWD03812	3	208	1	10,236	14.4	208	1	0.896	14	700	60 (27.2)
BWD03212	3	240	1	10,236	12.5	240	1	0.777	14	700	60 (27.2)
BWD03712	3	277	1	10,236	10.8	277	1	0.673	14	700	60 (27.2)
BWD03832	3	208	3	10,236	8.3	208	1	0.896	14	700	60 (27.2)
BWD03232	3	240	3	10,236	7.2	240	1	0.777	14	700	60 (27.2)
BWD03432	3	480	3	10,236	3.6	480	1	0.388	14	700	60 (27.2)
BWD05812	5	208	1	17,060	24.0	208	1	0.896	23	700	60 (27.2)
BWD05212	5	240	1	17,060	20.8	240	1	0.777	23	700	60 (27.2)
BWD05712	5	277	1	17,060	18.1	277	1	0.673	23	700	60 (27.2)
BWD05412	5	480	1	17,060	10.4	480	1	0.388	23	700	60 (27.2)
BWD05832	5	208	3	17,060	13.9	208	1	0.896	23	700	60 (27.2)
BWD05232	5	240	3	17,060	12.0	240	1	0.777	23	700	60 (27.2)
BWD05432	5	480	3	17,060	6.0	480	1	0.388	23	700	60 (27.2)
BWD05632	5	600	3	17,060	7.2	240	1	1.8	23	1450	75 (34)
BWD07812	7.5	208	1	25,590	36.1	208	1	0.896	34	700	60 (27.2)
BWD07212	7.5	240	1	25,590	31.3	240	1	0.777	34	700	60 (27.2)
BWD07712	7.5	277	1	25,590	27.1	277	1	0.673	34	700	60 (27.2)
BWD07412	7.5	480	1	25,590	15.6	480	1	0.388	34	700	60 (27.2)
BWD07832	7.5	208	3	25,590	20.8	208	1	0.896	34	700	60 (27.2)
BWD07232	7.5	240	3	25,590	18.0	240	1	0.777	34	700	60 (27.2)
BWD07432	7.5	480	3	25,590	9.0	480	1	0.388	34	700	60 (27.2)
BWD07632	7.5	600	3	25,590	7.2	240	1	1.8	34	1450	75 (34)
BWD10212	10	240	1	34,120	41.7	240	1	0.777	22	1450	60 (27.2)
BWD10712	10	277	1	34,120	36.1	277	1	0.673	22	1450	60 (27.2)
BWD10412	10	480	1	34,120	20.8	480	1	0.388	22	1450	60 (27.2)
BWD10832	10	208	3	34,120	27.8	208	1	0.896	22	1450	60 (27.2)
BWD10232	10	240	3	34,120	24.1	240	1	0.777	22	1450	60 (27.2)
BWD10432	10	480	3	34,120	12.0	480	1	0.388	22	1450	60 (27.2)
BWD10632	10	600	3	34,120	9.6	240	1	1.8	33	2400	75 (34)
BWD12812	12.5	208	1	42,650	60.1	208	1	1.793	27	1450	60 (27.2)
BWD12212	12.5	240	1	42,650	52.1	240	1	1.554	27	1450	60 (27.2)
BWD12832	12.5	208	3	42,650	34.7	208	1	1.793	27	1450	60 (27.2)
BWD12232	12.5	240	3	42,650	30.1	240	1	1.554	27	1450	60 (27.2)
BWD12432	12.5	480	3	42,650	15.0	480	1	0.777	27	1450	60 (27.2)
BWD15812	15	208	1	51,180	72.1	208	1	1.793	20	2400	110 (49.9)
BWD15212	15	240	1	51,180	62.5	240	1	1.554	20	2400	110 (49.9)
BWD15412	15	480	1	51,180	31.3	480	1	0.777	20	2400	110 (49.9)
BWD15832	15	208	3	51,180	41.6	208	1	1.793	20	2400	110 (49.9)
BWD15232	15	240	3	51,180	36.1	240	1	1.554	20	2400	110 (49.9)
BWD15432	15	480	3	51,180	18.0	480	1	0.777	20	2400	110 (49.9)
BWD20412	20	480	1	68,240	41.7	480	1	0.777	26	2400	120 (54.4)
BWD20232	20	240	3	68,240	48.1	240	1	1.554	26	2400	120 (54.4)
BWD20432	20	480	3	68,240	24.1	480	1	0.777	26	2400	120 (54.4)
BWD25832	25	208	3	85,300	69.4	208	1	1.793	33	2400	120 (54.4)
BWD25232	25	240	3	85,300	60.1	240	1	1.554	33	2400	120 (54.4)
BWD25432	25	480	3	85,300	30.1	480	1	0.777	33	2400	120 (54.4)
BWD30832	30	208	3	102,360	83.3	208	1	1.793	39	2400	120 (54.4)
BWD30232	30	240	3	102,360	72.2	240	1	1.554	39	2400	120 (54.4)
BWD30432	30	480	3	102,360	36.1	480	1	0.777	39	2400	120 (54.4)
BWD39432	39	480	3	133,068	46.9	480	1	0.777	51	2400	120 (54.4)

All units other than standard models are non-returnable.

Factory Installed Accessories

CATALOG NUMBER	DESCRIPTION
T	Thermostat
L	Pilot Light
S	Mode/Selector Switch
D	Disconnect Switch
E	Monel Element*
M	Manual Reset
P	Epoxy Coating

* Monel elements are subject to longer lead times - contact factory for details.

kW	Dimensions Inches (mm)			
	A	B	C	D
2-10	13 (330)	19.5 (495)	18 (457)	19.5 (495)
12.5-39.0	20 (508)	31 (787)	27 (686)	24.2 (615)

ARCHITECT'S AND ENGINEER'S SPECIFICATIONS

Corrosion resistant unit heater(s) shall be supplied by Berko, A Marley Engineered Products Brand, Bennettsville, SC. The unit heater(s) shall be UL listed for corrosive areas and NEMA4X wash down requirements.

HEATING ELEMENTS: The heating elements shall be corrosion resistant 300 stainless steel sheathed with 316 stainless steel fins for maximum heat dissipation. The elements are to be attached to junction box with leak-resistant stainless steel fittings.

CONTROL CENTER: The controls are completely factory prewired and tested and enclosed in a NEMA4X molded fiberglass control enclosure mounted beneath the heater cabinet. The control center shall include contactors, automatic reset over-temperature protector, fan delay relay, motor contactor and fused transformer for 24V control circuit. Convenient terminal blocks are included for remote thermostat connection.

FAN AND MOTOR ASSEMBLY: The fan and motor assembly shall include a totally enclosed, permanently lubricated, ball bearing motor, epoxy coated for corrosion resistance. Motor rating shall be 1/4 hp up to 10KW. 1/2 hp for 208V and 3/4 hp for 240/480 for units above 10kw. The fan shall be aluminum with corrosion resistant coating, directly connected to the motor, and be dynamically balanced. An epoxy sealed thermal fan delay shall be provided to allow the fan to continue to operate after heating thermostat has been satisfied to maximize transfer of generated heat to space being heated. The fan and motor shall be protected by an adjustable louvered outlet grille to direct flow up or down, painted with one coat zinc chromate primer and two coats of corrosion resistant paint.

OVER-TEMPERATURE PROTECTION: Built in over temperature protection shall be provided by an automatic reset thermal cutout.

HEATER CASE: The heater case shall be constructed of heavy 16 gauge type 304 stainless steel for corrosion resistance and assembled with stainless steel hardware. A stainless steel combination wall and ceiling swivel type mounting bracket to be supplied with unit heater.

Submittal #22 14 50-1.0
22 14 50 - Rainwater Harvesting System

Mortenson Construction
700 Meadow Lane North
Minneapolis, Minnesota 55422
Phone: (763) 522-2100
Fax: (763) 287-5457

Project: 16030010 - MN United-MN Soccer Stadium
400 Snelling Ave N
St. Paul, Minnesota 55104

Rainwater Harvesting System Control Panel

SPEC SECTION:	22 14 50 - Rainwater Harvesting System	**SUBMITTAL MANAGER:**	Dan Kimlinger **(Harris Companies)**
STATUS:	Open	**DATE CREATED:**	07/26/2018
ISSUE DATE:		**REVISION:**	0
RESPONSIBLE CONTRACTOR:	Harris Companies	**RECEIVED FROM:**	
RECEIVED DATE:		**SUBMIT BY:**	
FINAL DUE DATE:	08/22/2018	**LOCATION:**	
TYPE:	Product Data	**COST CODE:**	
APPROVERS:	Populous CA **(Populous Group Llc)**, Maria Bumgarner **(Mortenson Construction - Minneapolis Office)**		

BALL IN COURT:
Maria Bumgarner **(Mortenson Construction - Minneapolis Of)**

DISTRIBUTION:

DESCRIPTION:
Opti Control Panel and Accessories for Vault 200 Rainwater Harvesting System

ATTACHMENTS:
221450-PD-001.0 - OptiRTC In-Vault Storm Water Control Panel.pdf

SUBMITTAL WORKFLOW

NAME	SUBMITTER/ APPROVER	SENT DATE	DUE DATE	RETURNED DATE	RESPONSE	ATTACHMENTS	COMMENTS
Maria Bumgarner	Approver		8/16/2018		Pending		
Populous CA	Approver		8/22/2018		Pending		

CHECKED
By: MCB
M.A. Mortenson Company
08/08/2018

This check is only for conformance to and compliance with the Contract documents, and does not in any way relieve the Subcontractor or Supplier of the responsibility to verify accuracy of details, quantities and dimensions. The Subcontractor or Supplier remains responsible for dimensions to be confirmed and correlated at the Project Site, for information that pertains solely to fabrication process or to techniques of construction and for cordination of its work with others.

221450-PD-001.0 - OptiRTC In-Vault Storm Water Control Panel.pdf

LHB SUBMITTAL REVIEW

☒ Reviewed (Note any Comments)	☐ Rejected (Submit Specified Item)
☐ Resubmit (Make Corrections)	☐ Returned (No Review Required)

This review is only for general conformance with the design concept and the information in the Construction Documents. Comments do not relieve the contractor from compliance with the requirements of the plans and specifications. The Contractor is responsible for dimensions, fabrication, means, methods, sequences and procedures of construction including coordination of the Work.

By: DTW Date:

DATE

COPIES TO

HARRIS

Date: 7/26/2018

Submittal

Submittal Number: 221450-PD-001.0

Project:	MN United Stadium
Address:	400 Snelling Ave N St. Paul, Minnesota
Contractor:	Harris
Equipment:	Opti Control Panel, Level Transmitter, Rain Gauge Tipping Bucket
	Tag: N/A
Specification Section:	22 14 50 B
Supplier:	OptiRTC, Inc. 356 Boylston St. Boston, MA 02116
Equipment Manufacturer:	OptiRTC, Inc.
Date Issued:	7/26/2018
Date Requested By:	8/9/2018

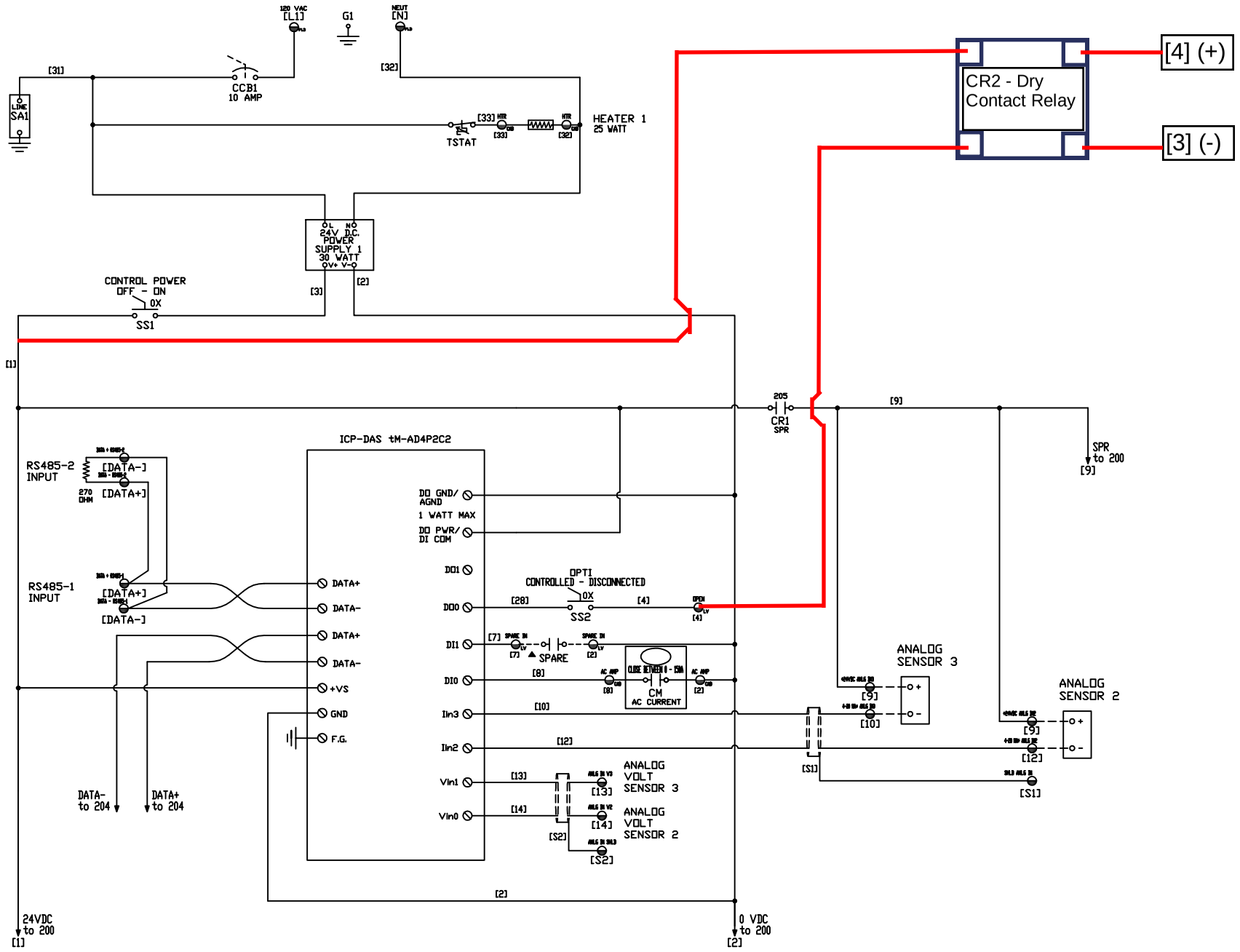
Note:

This submittal includes the Opti control panel that houses the OptiThunder communications gateway (spec sheet provided herein), the Levelgage General Purpose Submersible Level Transmitter, and the Texas Electronics Inc. TR-525USW Rain Gauge Tipping Bucket.

120 VAC 1 PH 60 HZ (QTY 3)

NOTE 1: THIS PANEL SHALL BE INSTALLED OBSERVING ALL APPLICABLE STATE AND LOCAL CODES AND AS PER LATEST REVISION OF NEC. USE ONLY COPPER CONDUCTOR WITH A MINIMUM INSULATION RATING OF 90°C.

UL-E76724



BY	REVISION	DATE
PH		

TLC QUOTE# Q-38147

OptiRTC, INC.

JOB REF: BINARY-ACTUATOR

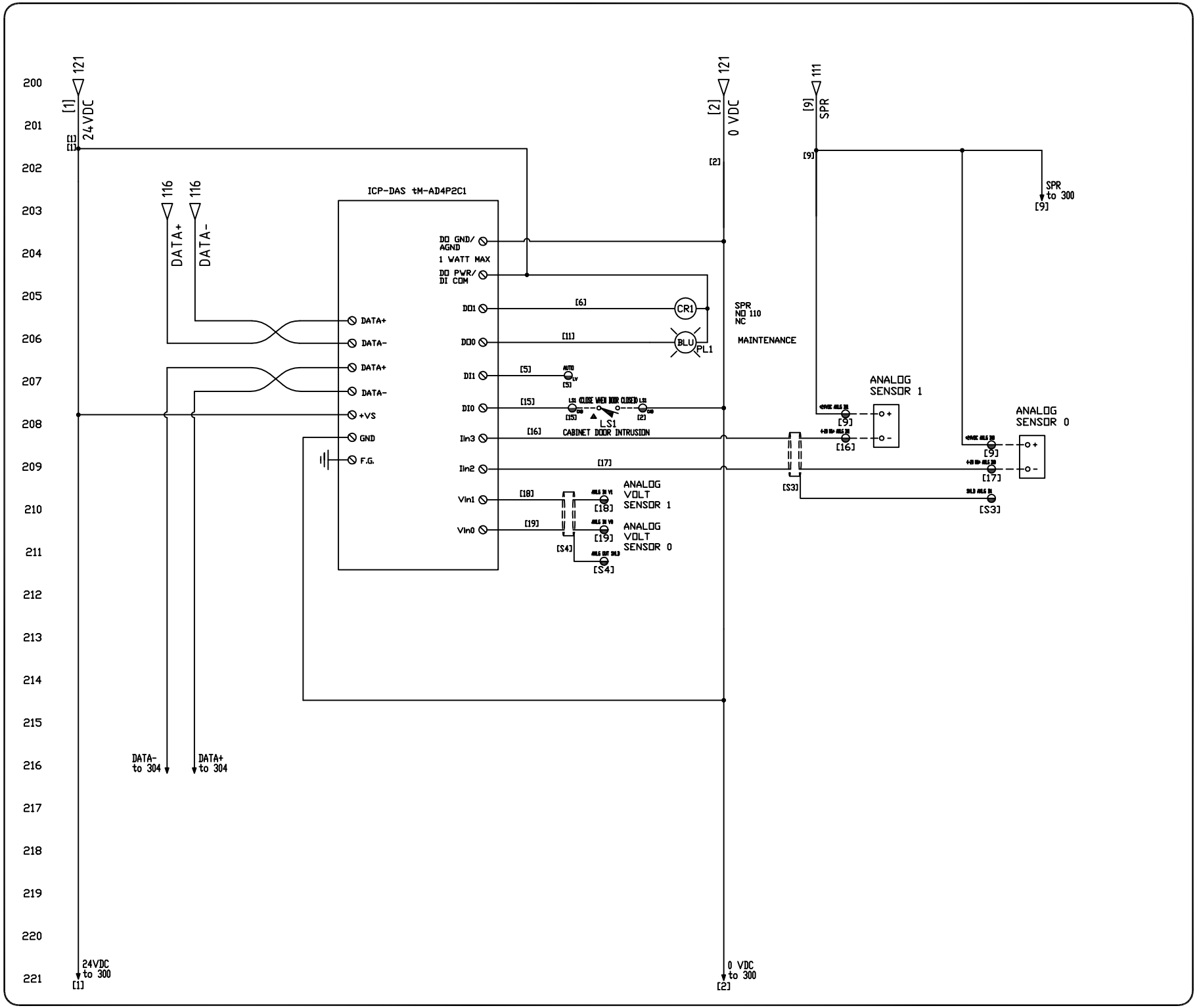
CUSTOMER PO#: OP

ORIGINAL DATE: 3/7/18

DRAWN BY: PH

DWG NO: OPT30718TLC

SHEET NO: 1 OF 4



BY | REVISION | DATE

TLC QUOTE# Q-38147

OptiRTC, INC.

JOB REF:

CUSTOMER PO# OP

ORIGINAL DATE 3/7/18 | DRAWN BY PH

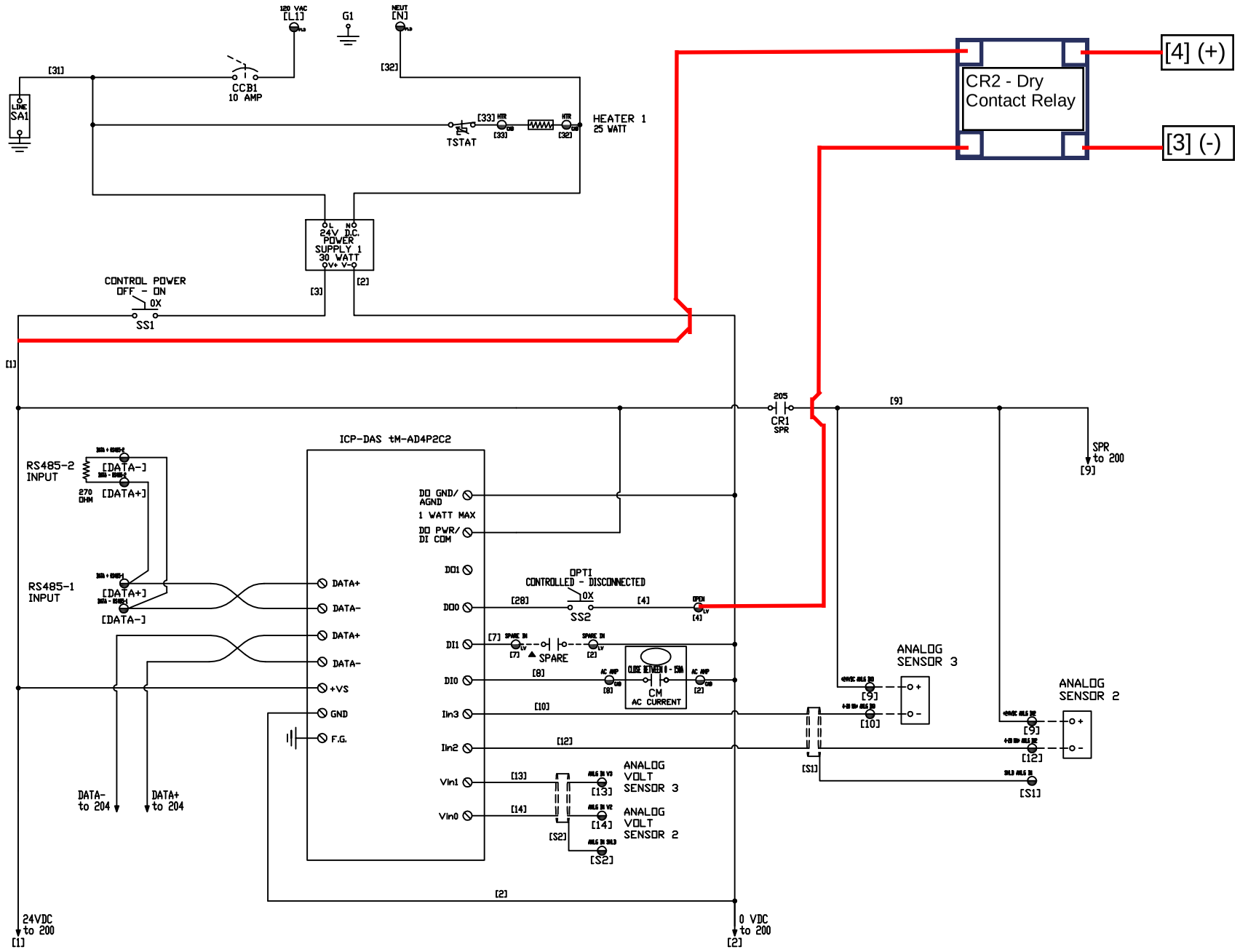
DWG NO OPT30718TLC

SHEET NO 2 OF 4

120 VAC 1 PH 60 HZ (QTY 3)

NOTE 1: THIS PANEL SHALL BE INSTALLED OBSERVING ALL APPLICABLE STATE AND LOCAL CODES AND AS PER LATEST REVISION OF NEC. USE ONLY COPPER CONDUCTOR WITH A MINIMUM INSULATION RATING OF 90°C.

UL-E76724



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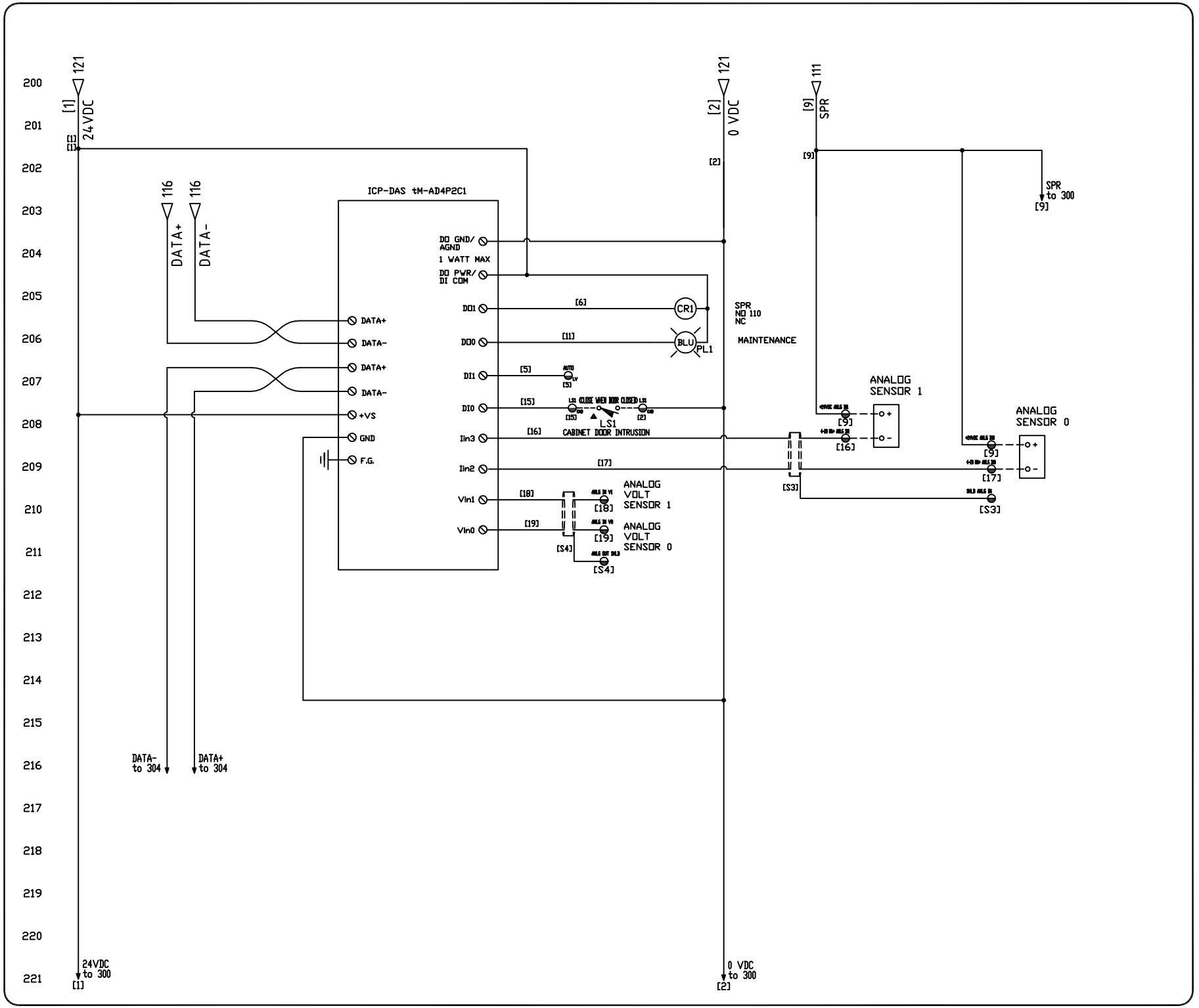

BY | REVISION | DATE

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OptiRTC, INC.

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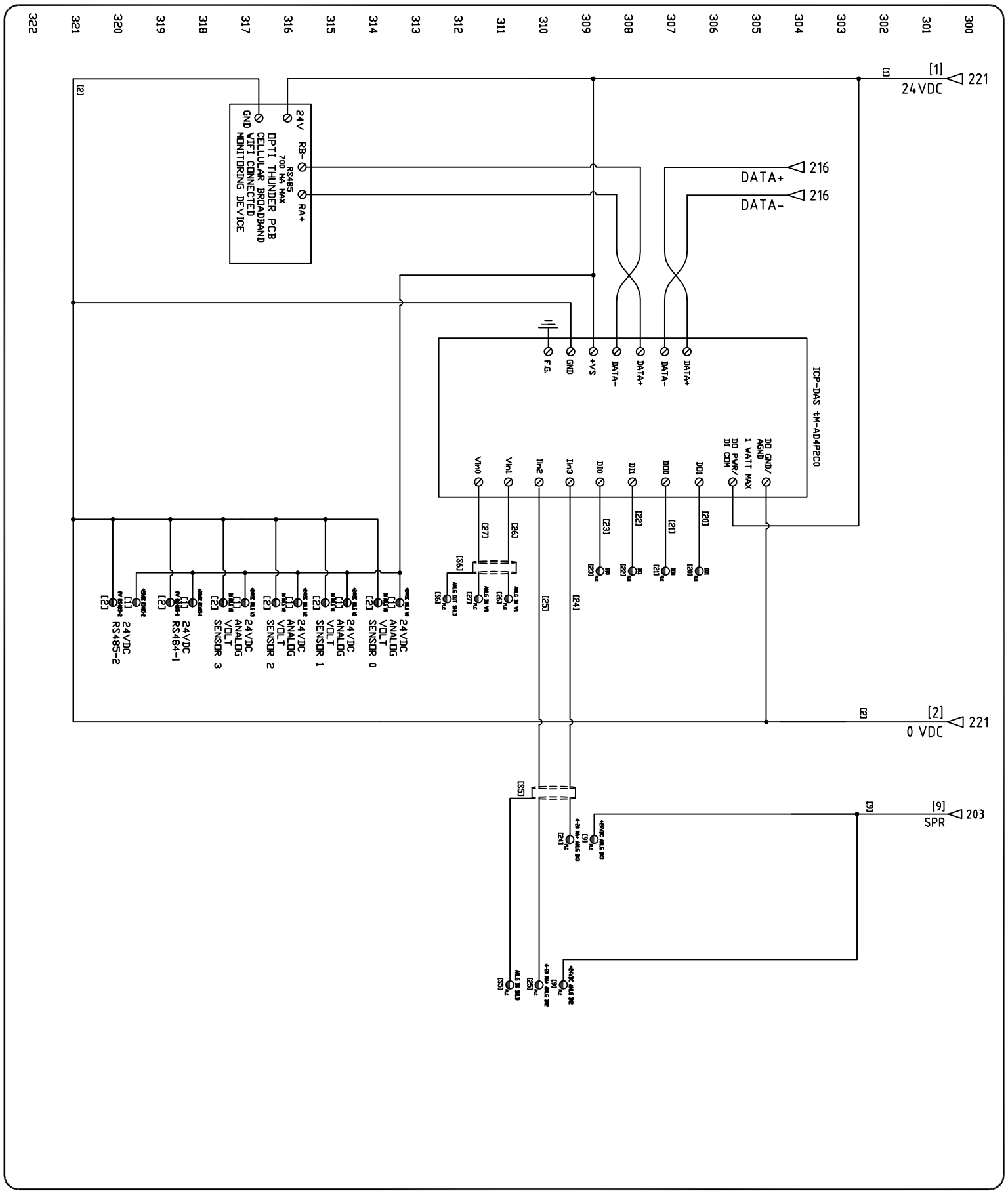
ORIGINAL DATE 3/7/18 | DRAWN BY PH

DWG NO OPT30718TLC

SHEET NO 2 OF 4



DATE	REVISION	BY

TLC CONTROLS, MT. PROSPECT, IL

TLC QUOTE# Q-38147

OptiRTC, INC.

JOB REF:

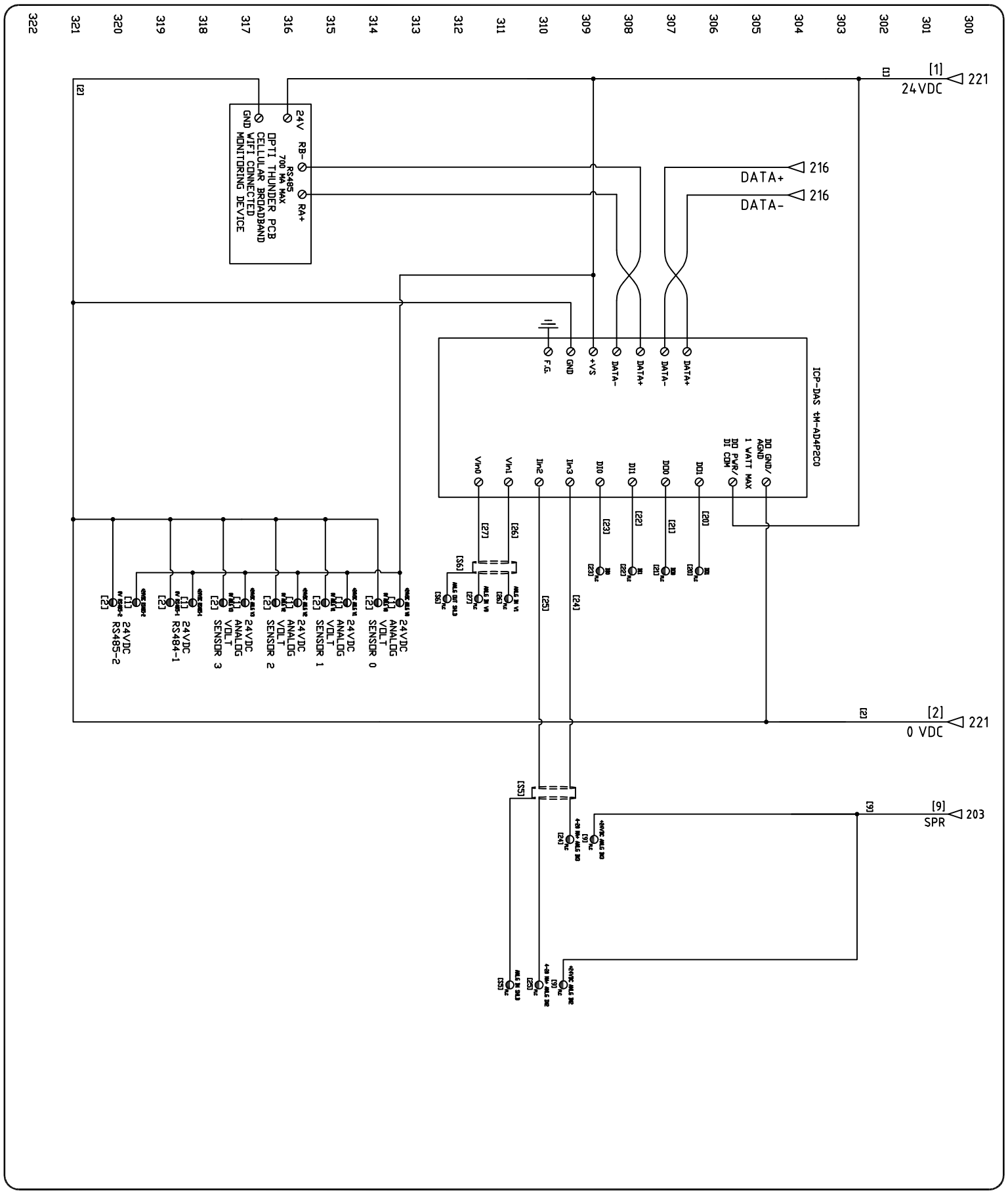
CUSTOMER PO#: OP

ORIGINAL DATE: 3/7/18

DRAWN BY: PH

DWG NO: OPT30718TLC

SHEET NO: 3 OF 4



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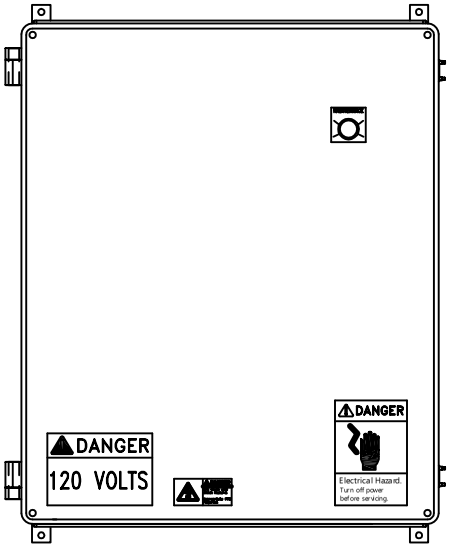
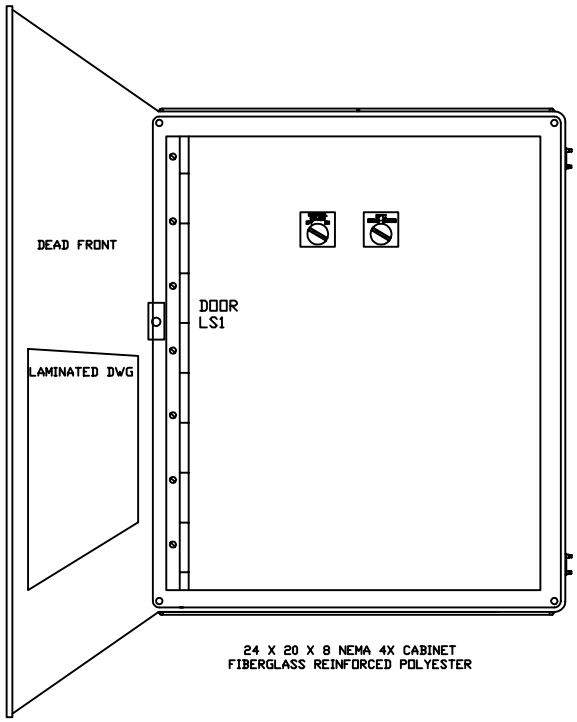
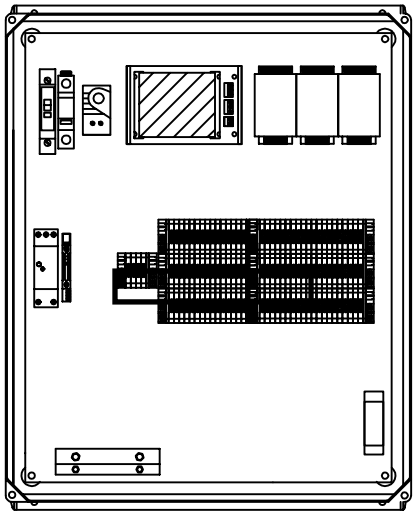
SHEET NO: 3 OF 4

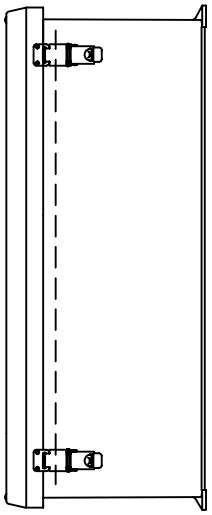




24 X 20 X 8 NEMA 4X CABINET
FIBERGLASS REINFORCED POLYESTER



SUB PANEL



WIRENO	INST	REF
[2]	LS1	209
[15]	LS1	209
[32]	HTR	104
[33]	HTR	104

WIRENO	INST	REF
[L1]	120 VAC	102
[N]	NEUT	102
[A+]	DATA + RS485-2	109
[B-]	DATA - RS485-2	109
[A+]	DATA + RS485-1	111
[B-]	DATA - RS485-1	112
[1]	+24VDC RS485-1	317
[2]	0V RS485-1	316
[1]	+24VDC RS485-2	318
[2]	0V RS485-2	318

NOTE: LOW VOLTAGE WIRING MUST BE IN
SEPERATE CONDUIT
FROM ALL OTHER WIRES

SPRING TYPE TERMINALS

WIRENO	INST	LOC	REF
[2]	SPARE IN	LV	115
[7]	SPARE IN	LV	115
[2]	AC AMP	CAB	116
[8]	AC AMP	CAB	116
[4]	Dry Contact Control Positive [+]	LV	114
[3]	Dry Contact Control Negative [-]	LV	206
[9]	+24VDC ANLG IN3	LV	116
[10]	4-20 MA+ ANLG IN3	LV	116
[S1]	SHLD ANLG IN	LV	118
[9]	+24VDC ANLG IN2	LV	117
[12]	4-20 MA+ ANLG IN2	LV	117
[9]	+24VDC ANLG IN1	LV	208
[16]	4-20 MA+ ANLG IN1	LV	208
[S3]	SHLD ANLG IN	LV	210
[9]	+24VDC ANLG IN0	LV	208
[17]	4-20 MA+ ANLG IN0	LV	209
[1]	+24VDC ANLG V3	LV	316
[2]	0V ANLG V3	LV	316
[13]	ANLG IN V3	LV	118
[S2]	ANLG IN SHLD	LV	119
[1]	+24VDC ANLG V2	LV	315
[2]	0V ANLG V2	LV	315
[14]	ANLG IN V2	LV	119
[1]	+24VDC ANLG V1	LV	314
[2]	0V ANLG V1	LV	314
[18]	ANLG IN V1	LV	210
[S4]	ANLG OUT SHLD	LV	211
[1]	+24VDC ANLG V0	LV	312
[2]	0V ANLG V0	LV	313
[19]	ANLG IN V0	LV	210

SPRING TYPE TERMINALS

WIRENO	INST	LOC	REF
[20]	DO1	PLC	306
[21]	Irrigation DO - 5V	PLC	307
[22]	DI1	PLC	308
[23]	DI0	PLC	309
[9]	+24VDC ANLG IN3	PLC	309
[24]	4-20 MA+ ANLG IN3	PLC	309
[9]	+24VDC ANLG IN2	PLC	309
[25]	4-20 MA+ ANLG IN2	PLC	309
[S5]	ANLG IN SHLD	PLC	310
[26]	ANLG IN V1	PLC	311
[27]	ANLG IN V0	PLC	312
[S6]	ANLG OUT SHLD	PLC	312

SPRING TYPE TERMINALS

TLC CONTROLS, MT. PROSPECT, IL

BY	REVISION	DATE

TLC QUOTE# Q-38147

OptiRTC, INC.

JOB REF:

CUSTOMER PO# OP

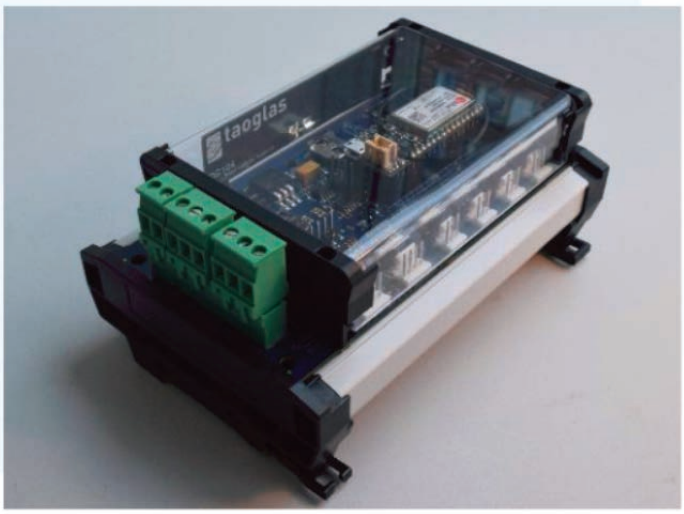
ORIGINAL DATE 3/7/18

DRAWN BY PH

DWG NO OPT30718TLC

SHEET NO 4 OF 4

OptiThunder
V1.0.3 for OptiNimbus



Features

- 3G/2G GSM cellular or WiFi connectivity worldwide
- Integrated antenna
- Over-the-air updates to firmware and device configuration
- Able to operate with or without continuous connectivity with the cloud
- Modbus Master capability on 1x RS485 ports
- End-to-end data encryption
- Short circuit and reverse polarity protection
- Industrial temperature range

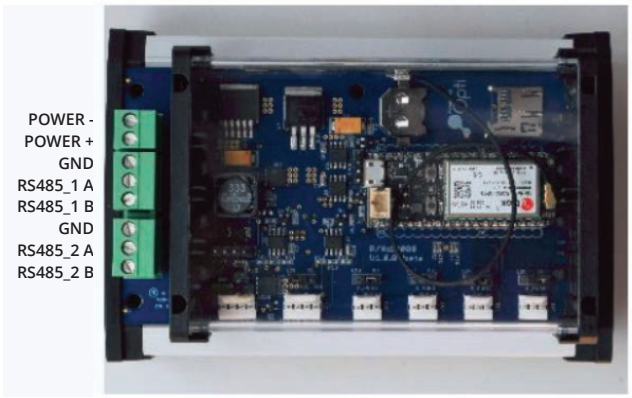
Description

The OptiThunder is a cellular broadband or WiFi-connected control and monitoring device. OptiThunder securely bridges industrial control hardware connected to its built-in RS485 Modbus RTU network ports with cloud-based operations services like OptiNimbus. Configurable on-board failsafe control provides service continuity during network outages. The OptiThunder is intended to be DIN-rail mounted inside a control panel along with an external power supply and necessary control and monitoring hardware.

Typical Application

Stormwater Storage Control

Pinout



System Specifications

Communication	
Interface	2x RS485
Protocol	Modbus RTU
Format	(N, 8, 1)
Baud Rate	9600 - 115200 bps
Device Limit	32/port, 4000' run
Power	
Input Voltage	9-24VDC
Idle Current	40 mA @ 12V
Average Current	70 mA @ 12V
Max Current	700 mA @ 12V
Mechanical	
Dimensions	5.5" L x 3.75" x 2.75" H
Installation	35mm DIN rail
Enclosure Requirements	Non-metallic, or external antenna required
Antennas	
Internal	Taoglas PC104
External	Taoglas Hercules G21
Environment	
Operating Temperature	-20 to 60 °C

Levelgage

GENERAL PURPOSE SUBMERSIBLE LEVEL TRANSMITTER

The Levelgage by Keller America provides standard features that far exceed those of comparably priced transmitters, including standard ±1% FS Total Error Band $(TEB)_3$ or optional ±0.5% FS TEB_3 accuracy.

The ability of the Levelgage to provide this level of sustained performance over a wide range of operating conditions makes it ideally suited to environmental monitoring applications such as surface water, streams, and reservoirs.

Keller America's guaranteed lightning protection makes this transmitter ideal for installation in areas prone to chronic damage due to transients caused by lightning.

For more information on the Levelgage, or any other Keller product, please contact Keller America, or view the entire Keller catalog at http://www.kelleramerica.com/datasheets.html.

FEATURES

4...20mA models include guaranteed lightning protection at no additional cost.

16-bit internal digital error correction for cost-effective low Total Error Band $(TEB)_3$

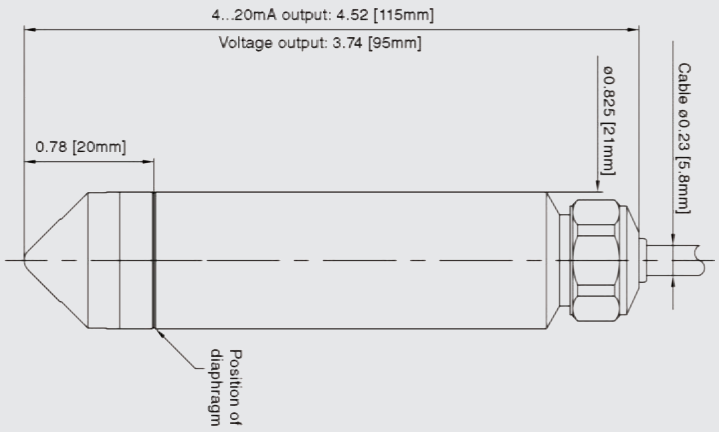
316L stainless steel construction

2-year warranty covers defects in materials and workmanship.

Industry standard analog outputs simplify interface to controls, data collection, and telemetry systems.

Built in the U.S.A. ARRA Section 1605 Compliant.

Standard 3-day lead time



Output	White	Black	Red
2-wire (mA)	OUT / GND	+Vcc	N/A
3-wire (VDC)	GND	+VCC	+OUT
Braided shield wire connected to transmitter housing			

SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE

06/15

KELLER AMERICA INC

351 BELL KING ROAD · NEWPORT NEWS, VA 23606 · TOLL FREE 877-253-5537 · PHONE (757) 596-6680 · FAX (757) 596-6659

EMAIL SALES@KELLERAMERICA.COM · WEBSITE WWW.KELLERAMERICA.COM

Levelgage

GENERAL PURPOSE SUBMERSIBLE LEVEL TRANSMITTER

Pressure Ranges[1,2]

Relative	Infinite between 0...3 thru 0...900 ft W.C
Absolute	Infinite between 0...2 thru 0...11 bar

1.The Acculevel can be provided with custom calibration at no extra cost. For fluids other than water, the specific gravity must be given at the time the order is placed.

2. Level range may be specified in units of lb/in2(psi), inches WC or feet WC. Keller America uses the International Standard conversion of 2.3067 feet WC/psi.

Accuracy[3]

Static	Standard ±0.25% FS
Total Error Band	Standard ±1% FS, Optional ±0.5% FS

3. Static accuracy includes the combined effects of non-linearity, hysteresis, and non-repeatability at room temperature (25°C). Total Error Band (TEB) includes static accuracy, plus thermal dependencies, over the compensated temperature range.

Output

Current	4...20mA
Voltage	0...5, 0...10VDC[4]

4. Other voltage output options available on request.

Certifications

CE	EN50081-1, EN50082-2

Electrical[5]

Supply (4-20mA)	11...28 VDC
Supply (0-5VDC)	8...28 VDC
Supply (0-10VDC)	13...28 VDC
Load Resistance (mA)	<(Supply-11V)/0.022A
Load Resistance (VDC)	>4k ohm

5. Nominal values may be higher depending upon cable length. Internal lightning protection increases the minimum-required supply voltage from 8VDC to 11VDC, due to internal resistance of the surge protectors. In addition, cable resistance (~70Ω / 1000ft) adds to the supply requirement. In order to insure proper system operation, calculate the minimum required supply voltage (at the source) as follows:

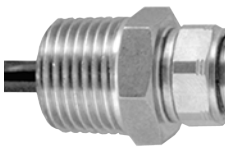
For two-part (internal+external) system (recommended):
MINIMUM SUPPLY VOLTAGE = 11.6 + 0.022 (CABLE LENGTH x 0.07) VDC

For internal only protector (standard with 4-20mA output):
MINIMUM SUPPLY VOLTAGE = 11 + 0.022 (CABLE LENGTH x 0.07) VDC

Environmental

Protection Rating	IP68
Operating Temp.	-10...60° C
Compensated Temp.	-10...80° C
Wetted Materials	316 L Stainless Steel
	Polyamide
	Fluorocarbon
Cable Options	Polyethylene for general purpose
	Hytrel for hydrocarbon
	Tefzel for chemical interaction

Optional Accesories


1/2" NPT Conduit Fitting


Drying Tube Assembly


Bellows Assembly


Cable Hanger


Termination Enclosure


Stabilizing Weight

Process Meter


Open-faced Nose Cap


Signal Line Surge Protector


Pressure Test Adapter

K E L L E R A M E R I C A I N C

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EMAIL SALES@KELLERAMERICA.COM · WEBSITE WWW.KELLERAMERICA.COM

Texas Electronics Inc.

"Relied on Worldwide in the Most Extreme Conditions"

Rain Gauge Tipping Bucket

TR-525USW Series Rainfall Sensor

Description

The Texas Electronics, Inc. TR-525USW Rainfall Sensor with 8" diameter funnel is a remote tipping bucket style rain gauge that measures liquid precipitation. The Rain Gauge is a freestanding receptacle for measuring precipitation. Through an opening at the top of the device, rain is collected and then funneled to a mechanical device, called a tipping bucket. As water is collected, the tipping bucket fills to the point that it tips over, causing a momentary closure of a switch to incrementally measure rainfall accumulation. This action empties the bucket in preparation for additional measurement. Water discharged by the tipping bucket passes out of the rain gauge with no need for emptying. The TR-525USW was specifically designed to meet the National Weather Service's requirements for rainfall measurement.

Features & Benefits

- Meets government requirements for an 8" collector
- Interfaces with virtually all data acquisition systems
- Knife-edge collector optimizes rainfall catch
- Exceptional splash-out protection improves accuracy in high winds
- Easy installation and maintenance
- Over 30 years in production
- Lightweight aluminum exterior
- Anodized aluminum collector for weather resistance
- Integrated bubble level

Specifications

Resolution:	0.01" or 0.2 mm
Accuracy:	0-2 in. (50 mm) per hour; +\-1%
Range:	27" (700 mm) per hour
Collector diameter:	8.00" (203 mm) with knife-edge
Funnel depth:	6.4" (163 mm)
Splash out protection:	>2" (50 mm)
Operating Temp:	32 to 158° F (0 to 50° C)
Storage Temp:	-40 to 185° F (-40 to 70° C)
Humidity Limits:	0 to 100%
Weight:	6 lbs.
Height:	11.125"
Cable:	10', 24 gauge 2 conductor
Switch:	Momentary potted reed switch
Switch rating:	30 VDC @ 2 A, 115 VAC @ 1 A
Switch Closure Time:	135 ms
Bounce Settling Time:	0.75 ms
Pivot:	Ground bronze pivots with hardened stainless steel shaft
Bucket:	Black ABS injection molded
Level:	Integral Bubble Level
Warranty:	3 years

Installation & Maintenance

Installation consists of attaching the three sensor support legs to a firm platform (such as our MB-525 Mounting Base). Pole mounting on the mast of a weather station is available by securing to the included side bracket.

Maintenance consists of routine cleaning of debris from the filter screen, and occasional calibration verification with our FC500 Field Calibration Kit.

Ordering Information

Model #: TR-525USW
Description: Rain Gauge, 8.00" collector, English
(Please specify for calibration of 0.2 mm/tip)

Optional Parts / Accessories

HOBO	Pendent Datalogger
MB-525	Pole Mounting Base
FC-500	Field Calibration Kit
BB-525	Bird Repellant
HT-525	Heater, 120 VAC

Texas Electronics, Inc. Dallas, TX 75237 Fax.214.631.4218
4230 Shilling Way Tel.214-631-2490 www.texaselectronics.com

System Startup and Operation and Maintenance Plan

Alliance Field

Rainwater Reuse System

St. Paul, MN

Date: October 15, 2018

Contractor: Harris Mechanical

Equipment Provided by: Rainwater Management Solutions

1260 West Riverside Dr. Salem, VA 24153

Phone: (540) 375-6750 Fax: (540) 375-6751

Prepared by:
TJ Smith and Dave Stark
1260 West Riverside Drive Salem, VA 24153
(540) 375-6750
www.rainwatermanagement.com

Table of Contents

List of Tables

List of Drawings

List of Appendices

Document Summary

This document is intended to provide a system specific startup plan, schedule and overview of operation and maintenance procedures for the Allianz Field Rainwater system provided by Rainwater Management Solutions (RMS). Individual component Operation and Maintenance Manuals are to be followed in all instances and are provided in Appendix 3, Operation and Maintenance Manuals. If there is a discrepancy between this document and the individual manufacturer manuals, the manual should be utilized. This is a summary document and the owner of the system should familiarize themselves with O&M procedures for each component.

1 System Startup

1.1 Pre-System Startup Checks

Ensure the pre-startup check list provided by the system integrator has been completed and returned and that all items on the check list have been completed and marked. A summary of the major components of startup are provided below:

Ensure that the plumbing system has been installed as designed and that all pressure testing, cross connection and backflow protection testing has been completed and passed.

Ensure that the cistern tank is clean, free of debris larger than 400 micron and has a water level such that the low water cut off float switches on the submersible pumps are in the up position, allowing the pumps to run.

Ensure that the submersible pumps are situated such that they are submerged in and full of water.

Ensure that city water connection is connected for testing backup operations.

Ensure that input voltage supply of 208V/3/60 Hz has been provided to the RMS Single Point Power Panel. Ensure that outgoing 208V/3/60HZ power has been provided to the submersible pumps in Manhole (MH) 251. These pumps are not powered through the RMS skid.

The RMS provided field wired components are identified on Figure 2, Electrical Schematic.
Ensure that all field wired components are landed on the proper terminal in the RMS 200 Controller.

Ensure that the float chain and anchor, float switches and level sensor provided by RMS are installed in MH-251.

The Final RMS Wiring Diagram identifies the terminal to land each wire and is included as Figure 3, Electrical Wiring Diagram to the final version of this document.

Ensure that SCADA and BACnet connections have been made to pick up points from the RMS 200 Controller. Refer to system supplier submittal for more information.

Ensure that Storm Control (Opti-RTC) connections for equipment in Tank A, rain sensor, cellular antenna, controller and equipment is connected and that the dry contact is landed on the RMS 200 controller. Refer to system supplier submittal for more information.

A copy of the pre-system startup checklists is provided in Appendix, 1.

1.2 MH 251 Duplex Submersible Pump Startup

Review operating instructions for duplex submersible pumps.

Ensure that valves to the NPW supply distribution system to out lot, irrigation and storm drain/recirculation are closed. Open the boiler drain valve.

Ensure all circuit breakers operating rainwater harvesting system components are turned on.

Turn on the toggle switch located on the upper right of the RMS 200 controller.

Listen at cistern tank for pump operation.

Watch for water flow at hose connected to boiler drain. Once water flow is steady, consistent and clear, slowly close the boiler drain.

The pressure tank should begin to fill and once the pressure the design pressure, the VFD should disable the running pump.

Open the boiler drain slowly until completely open. Listen for pump start at the cistern tank. Allow the pump to run for a minimum of three minutes. Close the boiler drain valve again and allow system pressure to build until the pump is deactivated.

Verify pumps meet design flow and pressure.

Verify all components associated with the duplex submersible pump system function as designed.

The individual components for the startup form are included in Appendix 2, System Startup Form.

1.3 Back flushing Pre-Filters

Ensure that there is power to the back flushing prefilters, discharge lines have been connected as identified on the final plans. Isolate the downstream water treatment equipment by closing the isolation valves and opening the valve off of the skid directing water back to Tank A. Verify that the back-flushing unit is operating as designed and in alternating fashion.

1.4 5 Micron and Carbon Filters

Ensure 5-micron bag filters and carbon filters are installed in housings provided. Refer to Appendix 3-Operations and Maintenance Manuals for product specific installation and maintenance instructions. Manufacturer recommended filter change at maximum 15 PSI differential for the 5 micron filters and 25 PSI for the carbon filter.

1.5 UV Light

Ensure UV light quartz sleeves and light bulbs are installed. Do not power UV system until water is present at start-up. Refer to Appendix 3-Operations and Maintenance Manuals for product specific instructions for installation of quartz sleeves and UV lights. On-line maintenance training videos are available through the UV light manufacturer.

1.6 Booster Pump

System installer to provide a valve and water hose to the irrigation and out lot water lines off of the skid to simulate irrigation and transfer demands.

Ensure submersible pumps and water lines in front of the booster pump are charged with water.

Open a valve on the two lines.

Ensure all circuit breakers operating rainwater harvesting system components are turned on.

Turn on the toggle switch located on the upper right of the RMS 200 controller.

Listen to booster pump for operation.

Watch for water flow at hose connected to the irrigation and out lot lines. Once water flow is steady, consistent and clear, slowly close the valve.

The pump should increase in speed until it reaches the design set points.

Open the valve slowly until completely open. Listen for pump start at the booster pump. Allow the pump to run for a minimum of three minutes. Close the valve again and allow system pressure to build until the pump is deactivated.

Verify all components associated with the booster pump system function as designed.

1.7 City Backup Water Supply for Out lot and Irrigation

Simulate tank empty conditions by removing the float tree and allowing the low-level float switch to fall. Observe that the motorized valve on the city water line opens. Adjust pressure reducing valve as needed.

1.8 Selector Valves

Ensure all selector valves operate per the final sequence of operations. Adjust modulating valves as needed.

1.9 Ozone System Startup Procedures

Manufacturer representatives from ozone solutions will be on site to perform startup and training.

1.10 Startup Schedule

RMS and our manufacturers will provide system startup after receiving the completed system pre-startup checklist in Appendix 1. The general schedule is as follows:

Monday 10-22-2018:

- RMS will require the vault to be free of any and all other trades and contractors.
- All work associated with the RMS system as called out in the prestartup checklist shall be completed by the appropriate party prior to this date.
- Confined space blower shall be provided by others.
- RMS personnel will enter the vault and begin the functional testing and sensor calibrations for the system.

Tuesday 10-23-2018:

- RMS will require the vault to be free of any and all other trades and contractors.
- RMS personnel will enter the vault to finalize the functional testing and sensor calibrations

for the system.
- Ozone Solutions will enter the vault to work with RMS to startup the ozone system and associated air compressor and complete functional testing.

Wednesday 10-24-2018

- RMS will require the vault to be free of any and all other trades and contractors.
- 07:30 RMS and Ozone Solutions personnel will enter the vault to finalize all functional testing and calibration procedures.
- 13:00 RMS and Ozone Solutions personnel will meet in the vault with appropriate parties from Harris, Mortenson, and City of St. Paul for witnessing of the system functionality.

Witnessing and Functionality Check:

- RMS will walk witness parties through the functionality of the system as well as demonstrate system functionality by forcing different scenarios in the RMS controller.
  1. RMS will force the system into a "tank dump" scenario as signaled from the OPTI controller where the valves will modulate to the appropriate position and water will be sent from MH251 to the tank drain location.
  2. RMS will force the system into an irrigation only mode where the valve will modulate accordingly so that water is sent only to the booster pump skid. The booster pump skid will then pressurize water to the irrigation manifold where the irrigation valve will modulate to open allowing flow to the hose provided by Harris. Once the flow is witnessed RMS will remove the irrigation signal closing the irrigation valve on the manifold where the booster pump skid will satisfy pressure and shutdown.
  3. RMS will force the system into an irrigation and recirculation mode where the valve will modulate to allow for recirculation and ozone injection as well as supply to the booster pump set.
  4. RMS will then provide a brief explanation of the filtration system maintenance and shutdown the system for winterization by others.

The system startup checklist provided in Appendix 3 will be completed during these days and used as the basis of a report that will be provided within one month of startup.

2 System Operation

The purpose of the rain water harvesting system is to provide treated non-potable water (NPW) under pressure to irrigation systems, provide storm control and recirculate water in the storage vessels.

After startup, the system should operate without the need for regular input. System functions on the RMS-200 controller will be provided to the building automation system for remote checks on the system. Periodically check the RMS 200 control panel for information regarding system operation. Observe the operation of the system at least once a week to ensure that it is operating per the Sequence of Operations. The RMS-200 controller will provide alarms as indicated in the final design drawings to alert the user that maintenance should occur on the system.

A custom manual for the RMS-200 will be provided after startup.

3 Routine Maintenance Procedure

Perform regular maintenance and compliance water testing as outlined in Chapter 17 of the Minnesota Plumbing Code as well as cross connection and RPZ testing and any additional requirements by the City of St. Paul. Refer to the maintenance procedures provided in the Operations and Maintenance manuals provided. Training for the owner's representative and City staff will be provided after the system is operational. A table of replacement items is provided on the next page. These estimates were provided by RMS, Hyfab and Ozone Solutions for their respective equipment.

Table 1 – Maintenance Items and Replacement Parts

Maintenance Items and Replacements						
Equipment	**Replacement Items/Part Number**	**Frequency**	**Number**	**List Price Unit Cost**	**Subtotal Cost**	**Notes**
Back Flushing Filter						No regular maintenance replacements are required on this unit. O&M manual states A FILTER DATA SHEET, spare parts list for the filter along with spare part lists for the rinse valve and hydraulic piston have been provided with the documents for the filter.
5 Micron Filter	Shelco 5 Micron Bag Filter/ BPG-5-2SSH	As needed	4	$6.63	$331.50	Sold by the case quantity of 50 delivered with skid. Highly dependent on incoming water quality.
Carbon Filter	Carbon Cartridge/ SCB-30	As needed	12	$43.05	$516.60	Sold by quantity of eight. Highly dependent on incoming water quality.
Ultraviolet Light	Light /602856	Annual	2	$342	$684	
	Quartz Sleeve/ 602976	As Needed	2	$87	$174	
	Lamp and Quartz Combo/ 602850-103	As Needed	2	$375	$750	Use this part number if both lamp and quartz sleeve is needed.
	UV Light	As	2	$439	$878	Replace if damaged or

	Sensor/650580	Needed				owner may choose to have two on site for troubleshooting.
OX-64 Oxygen Concentrator	CF-8: Replacement Filter	4 per yr.	1	$74.38	$297.50	Listed as an annual cost by Ozone Solutions.
	AF-8 & PR-8 + Filter: Replacement Filter	4 per yr.	1	$13.13	$52.50	
	ATF-15 Gear Motor 7371	12K hrs.	2	$178.75	$357.50	Listed as a run time total by ozone solutions.
	ATF32	12-16K hrs.	2	$2,410.00	$4820.00	Listed as a run time total by ozone solutions.
	SVB-8-GC Rebuilt Kit	1 per yr.	1	$95.00	$95.00	Listed as an annual cost by Ozone Solutions.
	CF-12: Replacement Filter	4 per yr.	1	$148.19	$592.75	Listed as an annual cost by Ozone Solutions.
	AF-12: Replacement Filter	4 per yr.	1	$20.00	$80.00	Listed as an annual cost by Ozone Solutions.
TG-300 Ozone Generator	Low Pressure Check Valve/ CVLP-4	1 per yr.	1	$9.49	$9.49	Listed as an annual cost by Ozone Solutions.
	High Pressure Check Valve/ CVHP-8	1 per yr.	1	$16.24	$16.24	Listed as an annual cost by Ozone Solutions.
Atlas Air Compressor	Seal Kit-Instrument Block/2901109700	1 per 2 yrs.	1	$100.00	$100.00	Listed as cost in second year by Ozone Solutions.
	Filter Kit (oil separator, oil & air filter)/ 2901086501	4 per yr.	1	$271.25	$1085.00	Listed as an annual cost by Ozone Solutions.
	Desiccant (lbs.)					Listed as not needed for this model by Ozone Solutions.
	Motor	As needed	2	$231.25	$462.50	Not listed as an annual cost by Ozone Solutions.
	Motor Cap.	As needed	2	$27.50	$55.00	Not listed as an annual cost by Ozone Solutions.
	Pressure Switch/2200600682	As needed	1	$81.25	$81.25	Not listed as an annual cost by Ozone Solutions.

	V-Belt CINGHIA/ 367010055	As needed	1	$38.75	$38.75	Not listed as an annual cost by Ozone Solutions.
	Oil-Roto-Extend (1 gallon)/ 1310036837	As needed	1	$143.75	$143.75	Not listed as an annual cost by Ozone Solutions.
Submersible Pumps in MH- 251		As needed				No regular maintenance items listed in O&M manual. RMS to review at startup training.
Booster Pump Skid	Seal Kit (p/n: 10K169)	Annual	1	$170	$170	Recommended annual maintenance items provided by Hyfab to RMS after order and delivery.
	Casing O-Ring (p/n: 5K510) - $10.00 each	Annual	1	$10	$10	
	Repair Kit for Cla-Val Check Valve (p/n: 91698-05A)	Annual	1	$110	$110	

3.1 Pumping Systems for MH-251 and Booster System

Perform regular maintenance as provided in the pump operation and maintenance manuals. Ensure pumps do not freeze.

3.2 Back flushing Prefilters

Perform regular maintenance as provided in the manufacturer operation and maintenance manual.

3.3 5 Micron Filters and Carbon Filters

The 5 micron and carbon filter elements should be changed when the pressure differential is greater than 10 psi. When the differential pressure monitor signals that the bag filter and or carbon filters need to be changed, shut off the system utilizing the toggle switch on the RMS 200 controller. Isolate the bag filter assembly and the carbon filter assembly using the ball valves on either side of these devices. Open, remove and change filter bag/cartridges following the detailed instructions for each specific component found in Appendix 3. Once maintenance is complete, open previously closed ball valves and turn system back on.

3.4 Disinfection Systems

Annually, the Ultraviolet Light Disinfection Unit's bulb must be changed. The communication center for each device date should be set up during installation that will start a 365-day timer. The system will provide a signal when it is time for the annual bulb replacement. Turn the system off using the toggle switch on the upper right side of the RMS 200 and isolate the UV light using the ball valves on either side of the device. Change the bulb, quartz sleeve and clean the sensors following the manufacturer's instructions. Once the service is complete, open the ball valves and turn the system back on.

3.5 Ozone Treatment System

Perform regular maintenance as provided in the individual manuals for the ozone generator, ozone concentrator and air compressor.

4 System Shutdown and Winterization Procedures

Perform specific shutdown and winterization procedures as required by the City of St. Paul.

Turn off the toggle switch located at the top right of the RMS 200 controller.

Turn off power to MH 251 and the single point power supply.

Review operating instructions for the three-way valve in regards to manual operation.

Manually place the treatment system into storm drain mode.

Open the MH 251 low level inlet to allow full drainage of Tank A into MH 251. Pump out as much water from MH-251 per the specifications of the pump. If debris has entered the tank due to bypass or inadequate pre-filtration utilize a sump pump rated to remove the water and debris from the bottom of MH-251.

Close water service curb valve.

Remove filters and sterilize housings. Remove filter and other low point drains.

Clean cisterns on an as needed basis or on an annual basis.

Blow out the water in the RMS skid and associated devices.

5 Possible Breakdowns/Repairs and Troubleshooting

Pump failure: If pump failure is observed in either of the duplex pumps or booster pump. Contact a Goulds Pump service technician for further assistance.

Failure of Differential Pressure Monitor: Flow and pressure of system will be decreased. Take system off line and replace filter bags/cartridges. Monitor flow rate and pressure by direct observation until problem is corrected or faulty item is replaced.

Failure of Ultraviolet Light Disinfection Unit: Entire system should be taken off line and NPW Supply Distribution System fed by municipal water supply until problem is corrected.

Failure of 3 Way and Modulating Valves: Turn system off using toggle switch on the RMS 200 controller. Refer to the O&M manuals for the individual valves to manually turn the valve to allow water from the isolated system until the problem can be corrected.

6 Description of Equipment/Components and Operation within System:

Summary descriptions of the major equipment and components and operation within the system are provided below for the equipment in Table, 2

Table 2- Major System Components

Quantity	RAINWATER HARVESTING SYSTEM COMPONENTS
Two (2)	15 HP (DUPLEX) SUBMERSIBLE PUMPS
One (1)	32 GALLON PRESSURE TANK WITH PRESSURE TRANSDUCER
Two (2)	25 MICRON BACKFLUSHABLE FILTERS
Two (2)	5 MICRON BAG FILTER HOUSINGS
One (1)	CARBON FILTER HOUSING
Two (2)	80 GPM UV LIGHTS AND COMMUNICATION CENTERS
Two (2)	7.5 HP (DUPLEX) HYFAB BOOSTER PUMP INTEGRATED SKID SYSTEM
Three (3)	3" FLOW METERS FOR INLET, STORMWATER DRAIN AND RECIRCULATION LINES
Three (3)	2" FLOW METERS ON CITY WATER LINE, OUTLOT AND IRRIGATION LINES
One (1)	OZONE SOLUTIONS GENERATOR WITH OXYGEN CONCENTRATOR
One (1)	AIR COMPRESSOR
One (1)	ORP SENSOR FOR OZONE SYSTEM
One (1)	OZONE AMBIENT AIR QUALITY SENSOR
Two (2)	TURBIDITY SENSORS
One (1)	TEMPERATURE SENSOR
One (1)	PH SENSOR
One (1)	1/3 HP SUMP PUMP – 115V
One (1)	RMS 200 CONTROLLER
One (1)	FIELD SERVER FOR BACNET WITH ENHANCED MODBUS RTU TO BACNET MSTP
Three (3)	N/O FLOAT SWITCHES FOR MH-251
One (1)	RMS LEVEL SENSOR FOR MH-251
One (1)	2" PRESSURE REDUCING VALVE
One (1)	2" CITY WATER MAKEUP WATER VALVE ON RMS SKID
Two (2)	2" MODULATING VALVES FOR OUTLOT AND IRRIGATION FLOW
One (1)	3" MODULATING SELECTOR VALVE IRRIGATION OR NOT
One (1)	3" 3 WAY SELECTOR VALVE FOR OZONE RECIRCULATION OR STORM DRAIN
One (1)	2" PRESSURE REDUCING VALVE

DUPLEX SUBMERSIBLE PUMP SYSTEM: Pressurizes and moves the water through the NPW Supply Distribution System to booster pump for out lot, irrigation and recirculation or stormwater drain.

DUPLEX BOOSTER PUMP SYSTEM: Pressurizes and moves the water through the NPW Supply Distribution System to out lot and irrigation uses.

WATER METERS: Records the amount of water pumped from mh-251, city water supply and individual supply lines to out lot, irrigation, recirculation and stormwater dump.

VARIABLE FREQUENCY DRIVE: Vary the flow and pressure of the system to the design set points.

PRESSURE TANK AND PRESSURE TRANSDUCER: Allows for pump cut in and cut out based on the change of water pressure in the NPW Supply Distribution System.

BACKFLUSHING PRE-FILTER: Removes particulate greater than 25 microns from the water being pumped from MH-251.

SEDIMENT FILTER: Removes particulate greater than 5 microns from the water being pumped from MH-251.

CARBON FILTER: Removes organic and other contaminants from water being pumped from the cistern tank and improves odor.

ULTRAVIOLET DISINFECTION UNIT: Provides disinfection to the water being pumped from the cistern tank.

OZONE RECIRCULATION SYSTEM: Provides additional disinfection and recirculation of water stored in Tank A. Consists of multiple components including the ozone generator, concentrator, air compressor, ORP meter and kynar injector.

TURBIDITY, TEMPERATURE and PH SENSORS: Monitor water quality parameters. Turbidity is measured before and after treatment. Turbidity meters should be calibrated per the manufacturer's instructions. Temperature and Ph sensor are located after the treatment system. All parameters are for informational purposes. Per MN plumbing code only state certified laboratories qualified for testing for the required parameters will be allowed for the E. coli and turbidity tests. Ph and temperature are measured and recorded at the time of sampling as well as noting the presence of odors.

SUMP PUMP – Evacuates water should it come inside of the vault.

SINGLE POINT POWER CONNECTION WITH DISCONNECT: Accepts 208V/3/60 power for distribution to the RMS Controller.

RMS 200 CONTROL PANEL: Controls the system allowing for hands free operation under normal conditions.

FIELD SERVER FOR BACNET WITH ENHANCED MODBUS RTU TO BACNET MSTP: Provides ability for SCADA and Building Automation Systems to obtain and distribute information recorded by the RMS 200 Controller.

FLOAT TREE WITH TOTAL OF 25' OF STAINLESS STEEL CHANIN FOR MH-251: Allows for removal and changing of float switch elevations without entering tank.

N/O FLOAT SWITCHES FOR MH-251: Provide low level pump protection, opening of city water valve

along with a mid-level and high-level indication.

RMS LEVEL SENSOR FOR MH-251: Provides MH-251 water level monitoring to the RMS 200 Control Panel for visual depiction of level.

2" CITY WATER MAKEUP WATER VALVE ON RMS SKID: Opens when rainwater is not present in the cistern for continuous supply to the irrigation and out lot end uses.

2" PRESSURE REDUCING VALVE: Allows for reduction in pressure on incoming city water if it is too high.

WATER VALVES: Open and close to provide water to the intended end use and modulate to alter supply.

RMS SYSTEM SCHEMATIC

RMS ELECTRICAL SCHEMATIC

RMS ELECTRICAL WIRING DIAGRAM

RMS PRE-STARTUP CHECKLIST FORM

MINNESOTA SOCCER STADIUM
PRE START-UP CHECKLIST

Prior to scheduling start-up for your rainwater harvesting system, it is important that the system is ready to be started. To ensure the system is ready please complete the information below. Sign and date the completed PRE-START-UP CHECKLIST and forward it to your RMS sales representative or fax it to (540) 375-6751.

No start-up will be scheduled without a completed checklist.

GENERAL INFORMATION	
Project Name: Minnesota Soccer Stadium	
Project Address: 400 Snelling Avenue St. Paul, MN	
Start-Up Contact Name: Adam Grahek and Dan Kimlinger	
Start-Up Contact Company Name: Harris Mechanical	
Start-Up Contact Company Address: Harris Mechanical 909 Montreal Circle St. Paul, MN 55102	
Start-Up Contact Phone Number: 651-602-6524	**Cell:** 612-366-6053 (Adam) **Cell:** 651-233-9637 (Dan)
Start-Up Contact Email Address: agrahek@hmcc.com	
Pre-Start Up System Check Trip: Week of October 8th. Submersible pumps, field installed devices and adequate power was not available to test system.	
Start-Up Date Requested:	

RMS
RAINWATER MANAGEMENT SOLUTIONS

MINNESOTA SOCCER STADIUM
PRE START-UP CHECKLIST

YES	NO	N/A	ITEM DESCRIPTION
			Cistern has sufficient water to start the system and operate the pump(s)
			All necessary components have been received
			All necessary components have been installed
			All plumbing connections have been made
			All plumbing connections have been tested for leaks
			All proper power sources have been verified and connected to RMS single point power. Power to the submersible pumps have been verified. Power to the booster pump skid has been verified.
			All components have been appropriately wired including field installed devices indicated on the RMS Shop drawings and landed on terminals per the wiring diagram provided inside the RMS 200 controller.
			Opti RC equipment has been installed.
			Valving and hose are in place to simulate flow to irrigation and out lot.
			All power connections have been tested
			Are there any changes to the original installation, design, or functionality of the system that need to be understood prior to the start- up (if yes list in "notes" below)

Comments and Notes (Use Additional Sheets if Necessary):

_____

Start-Up Contact Signature: _____ **Date:** _____

My signature certifies that all items on the checklist are completed and the rainwater harvesting system is ready for start-up. I understand the representative from RMS will not be responsible for any wiring or plumbing on site. The representative will only be responsible for starting the system. If for any reason the system does not perform as intended, the RMS representative will determine any issues with the system but it will be the responsibility of the contractor or person requesting the start-up to provide the necessary supplies, plumbers, electricians or other licensed professionals to make the necessary changes. Any system that is not properly installed or will not function and requires an additional visit by RMS will require a Purchase Order at a cost of $1,300.00 per day with meals, travel, and lodging being charged additionally. Once the signed Information Sheet and Start-up Checklist is received by RMS every attempt will be made to accommodate the requested start-up date but it is not guaranteed. A minimum of two weeks is necessary to schedule a start-up on any rainwater harvesting system. Confirmation of your start-up date will be forwarded to you by your RMS Representative.

RMS STARTUP CHECKLIST FORM

RMS
RAINWATER MANAGEMENT SOLUTIONS

JOB NAME:	MN Soccer Stadium
LOCATION:	400 Snelling Ave. St. Paul MN
START-UP DATE:	
COMPLETED BY:	Tim Smith

Rainwater Management Solutions (RMS) personnel have performed start-up on the rainwater harvesting system. The rainwater harvesting components supplied by Rainwater Management Solutions Inc are functioning as intended. All aspects of the system are in working order and I am satisfied the system is functioning as intended. An electronic copy of this file will be provided to the necessary parties.

INSTALLING CONTRACTOR:
Harris Mechanical – Mechanical Contractor; **Bolander** – Civil Contractor

PERSONS PRESENT FOR STARTUP:
Tim Smith

PROJECT DESCRIPTION:
Rooftop collection from soccer stadium and distribution for outdoor irrigation and future outlot irrigation.

RAINWATER HARVESTING SYSTEM CHECKLIST:

INSTALLED	CALIBRATED	TESTED	N/A	BY OTHERS	QUANTITY	GENERAL SYSTEM SECTION
✓						All system components are installed and properly secured
✓						System piping is ready for pressurization and flow test
✓						Component drains and vents are plumbed to necessary drains or atmosphere
✓						All electrical components and wiring are secure and in proper condition
						No leaks were found in the piping or system components
✓						After startup prior to leaving site the system was left in: - Off Position - Automatic Mode and running - Stopped Position on control panel

RMS
RAINWATER MANAGEMENT SOLUTIONS

JOB NAME:	MN Soccer Stadium
LOCATION:	400 Snelling Ave. St. Paul MN
START-UP DATE:	
COMPLETED BY:	Tim Smith

INSTALLED	CALIBRATED	TESTED	N/A	BY OTHERS	QUANTITY	RAINWATER FILTER SECTION ITEM DESCRIPTION
			X			Incoming pipe has proper horizontal run prior to install to allow proper flow
			X			Vortex Filter is installed plumb and level
			X			Extension Tube is installed and cut to length
			X			Filter insert is properly seated in housing
			X			Any transitions in piping size or type are made prior to the calming area
			X			All filter accessories and paperwork have been removed from the housing
				X		Document pre-filtration.

INSTALLED	CALIBRATED	TESTED	N/A	BY OTHERS	QUANTITY	POST-TANK FILTRATION SECTION ITEM DESCRIPTION
✓						All unions have been tightened
✓						All valves are closed to allow a slow startup and initial flow of water
✓						**Automatic filter:** discharge and vent tube routed to drain
✓						**Automatic filter:** manual backwash was completed to ensure proper pressure for backwash and no spilling at drain point.
✓						**Bag Filter Housing 1:** bag installed properly and verify 5-micron rating
✓						**Bag Filter Housing 2:** bag installed properly and verify 5-micron rating
✓						**Carbon Filter Housing:** Cartridges installed properly
✓						**UV Light:** Quartz sleeve and bulb installed properly Verify bulb is operable. Communication center is operable and set for annual change
✓	✓					**Ozone System:** operating and calibrated (By Ozone Solutions) - See additional startup documentation provided by Ozone Solutions
			X			**Chlorine Injection Pump:** operating and dosing is set Chlorine added? Yes / No PH level set? Yes / No

RMS
RAINWATER MANAGEMENT SOLUTIONS

JOB NAME:	MN Soccer Stadium
LOCATION:	400 Snelling Ave. St. Paul MN
START-UP DATE:	
COMPLETED BY:	Tim Smith

INSTALLED	CALIBRATED	TESTED	N/A	BY OTHERS	QUANTITY	PUMP SECTION ITEM DESCRIPTION
✓						Submersible pump motors and pumps rotation have been verified
✓						Float switch for pump protection is installed correctly and tested
			X			Floating filter is connected to pump/outlet to pump
✓						Booster Pump installed and cycles properly
✓						Transducer installation was verified to be in the position indicated on design drawings
			X			Pressure switch installation was verified to be in the correct position
✓						Submersible pumps have sufficient water in MH – 251 to prime pumps
						Submersible Pump operation based on (circle one): - Day Tank level - (Pressure setpoint) - Flow setpoint
						Submersible Pump setpoint - Pressure start: 55 PSI - Pressure shut off: 60 PSI - Flow: _____
✓						Booster pump was primed prior to starting
✓						Booster pump rotation was verified
✓						Booster pump installed and cycles properly
✓						Booster pump protection device installed and tested
						Booster pump operation based on (circle one): - Day Tank level - (Pressure setpoint) - Flow setpoint - On/off signal from external device
						Booster Pump setpoint - Pressure start: 90 PSI - Pressure shut off: 100 PSI - Flow:

RMS
RAINWATER MANAGEMENT SOLUTIONS

JOB NAME:	MN Soccer Stadium
LOCATION:	400 Snelling Ave. St. Paul MN
START-UP DATE:	
COMPLETED BY:	Tim Smith

INSTALLED	CALIBRATED	TESTED	N/A	BY OTHERS	QUANTITY	CONTROLS SECTION ITEM DESCRIPTION
✓						Controller main input power is present
✓						Controller was started with component breakers off to verify programming and setpoints
✓						RMS level sensor is properly installed in MH-251
✓						Controller operates in Auto Mode
✓						Controller operates in Manual mode
			X			RMS level sensor is properly installed in day tank
✓						Three submersible level switch(es) are installed in MH-251
✓						1. RMS Inlet Flowmeter: is installed in line properly and functioning
✓						2. RMS City Backup Flowmeter: is installed in line properly and functioning
✓						3. RMS Outlot Flowmeter: is installed in line properly and functioning
✓						4. RMS Irrigation Flowmeter: is installed in line properly and functioning
✓						5. RMS Drain to Stormwater Flowmeter: is installed in line properly and functioning
✓						6. RMS Ozone Recirculation Flowmeter: is installed in line properly and functioning
→	See Comments					Pressure Differential between components are installed properly and functioning?
✓						1. Additional sensor installations: inflow turbidity sensor
✓						2. Additional sensor installations: outflow turbidity sensor
✓						3. Additional sensor installations: pH sensor
✓						4. Additional sensor installations: temperature sensor
✓						1. City Selector Valve for backup water placement and installation verified. Valve position verified (circle):OPEN CLOSED
✓						2. Modulating Selector Valve for Irrigation or Not placement and installation verified. Valve position verified (circle): OPEN CLOSED Fail to drain
✓						3. Modulating Outlot Valve placement and installation verified. Valve position verified (circle): OPEN CLOSED
✓						4. Modulating Irrigation Valve placement and installation verified. Valve position verified (circle): OPEN CLOSED
✓						5. Modulating Recirculation or Storm Drain Valve placement and installation verified. Valve position verified (circle): OPEN CLOSED Fail to drain

JOB NAME:	MN Soccer Stadium
LOCATION:	400 Snelling Ave. St. Paul MN
START-UP DATE:	
COMPLETED BY:	Tim Smith

INSTALLED	CALIBRATED	TESTED	N/A	BY OTHERS	QUANTITY	CONTROL PARAMETER SETTING SECTION ITEM DESCRIPTION
			X			Pressure Differential scale set value:
✓						MH-251 Size Scale set value:
		[illegible]	X			Day Tank Size Scale set value:
✓						PH Scale set value: 14
✓						System Pressure Scale set value: 60psi - MH 251, 100psi irrigation/outlet
✓						Flow K-Factors set:
			X			Any user settable timer set point:
✓						Date and time in PLC were set

RMS
RAINWATER MANAGEMENT SOLUTIONS

JOB NAME:	MN Soccer Stadium
LOCATION:	400 Snelling Ave. St. Paul MN
START-UP DATE:	
COMPLETED BY:	Tim Smith

INSTALLED	CALIBRATED	TESTED	N/A	BY OTHERS	QUANTITY	HIGH VOLTAGE ELECTRICAL SECTION ITEM DESCRIPTION
✓						Main input to single point power source is present - Voltage: 208 V 3 PH
✓						Main Input to control panel is present - Voltage: 110 V
✓						Secondary Voltage from transformer in single point power source is present - Voltage: 247
✓						Output voltage to pump (at starter, drive, contactor, or pressure switch input) - Pump Name or Placement: Submersible duplex pumps in MH-251 (i.e. Cistern Pump, Booster Pump) - Voltage: 208 V
✓						Output voltage to pump (at starter, drive, contactor, or pressure switch input) - Pump Name or Placement: Booster Pump duplex (i.e. Cistern Pump) - Voltage: 208 V
			X			Output voltage to pump (at starter, drive, contactor, or pressure switch input) - Pump Name or Placement: Sump Pump (i.e. Cistern Pump,) - Voltage: 110 volts

RMS
RAINWATER MANAGEMENT SOLUTIONS

JOB NAME:	MN Soccer Stadium
LOCATION:	400 Snelling Ave. St. Paul MN
START-UP DATE:	
COMPLETED BY:	Tim Smith

INSTALLED	CALIBRATED	TESTED	N/A	BY OTHERS	QUANTITY	**MODES OF OPERATION SECTION** **ITEM DESCRIPTION**
		✓				System operates in normal irrigation mode
		✓	✓			System operates in normal outlot irrigation mode
		✓				System receives signal from opti-level sensor and opens and runs in storm drain mode
		✓				System receives signal from ORP sensor and starts and stops Ozone system and recirculation loop
						INSERT COMBINED MODES PER CONTROLLER.

JOB NAME:	MN Soccer Stadium
LOCATION:	400 Snelling Ave. St. Paul MN
START-UP DATE:	
COMPLETED BY:	Tim Smith

ADDITIONAL NOTES: (example: Filter replacements left on skid)

Leak found at tee on Recirc. Line, Pump inlet Flange from MH-251 leaking, flange at outlet/irrigation manifold leaking, drain flange in wall leaking. Pressure diff #3 not functioning properly ← believe to be fixed via RMS repair.
- Run by David Williams Auto Air Purge Valves on MH251 pump lines.
- Minor Malfunction on 10/24/2018 City Witness test - JK
  ↳ 90 psi fail sensor set to fail pumps at ≥90 psi
  ↳ tested and proved to work per T.J. Smith 10/25/2018

Contractor Signature: _____ Date: 10/25/2018

RMS Representative Signature: _____ Date: 10-25-18

Your signature constitutes completion of the start-up visit offered in conjunction with this proposal for this project. Payment for any future visits will be the responsibility of the requesting party and consist of $1,300.00 per day, travel, meals, lodging and rental car. The $1,300.00 per day fee must be paid prior to the visit. All additional costs will be billed once the visit is complete.

OZONE SOLUTIONS AND ATLAS PRE-STARTUP CHECKLIST FORM

Customer Pre- Start Up Check List

Please return the completed form to your sales person. Please allow for as much notice as possible to allow for efficient scheduling.

Customer: Rainwater Management Solutions

Unit Model: GX4EP tri-voltage 3-phase Part #8152101260 S/N: ITJ124333

Street Address of Equipment:

Minnesota MLS Stadium Rainwater Treatment Vault

400 Snelling Avenue

City: St. Paul State: MN Zip: 55104

Contact Name: Tim Smith Phone number: 540-204-5015 or 540-375-6750 or 866-653-8337

Preferred Start-up date October 23-24 2018

Check boxes to confirm they are completed.

- ☐ Review instruction manual
- ☐ Installed compressor according to the instruction manual (note wire and fuse size)
- ☐ Check electrical connections, unit grounded, protected against short circuits (fuses not breakers)
- ☐ Check incoming voltage phase to ground L1_____ L2_____ L3_____
- ☐ Check starter to control panel interconnect (external starters)
- ☐ Air piping connected. (Piped to top of header or receiver)
- ☐ Check cooling water connections, water shut-off solenoid, strainers and quality meets minimum requirements (water cooled units)
- ☐ Check Condensate drains piped according to instruction manual. (Separate, sloped downward to open drain with an air gap)
- ☐ Check room for proper ventilation
- ☐ Compressor is available for Lock out Tag out to be removed for start up.

Is the compressor located outdoors? ☐Yes ☑No

Is Safety training or site training required for the Atlas Copco Service Technician prior to start up?

☐Yes ☐No If yes hours needed. _____

Are there any site or union restrictions that will affect the Atlas Copco Service Technician from performing start up?

Comments: _____

_____

_____

Included in your start-up is 30 minutes of basic operation and maintenance requirements.
Site delays over 30 minutes will result in possible additional charges.

Customer Signature _____ Date _____

OPERATION AND MAINTENANCE MANUALS

Submersible Pump and Motor

Booster Pump

Submersible VFD

Pressure Tank

Backwash Filter

Sediment Filtration

Carbon Filter

UV Light

CommCenter

Flow Meter

OZONE GENERATOR

AIR COMPRESSOR

ORP SENSOR

Signet GF-2724
Flat pH Sensor

OZONE AMBIENT AIR QUALITY METER

Temperature Sensor

RMS pH Kit

GF-2751 pH/ORP Sensor

Sump Pump

Controller

Level Sensor

Float Switches

Pressure Sensor

Motorized Ball Valve

Modulating Valve

3-Way Valve

Pressure Reducing Valve

STATEMENT OF WORK

(Opti SaaS Platform)

STATEMENT OF WORK NO. 6

This Statement of Work No. 6 is entered into in connection with, and is governed by, that certain Master Services and License Agreement (the "**Agreement**") dated as of October 1, 2016 by and between OptiRTC, Inc. ("**Opti**") and Capitol Region Watershed District ("**Company**"). Capitalized terms used but not defined herein shall have the meanings ascribed to them in the Agreement.

In consideration of the mutual promises contained in the Agreement and for other good and valuable consideration, the receipt and sufficiency of which is acknowledged, the parties agree as follows:

1. General Information.

Statement of Work Effective Date:		October 27, 2023
Initial Term:		32 Months
Location/facility:		Allianz Field
Subscription Type:		Opti Essentials
Start Date (Activation):		November 1, 2023
End Date:		June 30, 2026
Project Managers:	Opti:	Dayton Marchese, dmarchese@optirtc.com, 805-708-0300 *(name, email, phone)*
	Company:	Forrest Kelley; forrest@capitolregionwd.org *(name, email, phone)*

2. Opti SaaS Platform.

a. *License*. As part of the Services, and subject to the terms and conditions of the Agreement and this Statement of Work, including but not limited to timely payment the Fees specified below, Opti hereby grants to Company, while this Statement of Work is in full force and effect, a non-exclusive, non-sublicensable, non-transferable right to access and use, solely for Company's internal business purpose, the following (collectively, the "**Opti SaaS Platform**"): (i) via the Internet, Opti's proprietary subscription based software-as-a-service platform (in object code format only), including access to the customer-accessible features and functionality of, (A) Opti's proprietary software (in object code format only) embedded on certain hardware devices provided by Opti, which facilitates the collection of data (the "**Opti Software**") and (B) Opti's proprietary application programming interface (the "**Opti API**"), and (ii) any documentation related to the Opti SaaS Platform that is made available to Company online or otherwise, as updated from time to time (the "**Documentation**").

b. *Restrictions*. Except as expressly permitted hereunder, Company shall not and shall not permit or authorize any third party to: (i) copy, modify, reverse engineer, decompile, disassemble or

otherwise attempt to discover the source code, object code or underlying structure, ideas or algorithms of any part of the Opti SaaS Platform; (ii) translate or create derivative works based on any part of the Opti SaaS Platform; (iii) license, sublicense, sell, resell, rent, lease, transfer, assign, distribute, time share, or otherwise commercially exploit or make any part of the Opti SaaS Platform available to any third party; or (iv) access any part of the Opti SaaS Platform to develop or build a competitive product or service.

c. *Agreement*. For purposes of the Agreement, the Opti SaaS Platform, each portion thereof, and all modifications, enhancements and improvements thereof and derivative works based thereupon are deemed to be Opti Property and Confidential Information of Opti, and Company agrees to treat them accordingly. To the extent the Opti SaaS Platform include Third-Party Products, the corresponding provisions of the Agreement shall apply. Subject to the limited rights expressly granted herein, Opti reserves all right, title and interest in and to the Opti SaaS Platform and all other Opti Property, all modifications, enhancements and improvements of and derivative works based upon any of the foregoing, and all related Intellectual Property Rights. Except for the limited license set forth above, nothing in the Agreement or this Statement of Work grants or shall be construed to grant to Company any right, title, interest or license in or to the Opti SaaS Platform.

d. *Warranty*. Opti warrants that the Opti SaaS Platform, as delivered, shall perform materially in accordance with the corresponding specifications contained in the then current Documentation for the Opti SaaS Platform. In the event of any breach of this warranty while this Statement of Work is in effect, Opti shall, as its sole liability and Company's sole remedy, diligently remedy such deficiencies that cause the Opti SaaS Platform to not conform to this warranty. If Opti determines that it is unable to remedy such deficiencies, Opti may terminate this Statement of Work and refund to Company a pro rata amount of the Fees previously paid by Company to Opti for the unused term of this Statement of Work.

3. Fees and Payments:

a. Subscription Fees by Period:

i.	11/1/23-10/31/24 (12 Months):	$5,000.00
ii.	11/1/24-10/31/25 (12 Months):	$5,000.00
iii.	11/1/25-6/30/26 (8 Months):	$3,333.33
	Total for 32 Months:	**$13,333.33**

b. Invoicing. Fees for the Opti SaaS Platform are based on annual periods that begin on the Start Date set forth above. The full **$13,333.33** shall be invoiced in advance and be payable by Company net thirty (30) days from receipt of invoice. Company's obligation to pay such Fees, to the extent attributable to any period of time prior to the effective date of termination of this Statement of Work, shall survive such termination.

4. Company Data: Opti acknowledges and agrees that any and all electronic data or information submitted by Company directly or otherwise made available to Opti through Company's use of the Opti SaaS Platform ("**Company Data**") shall be considered Company Property for purposes of the Agreement. Company hereby grants Opti:

a. During the term of this Statement of Work, a limited, non-exclusive, worldwide, royalty-free, fully paid-up, sublicensable right and license to (i) copy, transmit, display, distribute, modify, create derivative works of and otherwise use the Company Data in order to perform the Services, (ii) derive data therefrom ("**Derived Data**"), and (iii) allow third-party providers of Third-Party Products to access Company Data solely as required for the interoperation and troubleshooting of such Third-Party Products

with the Opti SaaS Platform; and

b. During the term of this Statement of Work and thereafter, an unrestricted, transferrable, non-exclusive, worldwide, royalty-free, fully paid-up, sublicensable right and license to copy, use, modify, distribute, display and disclose Company Data on an aggregate and anonymized basis, solely to the extent that the aggregate data does not include information that identifies or would reasonably be expected to identify Company as the source of such data.

c. Upon written request by Company made to Opti within thirty (30) days after the effective date of termination or expiration of this Statement of Work, Opti will make available to Company for download a file of the Derived Data in comma separated value (.csv) format, provided, however, that Company has materially met its payment obligations under the Agreement. After such thirty (30)-day period, Opti will have no obligation to maintain or provide any Company Data or Derived Data and may thereafter, at Opti's option, delete any such Company Data and Derived Data in Opti's possession or under Opti's control.

IN WITNESS WHEREOF, the Parties have signed this Statement of Work as of the Statement of Work Effective Date above.

OptiRTC, Inc.

By: David J Rubinstein

Name: David J Rubinstein

Title: CEO

Capitol Region Watershed District

By: Mark Doneux

Name: Mark Doneux

Title: Administrator