WithersRavenel
Our People. Your Success.

To:	Plan Holders
CC:	City of Elizabeth City
From:	Cathleen Saunders, PE
Date:	May 20, 2025
Project:	City of Elizabeth City KE White Water Tower Disinfection Improvements

ADDENDUM 1

Bidders on this Project are hereby notified that this Addendum, as all other Addenda, shall be attached to and made a part of the above-named Bidding and Contract Documents.

The following items are issued to add to, modify, and/or clarify the Bidding and Contract Documents. These items shall have full force and effect as the Bidding and Contract Documents, and costs involved shall be included in the bid prices. Bids to be submitted on the specified bid date shall conform to the additions and revisions listed herein.

Acknowledge receipt of all Addenda by inserting the Addendum number and date in the appropriate location of the Bid Form (Specification Section 00 04 10). Failure to do so may subject the bidder to disqualification.

Pre-Bid Conference Agenda

1. See the attached Pre-Bid Conference Agenda and sign-in sheet.

Questions/Clarifications:

1. **General:** The equipment submittal cut sheets have been included as Appendix A of the Project Manual.
2. **General:** The Meeting Summary and Sign-in from the non-mandatory pre-bid have been included within this Addenda.
3. **Do the mounting brackets on the outside of the tower need to be welded or three bolted:** Mounting brackets will need to be welded.
4. **Can the supplier provide more detail on the penetrations on top of the tower as far as around the hatch and how to bring all of the hoses, pipes, etc. through:**

   - **Mixer Electrical Connection -** The mixer has a flat jacketed cable attached to it that's designed to be submerged up until the point where it leaves the tank bowl. Cleanwater1 provides a strain relief that fits that flat cable (usually put just in the side of the hatch). Right after the strain relief, there is a small run of 1" conduit that goes into a junction box where it transfers the flat cable into the regular gauge wire and

conduit as detailed on the electrical plans. Necessary bends should be sweeping to avoid strain.

- **Ammonia Line** - The tubing is 3/8-inch outer diameter. The installer should anticipate penetrating the hatch with a 1 ½ inch conduit adapter and a strain relief section on the inside of the 1 ½" conduit on the 3/8-inch tubing for the ammonia line.

- **Hypochlorite line** - The tubing is 7/16-inch outer diameter. The installer should anticipate penetrating the hatch with a 1 ½ inch conduit adapter and a strain relief section on the inside of the 1 ½ inch conduit on the 7/16-inch tubing for the hypochlorite line.

- **Sampling Pump Electrical –** The pump is provided with a flat jacketed cable that's designed to be submerged up until the point where it leaves the tank bowl. Cleanwater1 provides a strain relief that fits that flat cable (usually put just in the side of the hatch). Right after the strain relief, there is a small run of 1" conduit that goes into a junction box where it transfers the flat cable into the regular gauge wire and conduit as detailed on the electrical plans. Necessary bends should be sweeping to avoid strain.

- **Water Sampling line –** The tubing is 1-inch outer diameter. The installer should anticipate installing loop interior to the tank including a PVC tee with additional tubing and globe valve to allow for release of pressure. See "WQS Sample Pump, Plumbing, Upper" detail within Appendix A of the project manual. After installation of the water return loop, the installer should anticipate penetrating the hatch with a 2-inch conduit adapter and a 1" strain relief section on the inside of the 2-inch conduit on the 1-inch tubing for the sampling line. Necessary bends should be sweeping to avoid strain.

Project Manual:

1. **Table of Contents:** Appendix A has been added at the end of the Project Manual.
2. **Appendix A:** Added.

Plan Updates:

1. **General**: Due to text corruption in the pdf, the plan set sheets G1.0, G1.01, C1.00, C2.00, and C2.01 have been reprinted to make the text legible. The scope and design have not been revised, but the plan set date within contract documents shall be 5/20/2025.

END OF ADDENDUM 1

Pre-Bid Conference

for the

KE White Water Tower Disinfection Project

WR Project No. 23-1097-004

May 19, 2025 at 3:00 PM

ATTENDANCE SHEET
(PLEASE PRINT CLEARLY - THANK YOU)

				Joined in person or virtual?
Name:	Cathleen Saunders	Phone #	252.491.8147	virtual
Company Name:	WithersRavenel	Fax#		
Company Address:	8466 Caratoke Highway, Building 400, Powells Point, NC 27966	Email	csaunders@withersravenel.com	
Name:	Erin Skinner	Phone #	919.469.3340	virtual
Company Name:	WithersRavenel	Fax#		
Company Address:	167 E. Chatham St., Suite 210	Email	espencer@withersravenel.com	
Name:	McPherson Enterprises Plumbing & Trucking	Phone #	(252) 339-9441	
Company Name:	Ben McPherson	Fax#		
Company Address:	209 Charles St	Email	Mcphersonent078@gmail.com	
Name:	Raymond Staten	Phone #	252 722-4822	
Company Name:	City of Elizabeth City	Fax#		
Company Address:	410 Pritchard St	Email	rstaten@elizabethcitync.gov	
Name:	Gregory Colvin	Phone #	252-333-2540	
Company Name:	City of Elizabeth City WTP	Fax#		
Company Address:	1 Wilson ST Elizabeth City	Email	gcolvin@elizabethcitync.gov	
Name:	Randy C. Lassiter, Jr.	Phone #	252-339-2068	
Company Name:	City of Elizabeth City	Fax#	elizabethcitync.gov	
Company Address:	410 Pritchard Street	Email	rlassiter@cityof	
Name:	Jeremy Regan	Phone #	404-971-0264,	virtual
Company Name:	Maverick Construction	Fax#		
Company Address:		Email	jregan@maverickregan.com	
Name:	Craig Laque	Phone #	317-989-1334	virtual
Company Name:	Clearwater1, Inc.	Fax#		
Company Address:		Email	claque@cleanwater1.com	
Name:		Phone #		
Company Name:		Fax#		
Company Address:		Email		
Name:		Phone #		
Company Name:		Fax#		
Company Address:		Email		
Name:		Phone #		
Company Name:		Fax#		
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Company Address:		Email		
Name:		Phone #		

Pre-Bid Conference

for the

KE White Water Tower Disinfection Project

WR Project No. 23-1097-004

May 19, 2025 at 3:00 PM

ATTENDANCE SHEET
(PLEASE PRINT CLEARLY - THANK YOU)

Company Name:	Fax#	
Company Address:	Email	
Name:	Phone #	
Company Name:	Fax#	
Company Address:	Email	
Name:	Phone #	
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Company Address:	Email	
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Company Address:	Email	

PRE-BID CONFERENCE AGENDA

Project:	City of Elizabeth City KE White Water Tower Disinfection Improvements
WR Project No.	23-1097-004
Date:	May 19, 2025 at 3:00 PM
Location:	Public Works 2nd Floor Conference Room, located at 410 Pritchard Street, Elizabeth City, NC 27909 In person and virtually via MS Teams

Please note that nothing discussed or said at this Pre-Bid Conference in any way amends the Contract Documents. Only Addenda can amend the Contract Documents.

1. **Introduction / Attendance**
   The project is KE White Water Tower Disinfection Improvements

Owner – City of Elizabeth City		
Public Utilities Director	Dwan Bell	dbell@elizabethcitync.gov
Public Works Project Manager	Randy (R.J.) Lassiter	rlassiter@elizabethcitync.gov
Engineer – WithersRavenel		
Project Manager	Cathleen Saunders, P.E.	csaunders@withersravenel.com
Director of Utilities, OBX	Michael W. Strader, P.E.	mstrader@withersravenel.com

   Provide full company name, mailing address, point of contract, telephone, and email address. This needs to be provided in order to receive any future addenda on this project.

2. **Project Location & Description**
   The project consists of installation of a Monoclor® Residual Control System (RCS) within the KE White Elevated Water Tower. The proposed booster pump disinfection improvement system includes a submerged tank mixer, water quality sampling system, submerged pump, injector assembly, hypochlorite storage tank, liquid ammonium storage tank, individual dosing skids for each chemical, and all associated appurtenances including, but not limited to, piping, control panels, chemical and electrical conduit. The booster pump disinfection system materials are to be provided by the City as detailed on the plan. All remaining materials for a complete and operational system are to be provided by the contractor.

3. **Project Schedule**
   Days to substantial completion: 30
   Days to final completion: 60

4. **Addenda**
   All questions related to this bid shall be submitted in writing to espencer@withersravenel.com and rlassiter@elizabethcitync.gov prior to 5 PM local time on Tuesday, May 20th, 2025 to receive

consideration. Questions received after that time will not be answered or accepted. A Final Addendum will be provided prior to the Bid Date.

Plans, specifications, and addenda are posted to www.questcdn.com/cdn/posting for downloading at a cost to the BIDDER of $25.00 for each contract. If plans and specifications are downloaded from this site, the BIDDER will automatically be added to the plan holders list and all addenda will be sent to the BIDDER.

Quest Project Number: 9656265

Addenda 1 will be released after this meeting and will include the summary and sign-in sheet from this meeting. Any questions will be compiled and answered in addenda and clarifications will distributed to **registered plan holders only**.

5. **Bid Submission (Section 00 02 00 Instructions to Bidders & Section 00 04 10 Bid Form)**
Bids may be submitted by UPS or hand delivery only at the Public Works building:

C/O: R. Lassiter or D. Bell

City of Elizabeth City

410 Pritchard Street

Elizabeth City, NC 27909

Bids delivered after 3:00 PM on May 29, 2025, will be rejected and not opened.

6. **Obtaining Plans and Contract Proposal Documents**
Complete digital bidding documents are available at http://withersravenel.com/bid/ or www.questcdn.com. You may download the digital documents for $25.00 by inputting Quest project # 9656265 on the website's search page. Please contact QuestCDN.com at (952) 233-1632 or info@questcdn.com for assistance in membership registration, downloading, and working with this digital project information. Contract documents may also be examined by downloading them under the project notices at www.elizabethcitync.gov, or evp.nc.gov.

7. **Required Submittals**
Bid submittal must meet all requirements outlined in the Contract Proposal. A successful bid package will include, but is not limited to the following:
    a. Completed Bid Form with lump sum costs for each base bid and additive bid item.
    b. Bid Security of 5%
    c. Required Insurance Documentation
    d. Copy of Contractor License

8. **Bid Form**
    a. Lump Sum Contract. - Base Bid items are lump sum and should include all work required to complete that particular base bid item to deliver a complete and operable system.

9. **Property Acquisition**
The OWNER has obtained all required property and easements for the project.

10. **Work Area**
All work must occur within the right-of-way owned by the OWNER (City of Elizabeth City). Staging areas beyond this are the responsibility of the CONTRACTOR.

11. **MBE Solicitation Requirements**
There is a 10% MWBE participation goal in accordance with North Carolina General Statutes. Documentation of MWBE solicitation will be required to be submitted with bids. The award of the Contract cannot be made until all such documentation have been submitted. BIDDERs are cautioned to become familiar with the forms and provide the requested documentation.

12. **Davis Bacon Wage Rates and American Iron and Steel; Build American Buy American (BABA)**
Do NOT apply to this project

13. **Question and Answer Period**
Please note that a portion of the materials are to be provided by the City of Elizabeth City as noted on the plans. This includes the disinfection system only. All other piping, wiring, and appurtenances necessary for a complete and operational system are to be provided by the BIDDER.

    a. It is the bidder's responsibility to visit the site and review existing conditions.
    b. Stockpiling can take place interior to fencing at the site as long as the BIDDER coordinates directly with the OWNER.
    c. Owner reserves the right to negotiate with apparent low bidder to phase the project as necessary.
    d. BIDDER Acknowledges they are available to enter into a contract within ten (10) days of award.
    e. The BIDDER shall review Bid Note 3. For a list of items to be provided by The City of Elizabeth City.
        - These items do not need to be included in bid, only installation and testing of these items (approximately pg. 28 in project manual)

    At this time all potential BIDDERs may ask project related questions.

    The deadline for submitting questions on the project is Tuesday, May 20, 2025 by 5:00 PM.

    - Can a visual of the Monoclor System be provided?
        - ENGINEER showed a schematic of the system during the meeting.
    - Will CONTRACTOR be required to manufacture the equipment racks or does that come with the package?
        - The pumps come on a skid, which has a flat bottom. They generally lay on the floor but can be mounted on a table, wall, etc. The manufacturer does not provide any additional mounting.
        - There are 3 control panels that are separate from the pump skids – approx. 20" x 10" and weigh less than 50 pounds
    - Do the mounting brackets on the outside of the tower need to be welded or three bolted? And when you get up to the tank, what is required?
        - The mounting brackets will need to be welded.
    - What is the ETA for supplies?
        - Will be ready to ship by the second week to mid-June
        - The mixer may come in a separate shipment
    - Does the system come with instructions for installation?
        - Each installation can be different so there is not necessarily an instruction manual, however Cleanwater1, Inc. will provide instructions with the equipment and will be available for consultation during the install. The equipment submittal will be

included with Addenda #1 – It does not include the sample pump setup that will be needed for this project, but does include instructions for the chemical lines, mixer, power lines, and mounting to the tank.

- For warranty/inspection of the system and its operation, will the supplier provide any additional support in that regard?
    - Yes, Cleanwater1, Inc. has a copy of the plans and previously reviewed them. They welcome progress photos and if they have someone in North Carolina, they can send them to the jobsite – may not be a technician but may be a salesman or someone from UGSI (their sister branch). They are also available by phone for any technical questions or tips.
- Can supplier provide more detail on the penetrations on top of the tower as far as around the hatch and how to bring all of the hoses, pipes, etc. through?
    - The mixer has a flat jacketed cable attached to it that's designed to be submerged up until the point where it leaves the tank bowl. Cleanwater1 provides a strain relief that fits that flat cable (usually put just in the side of the hatch). Right after the strain relief, there is a small run of conduit that goes into a junction box where it transfers the flat cable into the regular gauge wire as detailed on the electrical plans.
- How about chemical hoses? Do they drill through the top or does it come through the hatch?
    - Supplier typically recommends having the chemical lines in the riser and penetrate above the high-water level. However, everything will go through the top for this project due to constraints.
    - The tubing is 3/8-inch outer diameter. The installer should anticipate penetrating the hatch with a 1 ½ inch conduit adapter and a strain relief section on the inside of the conduit on the 3/8-inch tubing for the ammonia line. The hypochlorite line will be similar.
- It was acknowledged that the pdf became corrupt and some text is showing incorrectly on the plans. The ENGINEER will provide a reprinted set of plans with Addenda #1.
- Cleanwater1, Inc. to provide sketch including sample pump piping configuration.
- Are there any prior submittals regarding the equipment and drawings?
    - Supplier can provide photos, videos, and drawings from previous projects.
    - ENGINEER will provide submittal sheets in Addenda 1.
- Would there be any additional time for questions?
    - Not without pushing back the bid opening.

14. Site Visit

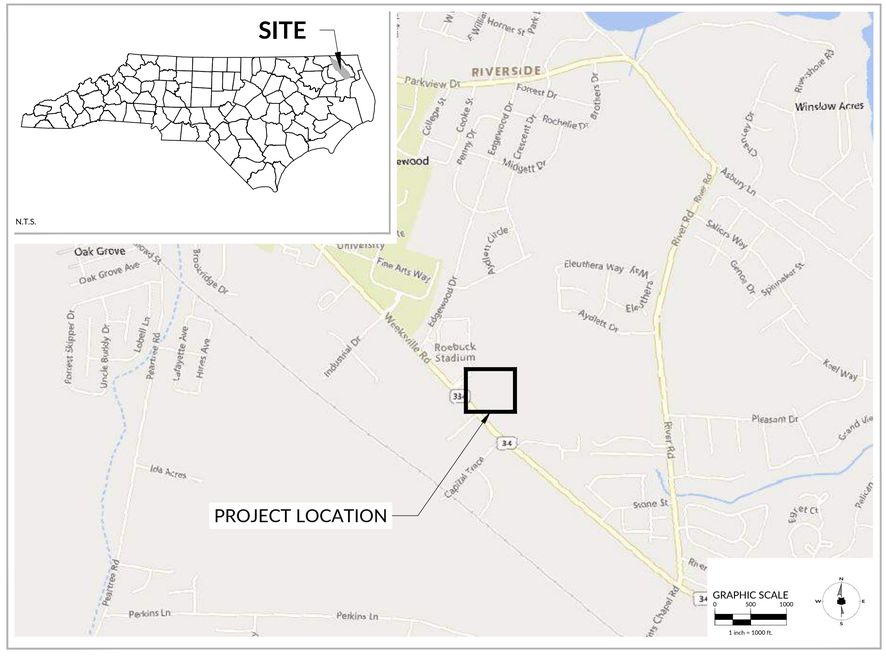
All potential BIDDERs may make a site visit to the project area on their own. Please schedule 24 hours ahead of time with R.J. Lassiter, Public Works Project Manager 252-621-7365

CONSTRUCTION PLANS

CITY OF ELIZABETH CITY
KE WHITE WATER TOWER
DISINFECTION IMPROVEMENTS

ELIZABETH CITY, NC 27909 | PASQUOTANK COUNTY

MAY 20, 2025



Sheet List Table

Sheet Number	Sheet Title
	COVER
G1.00	GENERAL NOTES, LEGEND & ABBREVIATIONS
G1.01	SHEET INDEX
C1.00	SITE PLAN
C2.00	ELEVATED TANK PLAN DETAILS
C2.01	ELEVATED TANK SECTION DETAILS
E0.01	ELECTRICAL NOTES, LEGEND & ABBREVIATIONS
E1.00	ELECTRICAL ELEVATED TANK PLAN
E7.00	ELECTRICAL SPECIFICATIONS

CONTACT LIST:

Senior Project Manager
Cathleen Saunders
WithersRavenel
8466 Caratoke Highway, Bldg. 400
Powells Point, NC 27966
252-491-8147
csaunders@withersravenel.com

811 Know what's below. Call before you dig.

NORTH CAROLINA PROFESSIONAL ENGINEER
BID SET
NOT RELEASED FOR CONSTRUCTION
KATHLEEN M. SAUNDERS

PREPARED BY:

WithersRavenel
8466 Caratoke Highway | Building 400 | Powells Point, NC 27966
License #: F-1479 | t: 252.491.8147 | www.withersravenel.com

OWNER:

CITY OF ELIZABETH CITY
P.O. BOX 347
ELIZABETH CITY, NC 27907
PHONE #: (252) 337-6628
ATTENTION: DWAN BELL-PUBLIC UTILITIES DIRECTOR

ELIZABETH CITY, NC · HARBOR of HOSPITALITY · EST 1683

CONSTRUCTION PLANS
CITY OF ELIZABETH CITY
KE WHITE WATER TOWER
DISINFECTION IMPROVEMENTS
WR PROJECT NO.23-1097-004

our people • your success

J:\23\1097-004-KE White Water Tower Disinfection Improvements\CAD\Drawing Sets\Construction\COVER.dwg - Tuesday, May 20, 2025 9:45:10 AM - BRACE

ABBREVIATIONS

&	AND	FOB	FIBER OPTIC BOX	MECH	MECHANICAL
@	AT	FOM	FIBER OPTIC MARKER	PR	PROPOSED
AASHTO	AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS	FP	FLAG POLE	PIV	POST INDICATOR VALVE
		FPE	FINISHED PAD ELEVATION	PKNF	PK NAIL FOUND
ABC	AGGREGATE BASE COURSE	FPT	PICKETT FENCE	PPLP	POWER POLE WITH LIGHT
ABS	ACRYLONITRILE BUTADIENE STYRENE	FPVC	PVC/PLASTIC FENCE	PS	PUMP STATION
AC	AIR CONDITIONER	FSR	SPLIT RAIL FENCE	PSI	POUNDS PER SQUARE INCH
ACP	ASBESTOS CEMENT PIPE	FSTL	STEEL FENCE	PVC	POLYVINYL CHLORIDE PIPE
ACI	AMERICAN CONCRETE INSTITUTE	FG	FINISHED GRADE	R	RADIUS
AI	AREA INLET	FGCL	FUTURE OR FINISHED GRADE CENTERLINE	R/W	RIGHT OF WAY
AIP	ANGLE IRON FOUND	FHA	FIRE HYDRANT ASSEMBLY	RBF	REBAR FOUND
ALBC	ALUMINUM BOX CULVERT	FL	FLOW LINE	RBS	REBAR SET
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE	FLG'D	FLANGED	RCBC	REINFORCED CONCRETE BOX CULVERT
ARV	AIR RELEASE VALVE	FM	FORCE MAIN	RCP	REINFORCED CONCRETE PIPE
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS	FOC	FACE OF CURB	RD	ROOF DRAIN
		FT/'	FOOT/ FEET	RECP	ROLLED EROSION CONTROL PRODUCT
AWWA	AMERICAN WATER WORKS ASSOCIATION	FVL	VINYL FENCE	RGRCP	RING-GASKETED REINFORCED CONCRETE PIPE
AXF	AXLE FOUND	FWD	WOOD FENCE	RJ	RESTRAINED JOINT
B	BOLLARD	FWI	WROUGHT IRON FENCE	RMF	RIGHT OF WAY MONUMENT FOUND
B-B	BACK TO BACK	FWW	WOVEN WIRE FENCE	RT	RIGHT
BFE	BASE FLOOD ELEVATION	GA	GAUGE	RWALL	RETAINING WALL
BFFE	BASEMENT FINISHED FLOOR ELEVATION	GALV	GALVANIZED	RWM	RIGHT OF WAY MONUMENT
BFP	BACK FLOW PREVENTER	GB	GRADE BREAK	RWV	RECLAIMED WATER VALVE
BFV	BUTTERFLY VALVE	GFFE	GARAGE FINISHED FLOOR ELEVATION	S	SOUTH
BFW	BOTTOM FACE OF WALL	GLT	GROUND LIGHT	SC	STANDARD CURB
BH	BORE HOLE	GM	GAS METER	SCH	SCHEDULE
BLDG	BUILDING	GPE	GRADED PAD ELEVATION	SCM	STORMWATER CONTROL MEASURE
BM	BENCHMARK	GPM	GALLONS PER MINUTE	SDR	STANDARD DIMENSION RATIO
BOA	BLOW OFF ASSEMBLY	GR	GUARD RAIL	SE	SOUTH EAST
BOB	BOTTOM OF BANK	GTMH	GREASE TRAP MANHOLE	SF	SQUARE FEET
BOC	BACK OF CURB	GTS	GAS TEST STATION	SPC	SPILL CURB
BR	BIKE RACK	GV	GATE VALVE	SPG	SPIGOT
BRKRW	BRICK RETAINING WALL	GW	GUY WIRE	SPH	SPRINKLER HEAD
BRL	BUILDING RESTRICTION LINE	HBX	HOT BOX	SPK	TRAVERSE SPIKE
BRW	BLOCK RETAINING WALL	HCR	HANDICAP RAMP	SS	SANITARY SEWER
C&G	CURB & GUTTER	HCS	HANDINCAP SIGN	SSMH	SANITARY SEWER MANHOLE
CA	COMMON AREA	HDD	HORIZONTAL DIRECTIONAL DRILL	SSTL	STAINLESS STEEL
CABC	COARSE AGGREGATE BASE COURSE	HDPE	HIGH DENSITY POLYETHYLENE PIPE	STA	STATION
CAMA	COASTAL AREA MANAGEMENT ACT	HORIZ	HORIZONTAL	SV	SEWER VALVE
CAP	CORRUGATED ALUMINUM PIPE	HPT	HIGH POINT	SW	SOUTH WEST
CAPA	CORRUGATED ALUMINUM PIPE ARCH	HPPP	HIGH PERFORMANCE POLYPROPYLENE PIPE	SY	SQUARE YARD
CATV	CABLE TELEVISION	HR	HANDRAIL	T	TELEPHONE
CB	CATCH BASIN	HVAC	HATING, VENTILATION AND AIR CONDITIONING	TBM	TEMPORARY BENCHMARK
CBX	CABLE TV BOX	HW	HEADWALL	TBX	TELEPHONE BOX
C-C	CENTER TO CENTER	IC	INTERCOM	TCA	TREE CONSERVATION AREA
CF	CUBIC FOOT (FEET)	ICV	IRRIGATION CONTROL VALVE	TCP	TERRA COTTA PIPE
CFS	CUBIC FEET PER SECOND	IN/"	INCH	TDD	TEMPORARY DIVERSION DITCH
CHH	CABLE TV HANDHOLE	INV	INVERT	TFW	TOP FACE OF WALL
CIP	CAST IRON PIPE	IPF	IRON PIPE FOUND	THH	TELEPHONE HANDHOLE
CISP	CAST IRON SOIL PIPE	IPS	IRON PIPE SET	TLP	TELEPHONE PEDESTAL
CL	CENTERLINE	IRF	IRON ROD FOUND	TOB	TOP OF BANK
CLM	COLUMN	IRM	IRRIGATION METER	TOC	TOP OF CURB
CLR	CLEAR SPACE	IRS	IRON ROD SET	TOE	TOE OF SLOPE
CMF	CONCRETE MONUMENT FOUND	JB	JUNCTION BOX	TOP	TOP OF SLOPE
CMP	CORRUGATED METAL PIPE	LA	LANDSCAPE AREA	TR	ELECTRIC TRANSFORMER
CMU	CONCRETE MASONRY UNIT	LAT	LATITUDE	TRHH	TRAFFIC HANDHOLE
CO	CLEAN OUT	LF	LINEAR FEET	TRM	TURF REINFORCEMENT MAT
CONC	CONCRETE	LOD	LIMIT OF DISTURBANCE	TS	TOP OF SLAB
CPP	CORRUGATED PLASTIC PIPE	LONG	LONGITUDE	TSB	TRAFFIC SIGNAL BOX
CS	CURB STOP	LP	LIGHT POLE	TSP	TRAFFIC SIGNAL POLE
CV	CONTROL VALVE	LPT	LOW POINT	TSV	TRACER WIRE TEST STATION VALVE
CY	CUBIC YARD	LT	LEFT	TYP	TYPICAL
DI	DROP INLET	MAX	MAXIMUM	TVPED	CABLE TV PEDESTAL
DIA/Ø	DIAMETER	MFR	MANUFACTURER	UG	UNDERGROUND
DIP	DUCTILE IRON PIPE	MGD	MILLION GALLONS PER DAY	UON	UNLESS OTHERWISE NOTED
DK	DECK	MH	MANHOLE	UP	UTILITY POLE
DMH	STORM MANHOLE	MIN	MINIMUM	USGS	UNITED STATES GEOLOGICAL SURVEY
DP	DOG WASTE DISPOSAL BIN	MJ	MECHANICAL JOINT	UV	UTILITY VALVE
E	EAST	MK	MAIL KIOSK	VERT	VERTICAL
EA	EACH	MNF	MAG NAIL FOUND	VCP	VITRIFIED CLAY PIPE
EC	EDGE OF CONCRETE	MNS	MAG NAIL SET	VLTC	CABLE VAULT
EG	EXISTING GRADE	MW	MONITORING WELL	VLTE	ELECTRIC VAULT
EGCL	EXISTING GRADE CENTERLINE	MWSE	MAXIMUM WATER SURFACE ELEVATION	VLTF	FIBER OPTIC VAULT
EL	ELEVATION	N	NORTH	VLTG	GAS VAULT
ELEC	ELECTRICAL	NCGS	NORTH CAROLINA GEODETIC MONUMENT	VLTP	TELEPHONE VAULT
EM	ELECTRIC METER	NE	NORTH EAST	VLTR	RECLAIMED VAULT
EMH	ELECTRIC MANHOLE	NG	NATURAL GROUND	VLTS	SEWER VAULT
EO	ELECTRIC OUTLET	NIC	NOT IN CONTRACT	VLTU	UTILITY VAULT
EOP	EDGE OF PAVEMENT	NO./#	NUMBER	VLTW	WATER VAULT
EPD	ELECTRIC PEDESTAL	NP	NO PARKING	VP	SEWER VENT PIPE
ESO	ELECTRIC STUBOUT	NTS	NOT TO SCALE	W	WEST
EW	EDGE OF WATER	NW	NORTH WEST	WI	WITH
EX	EXISTING	OC	ON CENTER	WDL	WOODLINE
FAL	ALUMINUM FENCE	OD	OUTSIDE DIAMETER	WF	WETLAND FLAG
FBD	BOARD FENCE	OH	OVERHEAD UTILITY	WH	WELL HOUSE
FBW	BARBED WIRE FENCE	OHE	OVERHEAD ELECTRICAL LINE	WM	WATER METER/WATER MAIN
FCA	ACCESS CONTROL FENCE	OHG	BUILDING OVERHANG	WMH	WATER MANHOLE
FCL	CHAIN LINK FENCE	OHT	OVERHEAD TELEPHONE	WMR	RECLAIMED WATER MANHOLE
FDC	FIRE DEPARTMENT CONNECTION	OS	OPEN SPACE	WR	WATER RECEPTACLE
FEL	ELECTRIC FENCE	PA	PLANTING AREA	WSE	WATER SURFACE ELEVATION
FEMA	FEDERAL EMERGENCY MANAGEMENT AGENCY	PCF	POUNDS PER CUBIC FOOT	WV	WATER VALVE
FES	FLARED END SECTION	PE	POLYETHYLENE	WWF	WOVEN WIRE FABRIC
F-F	FACE TO FACE	PG	PROPOSED GRADE	WWM	WELDED WIRE MESH
FFE	FINISHED FLOOR ELEVATION	PGCL	PROPOSED GRADE CENTERLINE	YI	YARD INLET
FNC	FENCE	PH	PHASE	HWL	HIGH WATER LEVEL
				LWL	LOW WATER LEVEL
				HR	HEIGHT REFERENCE

LEGEND
(UNLESS OTHERWISE DENOTED)

DESCRIPTION	EXISTING	PROPOSED
1' CONTOUR INTERVAL		
5' CONTOUR INTERVAL		
PROPERTY LINE		
RIGHT OF WAY LIMITS		N/A
ROADWAY CENTELINE		
EASEMENT LINE		
CURB & GUTTER		
EDGE OF PAVEMENT		
SANITARY SEWER FACILITIES	SS	SS
STORM SEWER FACILITIES		
WATER MAIN	W	W
FIRE HYDRANT ASSEMBLY		
WATER-RECLAIM	R	R
FORCE MAIN	FM	FM
ELECTRIC	E	E
OVERHEAD ELECTRIC	OHE	OHE
GAS MAIN	G	G
FIBEROPTIC	FO	N/A
TELEPHONE	T	N/A
OVERHEAD TELEPHONE	OHT	N/A
TV	TV	N/A
UTILITY	U	N/A
UTILITY-OH	OU	N/A
RAILROAD		N/A
STRUCTURES		
FENCING SRTUCTURE	X	XX
FLOODWAY		N/A
WATERWAYS		N/A
WOODS LINE		N/A
WETLANDS		N/A

DESCRIPTION	EXISTING	PROPOSED
BLOW OFF	BO	
CATCH BASIN		
CLEAN OUT		
CONTROL POINT		N/A
DROP INLET		
FIBER OPTIC BOX	FO	N/A
FLARED END SECTION		
GUY WIRE		N/A
LIGHT POLE		
POWER POLE		N/A
STORM DRAINAGE MANHOLE		
TV PEDESTAL		N/A
UNDERGROUND TELEPHONE BOX	THH	N/A
TREE		N/A
WATER METER		
WATER VALVE		
UTILITY MANHOLE	U	N/A
ELECTRICAL PEDESTAL	ELEC	N/A
SIGN		N/A
FIBER OPTIC MARKER	FO	N/A
PROPERTY IRON		N/A
MAIL BOX	MB	N/A

GENERAL NOTES:

1. THE CONTRACTOR SHALL HAVE A COMPLETE SET OF CONTRACT DOCUMENTS AS WELL AS ALL PERMIT APPROVALS AND EASEMENTS ON THE JOB SITE AT ALL TIMES.
2. CONSTRUCTION AND MATERIAL SPECIFICATIONS SHALL CONFORM TO THE STATE OF NORTH CAROLINA, CITY OF ELIZABETH CITY'S STANDARD SPECIFICATIONS AND CONSTRUCTION DETAILS, AND THE CONTRACT DOCUMENTS.
3. EXISTING UTILITIES ARE SHOWN FOR GENERAL INFORMATION ONLY AND MAY NOT BE ALL INCLUSIVE. CONTRACTOR IS TO DIG TEST PITS TO FIELD LOCATE ALL EXISTING UTILITIES THAT THE NEW WATER MAINS AND APPURTENANCES CROSS OR COME IN CLOSE PROXIMITY TO WELL IN ADVANCE OF PIPE LAYING TO DETERMINE SIZE, ELEVATION AND LOCATION OF ALL UTILITIES. CONTRACTOR IS TO NOTIFY ENGINEER WITHIN 48 HOURS OF ANY CONFLICTS BETWEEN EXISTING UTILITIES AND PROPOSED ROUTE OF WATER MAINS TO ALLOW ADEQUATE TIME FOR ENGINEER AND OWNER TO CONSIDER REALIGNMENT OR CHANGES THAT MAY BE REQUIRED.
4. CONTRACTOR SHALL MAKE EVERY EFFORT TO SAVE PROPERTY IRONS, MONUMENTS, OTHER PERMANENT POINTS AND LINES OF REFERENCE AND CONSTRUCTION STAKES. A REGISTERED LAND SURVEYOR AT THE CONTRACTOR'S EXPENSE SHALL REPLACE PROPERTY IRONS, MONUMENTS, AND OTHER PERMANENT POINTS OF REFERENCE DESTROYED BY THE CONTRACTOR.
5. THE CONTRACTOR SHALL FURNISH, INSTALL, AND MAINTAIN ALL NECESSARY EROSION CONTROL MEASURES WHETHER OR NOT SHOWN ON THE PLANS TO PROTECT ADJACENT CREEKS, RIVERS, ROADWAYS, ETC. FROM SILTATION AND EROSION.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RELOCATION OF EXISTING UTILITIES IF REQUIRED DURING INSTALLATION OF NEW WORK. THERE WILL BE NO ADDITIONAL OR SEPARATE PAY ITEM FOR THIS WORK UNLESS SPECIFICALLY CALLED OUT IN THE BID FORM. ANY RELOCATION OF EXISTING UTILITIES MUST BE COORDINATED WITH THE AFFECTED UTILITY COMPANY.
7. THE CONTRACTOR SHALL SUPPORT ALL UTILITY POLES AS NECESSARY. THE CONTRACTOR SHALL COORDINATE UTILITY POLE SUPPORT WITH THE APPROPRIATE UTILITY COMPANIES.
8. CONTRACTOR SHALL RESTORE/REPLACE ALL SIGNS, MAILBOXES, ETC. ENCOUNTERED DURING CONSTRUCTION TO ORIGINAL CONDITION.
9. THE CONTRACTOR SHALL RESTORE ALL DISTURBED AREAS TO THE EXISTING GRADE UNLESS OTHERWISE NOTED ON THE DRAWINGS.
10. ALL ROADWAY DITCHES DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO PRE-CONSTRUCTION CONDITION OR BETTER AND CONFORM TO NCDOT REQUIREMENTS. ALL DISTURBED DITCHES SHALL BE LINED WITH EROSION CONTROL MATTING UNLESS OTHERWISE NOTED.
11. ALL EXCAVATED MATERIAL SHALL BE PLACED WITHIN THE LIMITS OF DISTURBANCE DURING UTILITY INSTALLATION. THE CONTRACTOR SHALL PROVIDE THE NECESSARY SEDIMENT AND EROSION CONTROL MEASURES TO CONTROL RUN-OFF. ALL EXCESS EXCAVATED MATERIAL SHALL BE REMOVED FROM THE CONSTRUCTION SITE AND DISPOSED OF LEGALLY.
12. HORIZONTAL DATUM IS NAD 83.
13. VERTICAL DATUM IS NAVD 88.
14. ALL SHORING WILL BE IN ACCORDANCE WITH OSHA TRENCHING STANDARDS PART 126, SUBPART P, AMENDED TO DATE. CONTRACTOR SHALL SUBMIT SHORING PLANS TO THE ENGINEER PRIOR TO EXCAVATION. SHORING PLANS SHALL BE SIGNED AND SEALED BY A NC PROFESSIONAL ENGINEER.
15. RESTORE ALL DRIVES, FENCING, PAVEMENT, AND GRASSED AREAS TO THEIR ORIGINAL CONDITION AND MAINTAIN UNTIL FINAL ACCEPTANCE OF THE PROJECT.
16. ALL TREES HAVE NOT BEEN SHOWN. MORE SIGNIFICANT TREES HAVE BEEN SHOWN FOR CONTRACTOR CONVENIENCE. NO TREES SHALL BE REMOVED, TRIMMED, OR DAMAGED DURING ANY CONSTRUCTION ACTIVITIES, EXCEPT WHERE NOTED.
17. WHEN EXISTING UTILITY LINES ARE EXPOSED DURING CONSTRUCTION THE CONTRACTOR SHALL PROVIDE SUPPORT AS NECESSARY TO PREVENT DAMAGE TO THE EXISTING UTILITY. DAMAGE TO EXPOSED UTILITIES SHALL BE REPAIRED AT THE CONTRACTORS EXPENSE.
18. ONLY PIPE AND MATERIALS THAT ARE TO BE INSTALLED WITHIN THE WORK DAY MAY BE STORED WITHIN THE RIGHT-OF-WAY. MATERIAL SHALL BE BARRICADED, SEPARATED FROM TRAFFIC, AND HAVE PROPER SIGNAGE.
19. PROVIDE SCREENINGS TO PREVENT DAMAGE TO PAVEMENT WHERE MATERIAL IS PLACED ON ROADWAY. CONTRACTOR SHALL REPAIR ANY PAVEMENT DAMAGED OUTSIDE THE DESIGNATED TRENCH AREA. ROADS IN WORK AREA SHALL BE CLEANED AT END OF EACH DAY.
20. ACCESS DURING CONSTRUCTION FOR FIRE TRUCKS AND OTHER EMERGENCY RESPONSE VEHICLES SHALL BE COORDINATED WITH THE CITY OF ELIZABETH CITY.
21. CONTRACTOR SHALL VERIFY EXACT MATERIALS, LOCATION, ELEVATIONS, DIMENSIONS, AND LAYOUT OF EXISTING PIPING TO BE CONNECTED TO PRIOR TO ORDERING MATERIALS OR COMMENCING CONSTRUCTION.
22. ALL ITEMS THAT ARE REMOVED AND REPLACED OR DISTURBED DURING CONSTRUCTION ARE TO BE REPLACED WITH EQUAL OR BETTER QUALITY THAN THE ORIGINAL. ALL WATER AND SEWER PIPES THAT ARE TO BE ABANDONED SHALL BE FILLED WITH FLOWABLE FILL.
23. CONTRACTOR SHALL MAINTAIN ACCESS TO ALL AFFECTED PROPERTIES AT ALL TIMES DURING CONSTRUCTION.
24. CONTRACTOR IS RESPONSIBLE FOR PREPARATION, SUBMISSION, AND OBTAINING ANY PERMITS ASSOCIATED WITH STREET CUTS, LANE/ROAD CLOSURES, AND TRAFFIC CONTROL INSPECTIONS.
25. CONTRACTOR SHALL PREVENT ANY WATER ASSOCIATED WITH CONCRETE OR ASPHALT CUTTING FROM ENTERING STORM DRAINS. IF CUTTING WATER ENTERS STORM DRAIN, CONTRACTOR WILL BE RESPONSIBLE FOR IT'S REMOVAL.
26. CONTRACTOR SHALL BE RESPONSIBLE FOR IMMEDIATELY CLEANING ANY SOIL WHICH IS TRACKED OFF WORK SITE.
27. CONTRACTOR SHALL PROVIDE FULL DEPTH PAVEMENT REPLACEMENT AT ALL POINTS WHERE PAVEMENT IS REMOVED. CONTRACTOR SHALL MILL AND OVERLAY TO EXTENTS SHOWN AND PROVIDE REQUIRED PAVEMENT MARKINGS IF MILLING IS REQUIRED BY TOWN OR NCDOT. FOLLOW NCDOT PAVEMENT REPAIR STANDARDS. SEE NCDOT ENCROACHMENT AGREEMENT, EA PERMIT, AND STANDARD DETAILS SHEET.
28. CONTRACTOR SHALL SECURE AND PLATE PITS THAT ARE TO REMAIN OPEN FOR LONGER THAN THE COURSE OF A WORK DAY. CONTRACTORS SHALL ENGAGE THE SERVICE OF A STRUCTURAL ENGINEER TO DETERMINE APPROPRIATE METHODS FOR SHORING AND PLATING OPEN PITS.
29. PARCEL BOUNDARIES ARE BASED ON GIS DATA.
30. THE MINIMUM SEPARATION BETWEEN WATER AND SEWER MAINS SHALL BE 10 FEET HORIZONTALLY. IF A 10 FOOT HORIZONTAL SEPARATION CANNOT BE MAINTAINED THE WATER AND SEWER MAINS SHALL BE IN SEPARATE TRENCHES WITH THE ELEVATION OF THE BOTTOM OF THE WATER MAIN A MINIMUM OF 18 INCHES ABOVE THE TOP OF THE SEWER MAIN. WHEN IT IS NECESSARY FOR A WATER MAIN TO CROSS OVER A SEWER THE ELEVATION OF THE BOTTOM OF THE WATER MAIN SHALL BE A MINIMUM OF 18 INCHES ABOVE THE TOP OF THE SEWER. IF A WATER MAIN CROSSES UNDER A SEWER BOTH THE WATER MAIN AND THE SEWER SHALL BE CONSTRUCTED OF FERROUS MATERIAL WITH JOINTS EQUIVALENT TO WATER MAIN STANDARDS FOR A DISTANCE OF 10 FEET ON EACH SIDE OF THE POINT OF CROSSING. THE SECTION OF WATER MAIN PIPE SHALL BE CENTERED AT THE POINT OF CROSSING.
31. CURBS, SIDEWALKS, CONCRETE DRIVEWAYS, AND CONCRETE ROADWAYS SHALL BE REPLACED TO THE FIRST EXPANSION JOINT BEYOND THE TRENCH EXCAVATION LIMITS AND SHALL MATCH EXISTING.
32. CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING ALL EXISTING UTILITIES IN CONFLICT WITH THE TRENCH. TEMPORARY RELOCATION OF WIRES AND CABLES ALONG OR TO THE SIDE OF THE TRENCH MAY BE REQUIRED.
33. PROVIDE TRAFFIC CONTROL, BARRIERS, LANDSCAPING, AND TRENCH COVER, AND ALL ELSE REQUIRED TO PERFORM THE WORK IN ACCORDANCE WITH NCDOT STANDARDS, CITY OF ELIZABETH CITY, AND MUTCD.
34. POTENTIAL LOCATION OF DISPOSAL OF MATERIAL SHALL BE CONFIRMED BY THE CITY.
35. ALL REQUIRED TESTING, FLUSHING, DOCUMENTATION AND NOTIFICATION FOR NEW WATER MAINS, AND ABANDONMENT OF OLD LINES REQUIRED TO COMPLETE THE WORK IS THE RESPONSIBILITY OF THE CONTRACTOR AND WILL BE CONSIDERED INCIDENTAL. NO ADDITIONAL PAYMENT WILL BE MADE FOR THESE TASKS.

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CONSTRUCTION PLANS
CITY OF ELIZABETH CITY
KE WHITE WATER TOWER
DISINFECTION IMPROVEMENTS
ELIZABETH CITY, NC 27909 | PASQUOTANK COUNTY

NORTH CAROLINA PROFESSIONAL ENGINEER
BID SET
NOT RELEASED FOR CONSTRUCTION
COLLEEN M. SALINDA

INITIAL PLAN DATE: 03/06/2025
REVISIONS:
A - 05/20/2025 RKP
BID SET

WR JOB NUMBER 23-1097-004
DRN: RKP DGN: CMS CKD: TSP

GENERAL NOTES, LEGEND & ABBREVIATIONS

G1.00

EST. 1983

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SHEET INDEX
SCALE: 1" = 500'

CONSTRUCTION PLANS

CITY OF ELIZABETH CITY
KE WHITE WATER TOWER DISINFECTION IMPROVEMENTS

ELIZABETH CITY, NC 27909 | PASQUOTANK COUNTY

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BID SET

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 049007 BENJAMIN M. SAWYER

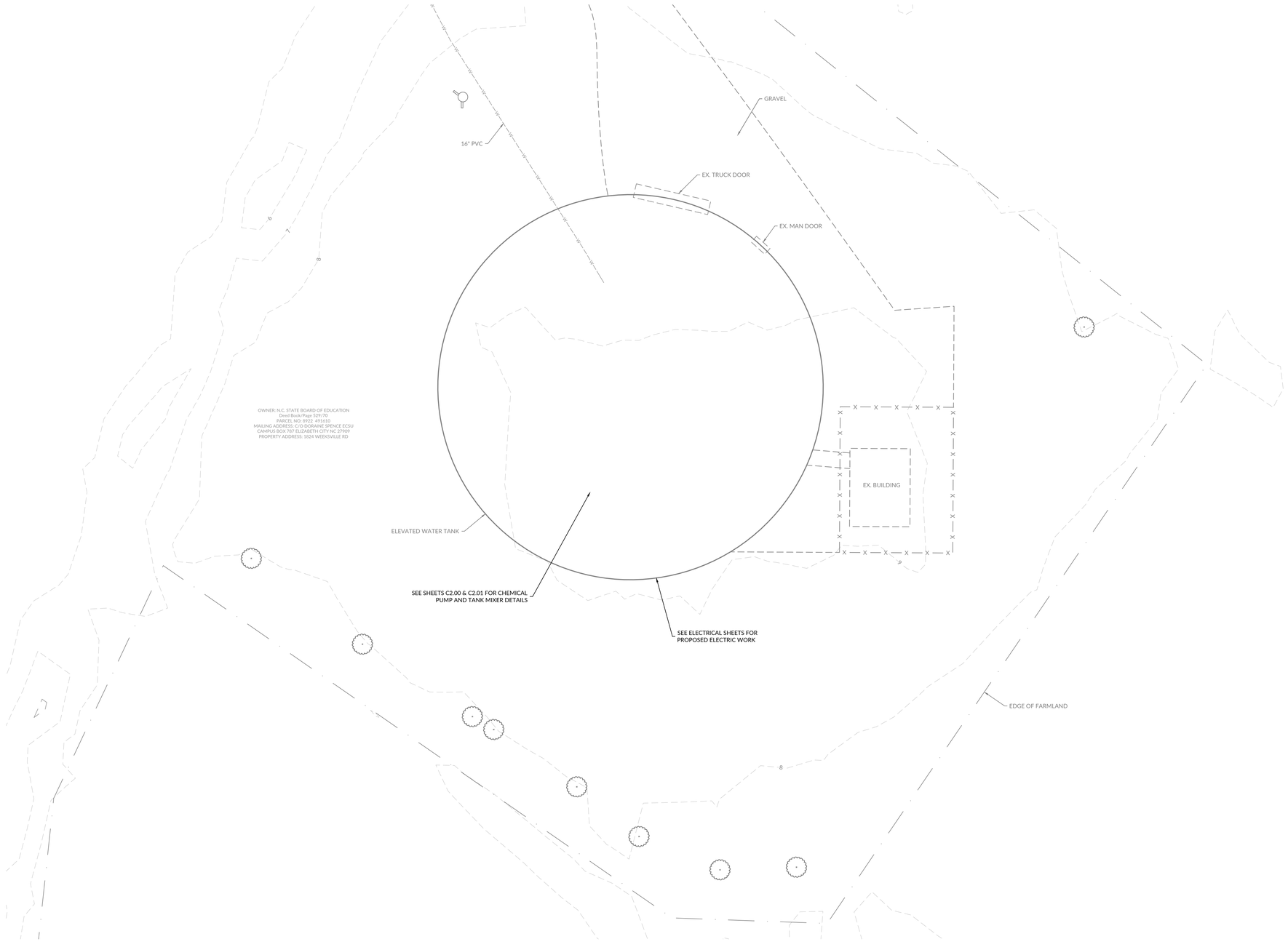
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0 250 500

INITIAL PLAN DATE: 03/06/2025
REVISIONS:
1 05/20/2025 RKP
BID SET

WR PROJECT NUMBER 23-1097-004
DRN: RKP DSN: DMK CHK: KTD

SHEET INDEX

G1.01



NOTES:

- ALL TOPOGRAPHIC, PHYSICAL, & BOUNDARY INFORMATION SHOWN IS APPROXIMATE BASED ON GIS DATA. SUPPLEMENTAL LIDAR INFORMATION OBTAINED FROM NCDPS SPATIAL DATA. STRUCTURES/BUILDINGS SHOWN PER AERIAL DATA AND NOT FIELD SURVEYED.

J:\23\1097-004\41 White Water Tower Disinfection Improvements\CAD\Drawing Sets\Construction\SITE PLAN.dwg Tuesday, May 20, 2025 9:46:17 AM - BRACE

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NORTH CAROLINA PROFESSIONAL ENGINEER SHEEN M. SAUNDERS

BID SET
NOT RELEASED FOR CONSTRUCTION

0 5 10
SCALE: 1 inch = 10 ft.

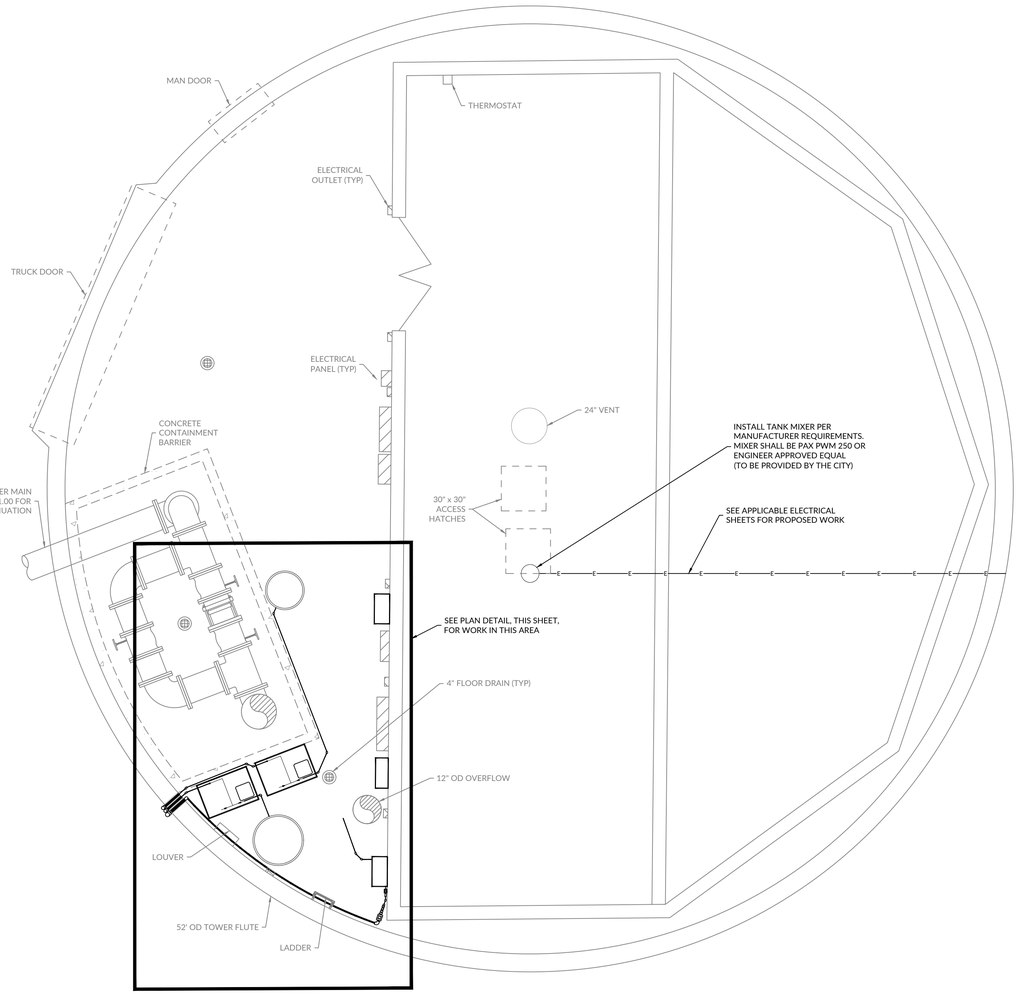
INITIAL PLAN DATE: 03/06/2025
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BID SET

WR JOB NUMBER 23-1097-004
DRN: RKP DGN: CMS CKD: TSP

SITE PLAN

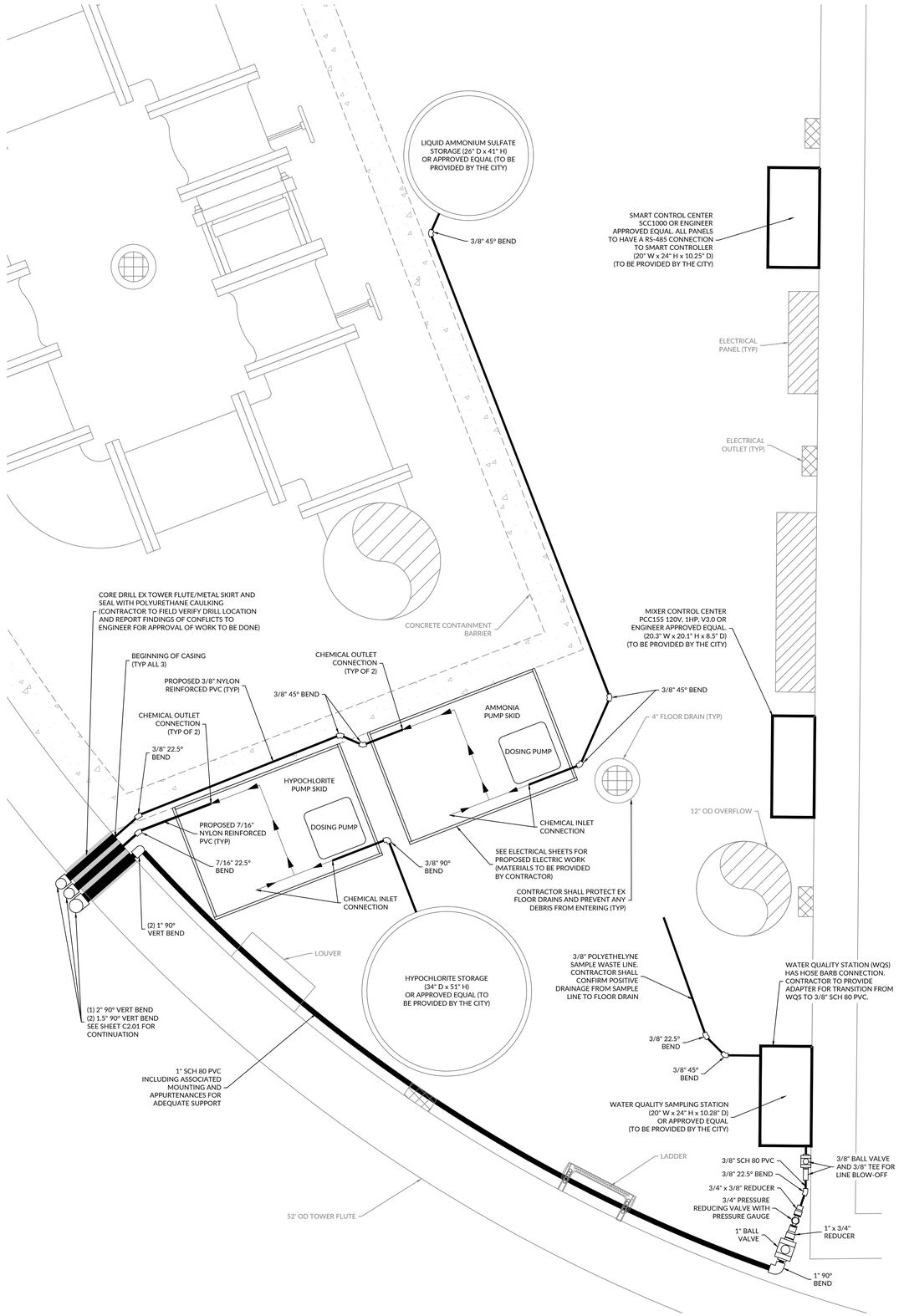
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EST 1983



ELEVATED TANK PLAN DETAIL
SCALE: 1/4" = 1'-0"

NOTES:
1. LOCATION OF EXISTING ELECTRICAL OUTLETS, CONDUIT AND EQUIPMENT IS APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS.
2. ALL 90 -DEGREE BENDS SHALL BE LONG SWEEP BENDS.
3. ALL MATERIALS NOT LISTED AS PROVIDED BY THE CITY SHALL BE PROVIDED BY THE CONTRACTOR. ENCOMPASSING, BUT NOT LIMITED TO, ANY ELECTRICAL CONDUIT RUNS, WIRING, DISCONNECT SWITCHES, ELECTRICAL MATERIALS AND ALL INTERCONNECT PIPING, HOSE, PIPE AND TUBING SUPPORTS, FREEZE PROTECTION FOR ALL TUBING AND PIPING, HATCH/SKIRT PENETRATIONS, VALVES, FITTINGS AND APPURTENANCES NEEDED FOR A FULL AND COMPLETE OPERATIONAL SYSTEM.
4. ALL CHEMICALS AND FEED EQUIPMENT SHALL BE NSF CERTIFIED.
5. ALL PIPING, FITTINGS AND EQUIPMENT INTERIOR TO THE TANK SHALL BE NSF CERTIFIED.
6. ALL CONNECTIONS TO THE TANK MUST BE WATERTIGHT.



ELEVATED TANK PLAN DETAIL
SCALE: 1" = 1'-0"

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ELIZABETH CITY, NC 27909 | PASQUOTANK COUNTY

NORTH CAROLINA PROFESSIONAL ENGINEER KATHLEEN M. SAUNDERS
BID SET
NOT RELEASED FOR CONSTRUCTION

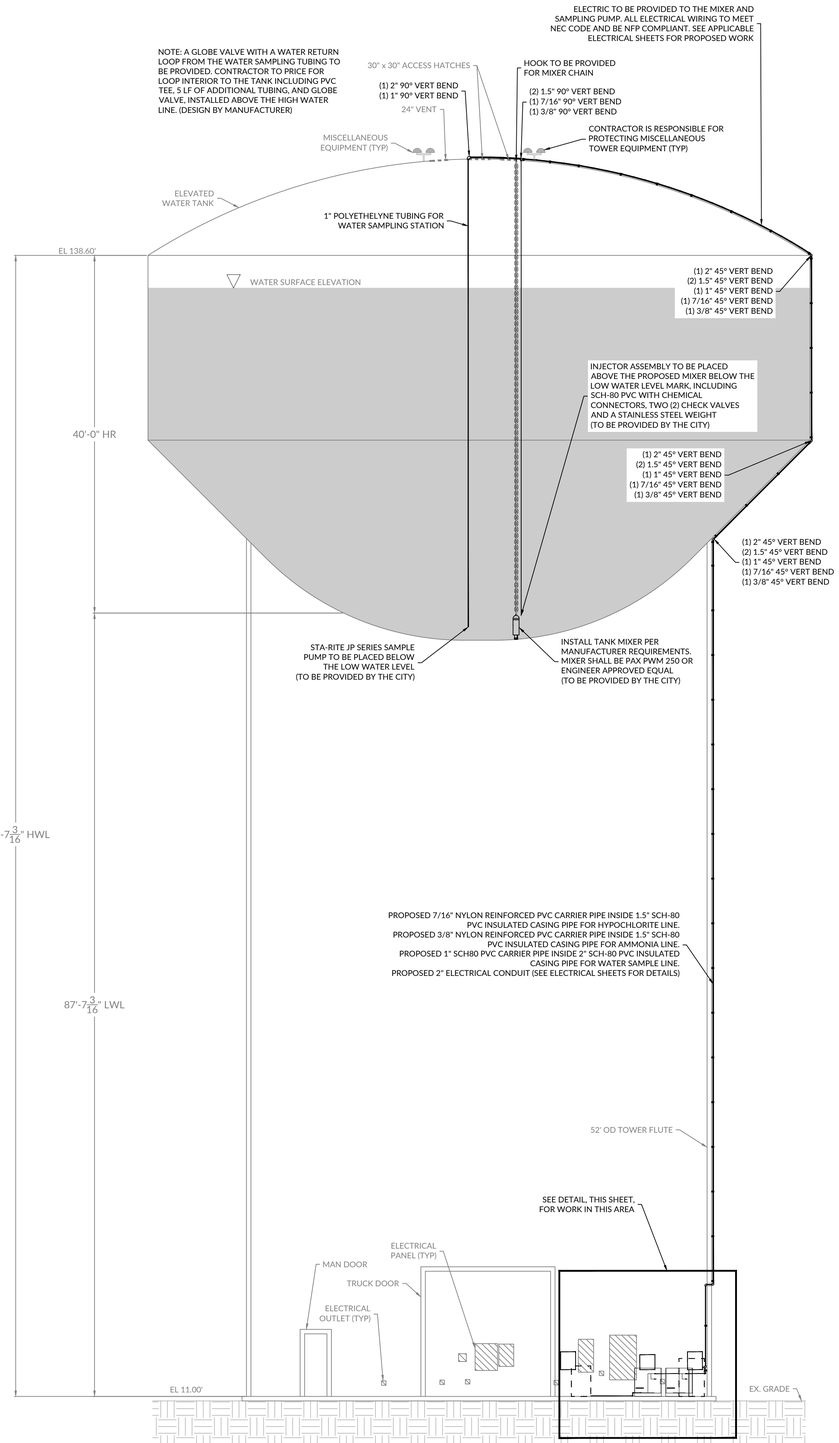
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BID SET

WR JOB NUMBER 23-1097-004
DRN: RKP DGN: CMS CKD: TSP

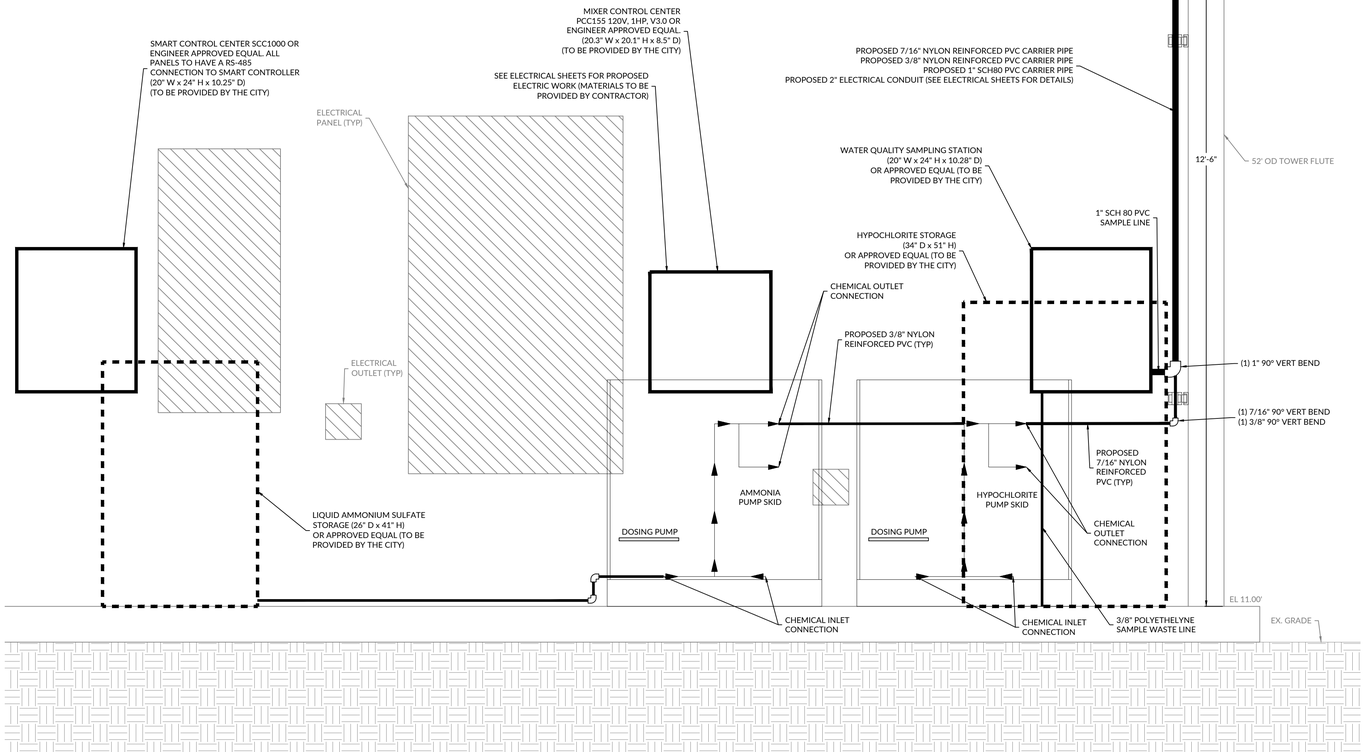
ELEVATED TANK PLAN DETAILS

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ELEVATED TANK ELEVATION
SCALE: NTS



ELEVATED TANK ELEVATION
SCALE: NTS

NOTES:
1. LOCATION OF EXISTING ELECTRICAL OUTLETS, CONDUIT AND EQUIPMENT IS APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS.
2. SECTION VIEWS OF THIS SHEET SHOWN FOR DESIGN CLARITY ONLY. REFER TO SHEET C2.00 FOR LOCATION OF PROPOSED WORK.
3. ALL 90 -DEGREE BENDS SHALL BE LONG SWEEP BENDS.
4. ALL MATERIALS NOT LISTED AS PROVIDED BY THE CITY SHALL BE PROVIDED BY THE CONTRACTOR. ENCOMPASSING, BUT NOT LIMITED TO, ANY ELECTRICAL CONDUIT RUNS, WIRING, DISCONNECT SWITCHES, ELECTRICAL MATERIALS AND ALL INTERCONNECT PIPING, HOSE, PIPE AND TUBING SUPPORTS, FREEZE PROTECTION FOR ALL TUBING AND PIPING, HATCH/SKIRT PENETRATIONS, VALVES, FITTINGS AND APPURTENANCES NEEDED FOR A FULL AND COMPLETE OPERATIONAL SYSTEM.
5. ALL CHEMICALS AND FEED EQUIPMENT SHALL BE NSF CERTIFIED.
6. ALL PIPING, FITTINGS AND EQUIPMENT INTERIOR TO THE TANK SHALL BE NSF CERTIFIED.
7. ALL CONNECTIONS TO THE TANK MUST BE WATERTIGHT.

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ELIZABETH CITY, NC 27909 | PASQUOTANK COUNTY

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL
BID SET
NOT RELEASED FOR CONSTRUCTION
KATHLEEN M. SAUNDERS

INITIAL PLAN DATE: 03/06/2025
REVISIONS:
A - 05/20/2025 RKP
BID SET

WR JOB NUMBER 23-1097-004
DRN: RKP DGN: CMS CKD: TSP

ELEVATED TANK SECTION DETAILS

C2.01

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GENERAL ELECTRICAL NOTES

GENERAL: UNLESS SPECIFICALLY INDICATED OTHERWISE, ALL WORK SHOWN ON ELECTRICAL DRAWINGS IS NEW WORK TO BE PROVIDED UNDER THIS CONTRACT.

COORDINATION: COORDINATE AND COOPERATE WITH ALL TRADES ON THE PROJECT. THE CONTRACTOR SHALL REVIEW ALL CONTRACT DOCUMENTS INCLUDING CIVIL DRAWINGS AND SPECIFICATIONS. CONTRACTOR SHALL COORDINATE AND ADJUST ACCORDINGLY AS DIRECTED BY THE ENGINEER.

AS-BUILT DRAWINGS: SECURE AN EXTRA SET OF ELECTRICAL DRAWINGS TO BE KEPT ON SITE AND MARK, DAILY, THE DRAWINGS IN RED AS THE PROJECT PROGRESSES IN ORDER TO KEEP AN ACCURATE RECORD OF ALL DEVIATIONS BETWEEN THE WORK SHOWN ON THE DRAWINGS AND THE WORK WHICH IS ACTUALLY INSTALLED. THESE MARKED DRAWINGS SHALL REFLECT ANY AND ALL CHANGES AND REVISIONS TO THE ORIGINAL DESIGN WHICH EXISTS IN THE COMPLETED WORK. DELIVER THE MARKED DRAWINGS TO THE ENGINEER AT PROJECT CLOSE-OUT.

TESTS: TEST ALL WIRING FOR CONTINUITY AND GROUNDS BEFORE CONNECTING ANY FIXTURES OR DEVICES. PERFORM INSULATION RESISTANCE TESTS ON ALL WIRING #6 OR LARGER TO ENSURE THAT ALL PORTIONS ARE FREE FROM SHORT-CIRCUITS AND GROUNDS.

INSPECTIONS: ARRANGE ALL NECESSARY INSPECTIONS. DELIVER ALL REQUIRED INSPECTION CERTIFICATES TO THE OWNER.

GROUNDING: PROVIDE GROUNDING IN ACCORDANCE WITH THE NEC FOR THE ENTIRE ELECTRICAL SYSTEM INCLUDING EQUIPMENT FRAMES CONDUITS, SWITCHES, CONTROLLERS, WIRE-WAYS, NEUTRAL CONDUCTORS, AND OTHER EQUIPMENT. PROVIDE A GROUNDING CONDUCTOR IN ALL POWER CONDUITS.

LABELS: PROVIDE LABELS FOR ALL PANELBOARDS, CABINETS, SAFETY SWITCHES, MOTOR-DISCONNECT SWITCHES, AND MOTOR CONTROLLERS. LABELS SHALL BE MACHINE ENGRAVED, LAMINATED PLASTIC, PERMANENTLY ATTACHED WITH SELF-TAPPING SCREWS OR RIVETS. DO NOT USE SELF-ADHESIVE LABELS. LABEL SHALL INDICATE EQUIPMENT DESIGNATION AND ASSOCIATED PANEL AND CIRCUIT THAT SERVES IT.

J-BOX LABELING: LABEL ALL JUNCTION BOXES WITH PERMANENT MARKER IDENTIFYING CIRCUIT NUMBER AND PANELBOARD OF CIRCUITS WITHIN.

WIRING DEVICES: LABEL ALL WIRING DEVICES WITH PANELBOARD AND CIRCUIT DESIGNATION PERMANENTLY ATTACHED WITH BLACK TYPED DESIGNATION ON CLEAR TAPE.

PANEL DIRECTORY: PROVIDE TYPEWRITTEN PANELBOARD DIRECTORY CARD IN EACH PANELBOARD WITH CIRCUIT LOAD INFORMATION AND ROOM NUMBER CLEARLY IDENTIFIED. USE ACTUAL ROOM NUMBERS IN THE BUILDING, NOT THE ROOM NUMBERS SHOWN ON THE CONTRACT DRAWINGS, AS THEY ARE OFTEN DIFFERENT.

MOTOR COORDINATION: MOTORS, MOTOR STARTERS, CONTROLLERS, INTEGRAL DISCONNECT SWITCHES, AND CONTACTORS SHALL BE PROVIDED WITH THEIR RESPECTIVE PIECES OF EQUIPMENT BY THE EQUIPMENT SUPPLIER. COMMUNICATE WITH THE TRADES PROVIDING THE EQUIPMENT, VERIFYING ALL REQUIREMENTS, PROVIDE ALL ELECTRICAL CONNECTIONS REQUIRED THEREIN, AND INSTALL MOTOR STARTERS.

MOTOR DISCONNECTS: ALL MOTORS SHALL HAVE DISCONNECTING MEANS.

MOTOR CONTROLLERS: ALL 3-PHASE MOTORS SHALL HAVE MAGNETIC MOTOR CONTROLLERS WITH SOLID STATE OVERLOAD RELAY PROTECTION. THE SOLID STATE OVERLOAD RELAY SHALL HAVE PHASE LOSS AND PHASE OVERCURRENT PROTECTION WITH AUTOMATIC RESET UPON RETURN OF NORMAL POWER.

MOTOR FUSE PROTECTION: WHERE FUSE PROTECTION IS SPECIFICALLY REQUIRED BY THE EQUIPMENT MANUFACTURER, PROVIDE FUSED SWITCHES IN LIEU OF NON-FUSED SWITCHES OR IN LIEU OF ENCLOSED CIRCUIT BREAKERS, OR OTHER DEVICES INDICATED.

CONNECTION DETAILS: SECURE APPROVED SHOP DRAWINGS SHOWING WIRING DIAGRAMS, ROUGH-IN AND HOOK UP DETAILS FROM OTHER INVOLVED CONTRACTORS FOR EQUIPMENT WHICH MUST BE CONNECTED ELECTRICALLY.

COORDINATION DETAILS: WATER EQUIPMENT WILL BE FURNISHED AND INSTALLED BY THE WATER CONTRACTOR. THE LOCATIONS SHOWN ON THE ELECTRICAL DRAWINGS ARE APPROXIMATE. COORDINATE WITH THE WATER CONTRACTOR TO DETERMINE THE EXACT LOCATION OF EACH PIECE OF EQUIPMENT AND DETERMINE THE EXACT ROUGH-IN AND CONNECTION REQUIREMENTS.

WORKING CLEARANCE: COORDINATE FINAL LOCATIONS OF ELECTRICAL EQUIPMENT WITH MECHANICAL DUCTWORK, PIPING ETC. AND ENSURE WORKING CLEARANCE REQUIRED BY NEC WILL BE MET. SUFFICIENT ACCESS AND WORKING SPACE SHALL BE PROVIDED AND MAINTAINED AROUND ELECTRICAL EQUIPMENT AS REQUIRED BY THE NATIONAL ELECTRICAL CODE. CONTRACTOR SHALL COORDINATE FINAL LOCATION OF EQUIPMENT PROVIDED AND INSTALLED BY OTHER TRADES.

CLEAN UP: ON PROJECT CLOSE-OUT CLEAN ALL ELECTRICAL DEVICES, AND REMOVE ALL PAINT SPATTERS FROM DEVICES, FIXTURES AND PLATES.

ELECTRICAL LEGEND

POWER

THE FOLLOWING SUBSCRIPTS SHALL APPLY TO RECEPTACLES WHERE USED:

- WP: WEATHER RESISTANT GFI RECEPTACLE WITH WEATHERPROOF WHILE-IN-USE COVER.

DUPLEX CONVENIENCE RECEPTACLE 20A, 120V, 18" AFF, UON

EQUIPMENT CONNECTION

WEATHERPROOF JUNCTION BOX

MOTOR CONNECTION

MOTOR RATED SWITCH WITH THERMAL OVERLOADS 20A, 120V, UON, MOUNTED WITHIN SIGHT OF MOTOR IN WEATHERPROOF ENCLOSURE.

SAFETY SWITCH, 60A-3P, FU @ 30A, 3R

SWITCH RATING
NUMBER OF POLES
FUSE RATING (NF INDICATES NON-FUSED)
NEMA ENCLOSURE IF OTHER THAN NEMA 1

ELECTRICAL PANELBOARD

AND

ELECTRICAL CIRCUIT RUN IN CONDUIT AND CIRCUIT HOMERUN TO PANELBOARD (PANEL AND CIRCUIT DESIGNATION AS INDICATED). AS A MINIMUM CONDITION, EACH SINGLE PHASE CIRCUIT SHALL HAVE 1 #12 PHASE CONDUCTOR, 1 #12 NEUTRAL CONDUCTOR AND 1 #12 GROUNDING CONDUCTOR IN 1/2" CONDUIT. PROVIDE ADDITIONAL PHASE CONDUCTORS AS REQUIRED FOR "MULTIPLE PHASED" ELECTRICAL LOADS. GROUNDING CONDUCTORS MAY BE SHARED AS ALLOWED BY THE NEC. NEUTRAL CONDUCTORS SHALL NOT BE SHARED. MULTI-POLE BREAKERS SHALL BE PROVIDED IN ACCORDANCE WITH THE NEC WHERE MULTI-WIRE BRANCH CIRCUITS ARE REQUIRED. CONDUIT LARGER THAN 1/2" AND CONDUCTORS LARGER THAN #12 SHALL BE AS INDICATED.

ABBREVIATIONS

A	AMPERE
AFG	ABOVE FINISHED GRADE
AIC	AMPERE INTERRUPTING CAPACITY
AWG	AMERICAN WIRE GAUGE
C	CONDUIT
CKT	CIRCUIT
EC	EMPTY CONDUIT
EQUIP	EQUIPMENT
FHP	FRACTIONAL AC HORSEPOWER
FLA	FULL LOAD AMPS
GFI	GROUND FAULT INTERRUPTER
GND	GROUND
HP	HORSE POWER
IBC	INTERNATIONAL BUILDING CODE
KAIC	THOUSAND AMPERE INTERRUPTING CAPACITY
KVA	KILO-VOLT-AMPERES
KW	KILO-WATTS
MCA	MINIMUM CIRCUIT AMPS
MCB	MAIN CIRCUIT BREAKER
MFR	MANUFACTURER
MIN	MINIMUM
MLO	MAIN LUGS ONLY
MOCP	MAXIMUM OVER-CURRENT PROTECTION
MTD	MOUNTED
NCSB	NORTH CAROLINA STATE BUILDING CODE
NEC	NATIONAL ELECTRICAL CODE
NF	NON-FUSED
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NTS	NOT TO SCALE
P	POLE
PNL	PANEL
Ø	PHASE
SEC	SECONDARY
UON	UNLESS OTHERWISE NOTED
V	VOLT
W	WATTS/WIRE
WH	WATER HEATER
WP	WEATHERPROOF

EXISTING PANELBOARD MDP SCHEDULE

150 MCB, 120/240V, 1Ø, 3W, SURFACE MOUNT

LOAD SERVED	LOAD (AMPS) A	LOAD (AMPS) B	BKR TRIP	CKT NO.	PHASE A B	CKT NO.	BKR TRIP	LOAD (AMPS) A	LOAD (AMPS) B	LOAD SERVED
VALVE VAULT LIGHTS	2.0		20/1P	1		2	20/1P	3.0		OUTER WALL RECEPT
STORAGE AREA LIGHTS		2.0	20/1P	3		4	20/1P		3.0	STORAGE AREA RECEPT
LOWER LADDER LIGHTS	2.0		20/1P	5		6	20/1P	3.0		STORAGE AREA RECEPT
DRY RISER LIGHTS		2.0	20/1P	7		8	20/1P			SPARE
OUTSIDE DOOR LIGHTS	2.0		20/1P	9		10	20/1P	3.0		EXHAUST FAN
SPARE			25/1P	11		12	20/1P		3.0	OUTER WALL RECEPT
CATHODIC PROTECTION	5.0		20/1P	13		14	20/1P	8.0		HEAT PUMP COMP
TELEMETRY		5.0	20/1P	15		16	20/1P		8.0	
AIR HANDLER RECEPT	1.5		20/1P	17		18	20/1P	10.0		AIR HANDLER HEATER
OBSTRUCTION LIGHTNG		2.0	20/1P	19		20	20/1P		10.0	
MIXER	9.8		20/1P	21		22	20/1P	10.0		VALVE UNIT OHD HEATER #1
WATER QUALITY SAMPLING STATION ++		**1.0**	**15/1P**	23		24	20/1P		10.0	
SMART CONTROL PNL +	**10.0**		20/1P	25		26	20/1P	10.0		VALVE UNIT OHD HEATER #2
MIXER CONTROL PNL ++		**20.0**	**30/1P**	27		28	20/1P		10.0	
SAMPLE PUMP +	**9.8**		20/1P	29		30	20/1P	**1.5**		**REC TOP OF TANK +**
AMMONIA PUMP SKID ++		**8.0**	**15/1P**	31		32	20/1P		**8.3**	**WATER SAMPLE PIPE HEAT TRACE +**
HYPOCHLORITE PUMP SKID ++	**8.0**		**15/1P**	33		34	20/1P	**8.3**		**AMMONIA PIPE HEAT TRACE +**
CONTROL POWER		5.0	20/1P	35		36	20/1P		**8.3**	**HYPOCHLORITE PIPE HEAT TRACE +**
SPARE			20/1P	37		38	20/1P			SPARE
SPARE			20/1P	39		40	20/1P			SPARE
SPARE			20/1P	41		42	20/1P			SPARE
TOTAL	50.1	45.0						56.8	60.6	**TOTAL**
TOTAL CONNECTED AMPS A: 106.9 B: 105.6										

NOTES:

PANEL IS MANUFACTURERED BY SIEMENS TYPE S1 SERIES.

ALL LOADS ARE EXISTING TO REMAIN UNLESS OTHERWISE NOTED.

" + " CONNECT LOAD TO EXISTING CIRCUIT BREAKER.

" ++ " PROVIDE CIRCUIT BREAKER AND CONNECT LOAD.

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CONSTRUCTION PLANS
CITY OF ELIZABETH CITY
KE WHITE WATER TOWER
DISINFECTION IMPROVEMENTS
ELIZABETH CITY, NC 27909 | PASQUOTANK COUNTY

NORTH CAROLINA PROFESSIONAL SEAL 046553 ENGINEER JAMES E. BARKLEY JR.
#25008

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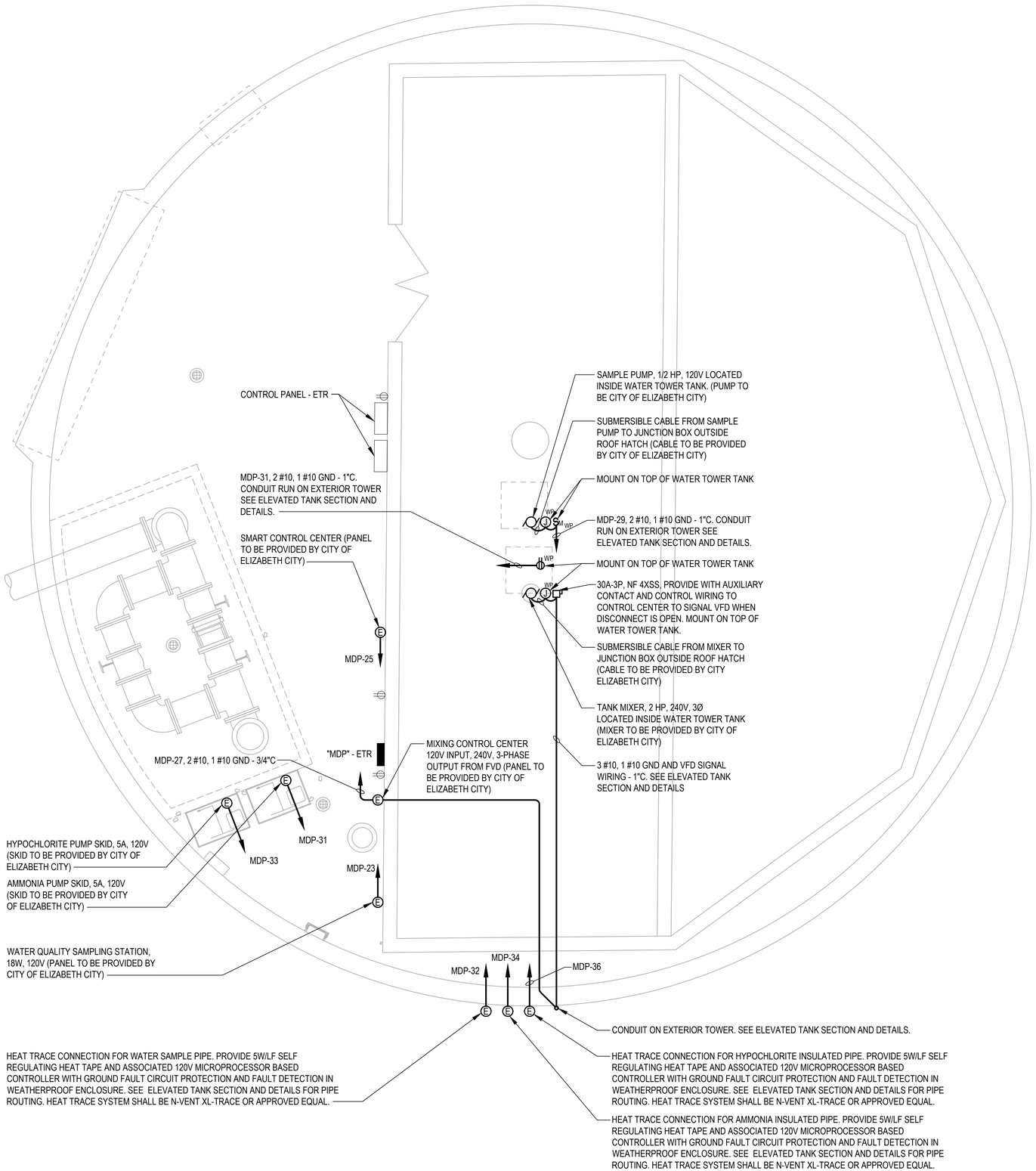
WR JOB NUMBER 23-1097-004
DRN: SLP DGN: JWS CKD: JWS

ELECTRICAL NOTES, LEGEND & ABBREVIATIONS

E0.01

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ELECTRICAL ELEVATED TANK PLAN

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

GRAPHIC SCALE(S)

1/4" = 1'-0" 5' 0' 5' 10'

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CONSTRUCTION PLANS

CITY OF ELIZABETH CITY
KE WHITE WATER TOWER
DISINFECTION IMPROVEMENTS

ELIZABETH CITY, NC 27909 | PASQUOTANK COUNTY

NORTH CAROLINA PROFESSIONAL SEAL 046553 ENGINEER JAMES E BARKLEY JR

#25008

RELEASED FOR BIDDING ONLY 5/3/2025. NOT FOR CONSTRUCTION.

WR JOB NUMBER 23-1097-004
DRN: SLP DGN: JWS CKD: JWS

ELECTRICAL ELEVATED TANK PLAN

E1.00

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SPECIFICATIONS

SECTION 260500 - GENERAL PROVISIONS

PART 1 - GENERAL

1.1 Codes and standards - the latest effective publications of all applicable standards, codes, etc., as they apply, form part of these specifications as if were written fully herein and constitute minimum requirements. The following will be referred to throughout in abbreviated forms.

A. National Electrical Code, (NFPA 70) (NEC).

B. Institute of Electrical and Electronic Engineers (IEEE).

C. Rules and regulations of local electric utility company.

D. National Electrical Manufacturer's Association (NEMA).

E. American National Standards Institute (ANSI).

F. Applicable local codes.

G. Underwriter's Laboratories, Inc. (UL).

H. National Fire Protection Association (NFPA).

I. North Carolina State Building Code

1.2 Scope of work - provide all work required for this division including all labor, materials, equipment, appurtenances and services to provide complete electrical systems as shown on the drawings and specified in this division of the specifications. The word "provide" shall mean "furnish and install complete and ready for use".

1.3 The Contractor shall visit the site prior to bid to determine the extent of the work. Lack of knowledge of existing conditions will not be considered a basis for change orders. Prior to ordering equipment, verify that equipment to be provided under this contract is acceptable and can fit into bldg. and room. Expense incurred by the Contractor, which in the Engineer's opinion could have been avoided by this step, shall not be a basis for change orders.

1.4 Drawings and specifications - the drawings are diagrammatic and indicate the general extent, character and arrangement of equipment, fixtures and conduit and wiring systems. It is the intention of these specifications and drawings to fully cover all work and materials for a complete, first-class electrical installation, and any devices such as pull boxes and disconnect switches, usually employed in this class of work, though not specifically mentioned or shown on the drawings or in this specification, but which may be necessary for the satisfactory completion of the work, shall be furnished and installed by the Contractor as a part of his total work under this Division. Consult the specifications and drawings of all other trades and perform all electrical work required therein. Cooperate with all other Contractors or Subcontractors to furnish complete workable systems.

1.5 During construction, keep an accurate record of all deviations between the work as shown on the contract drawings and that which is actually installed on a set of blue line prints of the electrical drawings, and note changes thereon with red marks, in a neat and accurate manner. When all revisions have been shown on these prints to indicate the work as finally installed, the prints shall be delivered to the Engineer, before final payment.

1.6 Permits, inspection and tests - the right is reserved to inspect and test any portion of the installation/equipment during the progress of its installation. This Contractor shall test all wiring for continuity and grounds before connecting any fixtures or devices. This Contractor shall test the entire system when the work is finally completed to ensure that all portions are free from short circuits and grounds.

1.7 Secure and pay for all required permits and inspections. Inspection certificates from local authorities having jurisdiction shall be delivered to the Owner before final payment.

1.8 Submittals - submit shop drawings, product data and samples within thirty (30) days of award of contract and in accordance with the general conditions and supplementary conditions. Submittals are required for all items provided under this specification. Review of submittals by the Engineer and any associated action taken by the Engineer does not relieve the Contractor of any requirements set forth by the contract documents.

PART 2 - PRODUCTS

2.1 Manufacturing standards - materials shall be new and approved and labeled by UL wherever standards have been established by that agency. Defective equipment or equipment damaged in the course of installation or test shall be replaced or repaired in a manner meeting the approval of the Owner. All items of the same type and rating shall be identical.

2.2 Trade names - unless specifically identified otherwise, manufacturers' names and catalog numbers indicated herein and on the drawings are not intended to be proprietary designations. They are to indicate general type and quality of materials and equipment required. Equipment and materials by other manufacturers which in the opinion of the Engineer are of equal quality and which will produce the same results will be considered acceptable.

2.3 Motors - motors shall have disconnecting means and controllers. Controllers shall have solid state overload protection with phase outage and phase reversal protection.

2.4 Disconnect switches and power wiring up to and including motor connections for all equipment provided under other divisions of this specification shall be included in this division. Where manual motor control switches for single phase motors are indicated, they shall be provided and wired complete under this division. Motor controllers and motor starters furnished under other divisions shall be set in place and connected to source and load under this division. In general, motors will be provided with the equipment they drive and are not part of this work under this division, except that they shall be connected hereunder.

2.5 Obtain approved shop drawings showing wiring diagrams, connection diagrams, roughing-in and hookup details, from other involved Contractors for all equipment and comply therewith.

2.6 Control, interlock, and internal equipment wiring regardless of voltage will be provided under the respective division where the equipment is shown unless specifically shown here.

2.7 Grounding - the electrical system, including equipment frames, conduit, switches, controllers, wireways, neutral conductors, and all other such equipment shall be permanently and effectively grounded in accordance with the NEC. Provide a separate ground conductor in all branch circuit conduits sized in accordance with the NEC.

2.8 Schedule of work - the schedule of the electrical work shall be arranged to suit the progress of work by the other trades and shall in no way retard progress of construction of the project.

2.9 Work under this division shall proceed in advance of the work of others whenever possible, eliminating all cutting and patching. When such procedure is impossible, cutting and patching shall be done in an approved manner. Cutting shall not endanger structural integrity in any way. Patching shall exactly match contiguous work. Actual work of cutting and patching of existing surfaces shall be performed by the Subcontractor who originally prepared these surfaces, e.g., cutting and patching of masonry wall will be performed by the masonry Subcontractor. Costs of such cutting and patching shall be borne by the electrical Subcontractor. Cutting shall be carefully done and damage to building, piping, wiring or equipment as a result of cutting shall be repaired by skilled mechanics of trade involved.

2.10 Storage and materials - space will be assigned to the Contractor by the Owner for the storage of materials. This Contractor will be responsible for the protection and safekeeping of materials, tools, and equipment. All materials and equipment shall be kept in its assigned place until the time of its installation. Excess materials, dirt and refuse shall be promptly removed from the work site.

2.11 Labeling of equipment

A. All cabinets, safety switches, motor disconnect switches, and motor controllers shall be identified by machine engraved laminated plastic designation plates permanently attached thereto with self-tapping screws or rivets. All component parts of each item of equipment or device shall bear the manufacturer's nameplate, giving name of manufacturer, description, size, type, serial and model number and electrical characteristics in order to facilitate maintenance or replacement.

B. All industrial control Panels shall be field marked to warn personnel of the potential for Arc Flash. Labels shall state "WARNING - ARC FLASH AND SHOCK HAZARD APPROPRIATE PPE REQUIRED".

2.12 Coordination - cooperate and coordinate efforts with all Contractors on the project. Any cost incurred which in the opinion of the Owner, could have been avoided by this step shall be the responsibility of the electrical Contractor.

2.13 Guarantee of work - Contractor guarantees by his acceptance of the contract that all work installed is free from any and all defects in workmanship and/or materials, and that the apparatus will develop capacities and characteristics specified, and that if, during the period of one year or as otherwise specified, from date of certificate of completion and acceptance of the work any such defects in workmanship, material or performance appear, he will, without cost to the Owner, remedy such defects within a reasonable time to be specified in notice. In default thereof, the Owner may have such work done and charge cost to Contractor. Equipment guarantees from date of "start-up" will not be recognized.

PART 3 – EXECUTION

3.1 The installation shall be complete including but not limited to the requirements indicated on the drawings and in these specifications.

3.2 Contractor shall thoroughly coordinate and comply with the manufacturer's requirements. Coordination shall be accomplished prior to commencing work.

3.3 All work shall be accomplished in a neat and workmanlike manner consistent with commercial construction practices, code requirements and the local authority having jurisdiction.

SECTION 260519 - CONDUCTORS

A. Conductors and insulation - wire and cable shall be soft drawn, annealed copper with 600 volt color coded insulation. Minimum wire size shall be #12 awg. Insulation for branch circuits and feeders shall be type THHN-2-THWN-2 or XHHW-2. Conductors No. 8 AWG and larger diameter shall be stranded. Conductors No. 10 AWG and smaller diameter shall be solid, except that conductors for remote-control and signal circuits, classes 1, 2, and 3, may be stranded.

B. Provide a separate ground conductor in all raceways sized in accordance with the NEC.

C. Joints and terminations - for conductors #12 and #10 all fixture and branch circuits joints in junction and outlet boxes shall be made with UL listed pressure type connectors rated at 600 volts and 105 degrees C. Connectors shall be Ideal Industries "Wing-Nut" or Buchannan "B-Cap", 3M "Scotch-Lok" connectors or equal. Wire #8 and larger shall be joined or terminated with solderless pressure connectors properly taped in layers to form a moisture-tight joint.

D. All wiring shall be in conduit unless otherwise noted.

SECTION 260533 - RACEWAY, FITTINGS AND BOXES

A. Raceways - conduit shall be hot-dipped, zinc coated or sherardized rigid steel (RS), intermediate metal conduit (IMC), electrical metallic tubing (EMT).

B. Flexible conduit shall be galvanized, continuous spiral, single strip type. Flexible conduit shall be covered with PVC jacket in wet or damp locations. Provide suitable fittings with ground connector.

C. Fittings - all conduit entering or leaving outlet, junction or pull boxes, and cabinets and all conduit stubs shall have bushings. Provide insulating bushings where required by NEC. Provide expansion fittings with bonding jumper where conduits cross expansion joints.

1. Fittings for RS and IMC shall be threaded type.

2. Fittings for EMT shall be threadless, approved for the conditions encountered and may be cast setscrew type or compression type.

D. Outlet boxes and junction boxes - outlet boxes shall be pressed steel, electro-galvanized or cadmium plated with clean cut, easily removable knockouts. Except as noted hereinafter minimum size outlet box shall be 4" square, 1 1/2" deep, and shall be increased in dimensions to accommodate conductors, conduits, and devices as required by the NEC. Shallower boxes may be used where required by structural conditions. Provide suitable plaster-rings to match wall construction and device. Ceiling and bracket outlet boxes shall be not less than 4" octagonal, 1 1/2" deep except that smaller boxes may be used where required by particular fixture to be installed.

E. Outlet boxes in wet or damp locations shall be cast-metal, threaded hub-type with gaskets.

F. Junction or pull boxes not over 100 cubic inches in volume shall be standard outlet boxes. Junction boxes over 100 cubic inches in volume shall be constructed of code gage, galvanized sheet steel. Junction boxes shall have removable covers and shall be accessible after completion of work.

G. Raceway and fitting installation - Conduits may be run exposed in mechanical rooms and spaces with exposed construction. Conduit shall be supported at intervals of not more than 8'. Run exposed conduit parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceiling.

H. Support conduits by pipe straps, wall brackets, strap hangers, or ceiling trapeze.

I. Do not install EMT outdoors, or underground, or encased in concrete, or in hazardous areas, or in areas subject to severe physical damage.

J. Sleeves - All electrical system conduit shall have sleeves where conduit passes through concrete slabs except concrete slabs in contact with grade. All conduit 1 1/4 inch and larger running concealed above ceiling shall have sleeves where the conduit passes through masonry, tile and gypsum wall construction. Sleeves shall be constructed of galvanized steel pipe, Schedule 40. Provide escutcheon plates for all exposed conduit passing through walls, floors and ceilings. Where plates are provided for conduits passing through sleeves, which extend above the floor surface, provide deep recessed plates to conceal the sleeves. Terminate sleeves flush with wall, partitions and ceilings. In areas where conduits are concealed, as in chases, terminate sleeves flush with floor. In finished areas, where conduits are exposed, extend sleeves 1/2 inch above finished floor, except in rooms having floor drains extend sleeves 1 inch above floor. Fasten sleeves securely in floors, walls, so that they will not become displaced when concrete is poured or when other construction is built around them. Where sleeves pass through floors or fire rated walls provide proper sealant around conduit to maintain fire rating.

SECTION 262810 – SAFETY SWITCHES

A. Safety switches - safety switches shall be rated at 600 or 240 volts with number of poles and current rating as indicated. Switches shall be fused or non-fused type as indicated, NEMA type GD or HD as required, with full cover interlocks and quick-make, quick-break mechanism.

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NORTH CAROLINA PROFESSIONAL SEAL 046553 ENGINEER JAMES E. BARKLEY JR.
#25008

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WR JOB NUMBER 23-1097-004
DRN: SLP DGN: JWS CKD: JWS

ELECTRICAL SPECIFICATIONS

E7.00

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PROJECT MANUAL

for the

City of Elizabeth City

KE White Water Tower Disinfection Improvements

May 3, 2025

WithersRavenel Project No. 23-1097-004



Cathleen Saunders, P.E.

5/2/2025

WithersRavenel
8466 Caratoke Highway, Building 400 | Powells Point, NC 27966
Office: 252.491.8147 | Fax: 919.467.6008 | www.withersravenel.com | License No. F-1479
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	APPENDIX A – VENDOR EQUIPMENT LIST

ADVERTISEMENT FOR BIDS

Project: KE White Tower Disinfection Project
Owner: City of Elizabeth City
410 Pritchard Street, Elizabeth City, NC 27909
Engineer: WithersRavenel
8466 Caratoke Highway, Building 400, Powells Point, NC 27966

The City of Elizabeth City will receive separate sealed formal bids for the KE White Tower Disinfection Project at the City of Elizabeth City's Public Works 2nd Floor Conference Room, located at 410 Pritchard Street, Elizabeth City, NC 27909, until Thursday, May 29th, 2025, at 3 PM, local prevailing time, at which time the Bids received will be publicly opened and read. Bids received after this time will not be accepted. Bids may be submitted by UPS or hand delivery only at the Public Works building located at 410 Pritchard Street, Elizabeth City, NC 27909. While there is an option to attend the Bid Opening virtually, hardcopy bids are still required to be received. Sealed bids should be marked clearly:

City of Elizabeth City
RE: KE White Tower Disinfection Project
C/O: R. Lassiter or D. Bell
410 Pritchard Street
Elizabeth City, NC 27909

The project consists of installation of a Monoclor® Residual Control System (RCS) within the KE White Elevated Water Tower. The proposed booster pump disinfection improvement system includes a submerged tank mixer, water quality sampling system, submerged pump, injector assembly, hypochlorite storage tank, liquid ammonium storage tank, individual dosing skids for each chemical, and all associated appurtenances including, but not limited to, piping, control panels, chemical and electrical conduit. The booster pump disinfection system materials are to be provided by the City as detailed on the plan. All remaining materials are to be provided by the contractor.

A non-mandatory Pre-Bid Conference will be held on Monday, May 19th, 2025, at 3 PM local time, virtually, and at the City of Elizabeth City's Public Works 2nd Floor Conference Room, located at 410 Pritchard Street, Elizabeth City, NC 27909. Interested parties are encouraged to attend this conference to review the plans. Attendance is strongly encouraged.

To participate in the virtual Pre-Bid Conference, you must email Erin Spencer at espencer@withersravenel.com by 10:00 am local time on Friday, May 16th, 2025, to be provided with the information to join the meeting.

Complete digital bidding documents are available at http://withersravenel.com/bid/ or www.questcdn.com. You may download the digital documents for $25.00 by inputting Quest project # 9656265 on the website's search page. Please contact QuestCDN.com at (952) 233-1632 or info@questcdn.com for assistance in membership registration, downloading, and working with this digital project information. Contract documents may also be examined by downloading them under the project notices at www.elizabethcitync.gov, or evp.nc.gov.

All questions related to this bid shall be submitted in writing to espencer@withersravenel.com and rlassiter@elizabethcitync.gov prior to 5 PM local time on Tuesday, May 20th, 2025 to receive consideration. Questions received after that time will not be answered or accepted. A Final Addendum will be provided prior to the Bid Date.

Bidders are responsible for the review of any addenda for the project and shall acknowledge the addenda on the bid form. To qualify, all bids shall be submitted using bid forms contained in the Contract Documents.

Incomplete or segregated bids will not be accepted. All bids must be accompanied by a certified or cashier's check or bid bond in the amount of 5% of the total amount bid made payable to the Owner. The bid deposit shall be retained by the Owner if the successful bidder fails to execute contracts or fails to provide the required bonds, as stated above, within ten (10) days after the proper notice of award of the contract. No bid shall be withdrawn for a period of **60 consecutive calendar days** after bid opening except as provided in Information for Bidders. Bidders must show evidence that they are licensed to perform the work in the Bid Documents as required by the North Carolina General Statutes Chapter 87. The Owner reserves the right to reject any/all bids, to waive formalities, or to reject non-conforming, non-responsive, or conditional bids. The Owner reserves the right to award a contract to the lowest, responsive, responsible bidder or bidders, taking into consideration quality, performance, and time.

The Owner is an Equal Opportunity Employer. The Owner encourages bidding from small, minority and female (M/WBE), disadvantaged business enterprise (DBE), historically underutilized businesses (HUB). Bidders shall be required to submit with their Bids affidavits of “Good Faith Efforts” in the recruitment of MBEs.

Dwan Bell, Public Utilities Director

INSTRUCTIONS TO BIDDERS

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ARTICLE 1 – DEFINED TERMS

1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:

A. *Issuing Office* – The office from which the Bidding Documents are to be issued.

ARTICLE 2 – COPIES OF BIDDING DOCUMENTS

2.01 Complete sets of the Bidding Documents may be obtained from the Issuing Office in the number and format stated in the advertisement or invitation to bid.

2.02 Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2.03 Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not authorize or confer a license for any other use.

ARTICLE 3 – QUALIFICATIONS OF BIDDERS

3.01 To demonstrate Bidder's qualifications to perform the Work, Bidder shall submit, with the bid, (a) written evidence establishing its qualifications such as financial data, previous experience, and present commitments, and (b) the following additional information:

A. Evidence of Bidder's authority to do business in the state where the Project is located

B. Bidder's state or other contractor license number, if applicable

C. Subcontractor and Supplier qualification information; coordinate with provisions of Article 12 of these Instructions, "Subcontractors, Suppliers, and Others"

D. Other required information regarding qualifications

3.02 A Bidder's failure to submit required qualification information with the bid may disqualify Bidder from receiving an award of the Contract.

3.03 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder's qualifications.

3.04 Bidder is advised to carefully review those portions of the Bid Form requiring Bidder's representations and certifications.

ARTICLE 4 – SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE

4.01 *Site and Other Areas*

A. The Site is identified in the Bidding Documents. By definition, the Site includes rights-of-way, easements, and other lands furnished by Owner for the use of the Contractor. Any additional lands required for temporary construction facilities, construction equipment, or storage of

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materials and equipment, and any access needed for such additional lands, are to be obtained and paid for by Contractor.

4.02 *Existing Site Conditions*

A. Subsurface and Physical Conditions; Hazardous Environmental Conditions

1. The Supplementary Conditions identify:

a. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site.

b. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

c. reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site.

d. Technical Data contained in such reports and drawings.

2. Owner will make copies of reports and drawings referenced above available to any Bidder on request. These reports and drawings are not part of the Contract Documents, but the Technical Data contained therein upon whose accuracy Bidder is entitled to rely, as provided in the General Conditions, has been identified and established in the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any Technical Data or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

3. If the Supplementary Conditions do not identify Technical Data, the default definition of Technical Data set forth in Article 1 of the General Conditions will apply.

B. Underground Facilities: Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site are set forth in the Contract Documents and are based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others.

C. Adequacy of Data: Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions, and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated subsurface or physical conditions appear in Paragraphs 5.03, 5.04, and 5.05 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work, appear in Paragraph 5.06 of the General Conditions.

4.03 *Site Visit and Testing by Bidders*

A. Bidder shall conduct the required Site visit during normal working hours, and shall not disturb any ongoing operations at the Site.

B. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.

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C. On request, and to the extent Owner has control over the Site, and schedule permitting, the Owner will provide Bidder access to the Site to conduct such additional examinations, investigations, explorations, tests, and studies as Bidder deems necessary for preparing and submitting a successful Bid. Owner will not have any obligation to grant such access if doing so is not practical because of existing operations, security or safety concerns, or restraints on Owner's authority regarding the Site.

D. Bidder shall comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established by Owner or by property owners or other entities controlling the Site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.

E. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

4.04 *Owner's Safety Program*

A. Site visits and work at the Site may be governed by an Owner safety program. As the General Conditions indicate, if an Owner safety program exists, it will be noted in the Supplementary Conditions.

4.05 *Other Work at the Site*

A. Reference is made to Article 8 of the General Conditions for the identification of the general nature of other work of which Owner is aware (if any) that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) and relates to the Work contemplated by these Bidding Documents. If Owner is party to a written contract for such other work, then on request, Owner will provide to each Bidder access to examine such contracts (other than portions thereof related to price and other confidential matters), if any.

ARTICLE 5 – BIDDER'S REPRESENTATIONS

5.01 It is the responsibility of each Bidder before submitting a Bid to:

A. examine and carefully study the Bidding Documents, and any data and reference items identified in the Bidding Documents;

B. visit the Site, conduct a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfy itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;

C. become familiar with and satisfy itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work;

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

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

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

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

H. promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder;

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

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

ARTICLE 6 – PRE-BID CONFERENCE

6.01 A pre-Bid conference will be held at the time and location stated in the invitation or advertisement to bid. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference. Engineer will transmit to all prospective Bidders of record such Addenda as Engineer considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

ARTICLE 7 – INTERPRETATIONS AND ADDENDA

7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to Engineer in writing. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all parties recorded as having received the Bidding Documents. Questions received less than seven days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

7.02 Addenda may be issued to clarify, correct, supplement, or change the Bidding Documents.

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ARTICLE 8 – BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of 5% of Bidder's maximum Bid price (determined by adding the base bid and all alternates) and in the form of a certified check, bank money order, or a Bid bond (on the form included in the Bidding Documents) issued by a surety meeting the requirements of Paragraphs 6.01 and 6.02 of the General Conditions.

8.02 The Bid security of the apparent Successful Bidder will be retained until Owner awards the contract to such Bidder, and such Bidder has executed the Contract Documents, furnished the required contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be released. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited. Such forfeiture shall be Owner's exclusive remedy if Bidder defaults.

8.03 The Bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven days after the Effective Date of the Contract or one day longer than the number of days to bid withdrawal as described in Article 2 of the Bid Form, whereupon Bid security furnished by such Bidders will be released.

8.04 Bid security of other Bidders that Owner believes do not have a reasonable chance of receiving the award will be released within seven days after the Bid opening.

ARTICLE 9 – CONTRACT TIMES

9.01 The number of days within which, or the dates by which, the Work is to be substantially completed and ready for final payment are set forth in the Agreement.

ARTICLE 10 – LIQUIDATED DAMAGES

10.01 Provisions for liquidated damages, if any, for failure to timely attain a Milestone, Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Agreement.

ARTICLE 11 – SUBSTITUTE AND "OR-EQUAL" ITEMS

11.01 The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, and those "or-equal" or substitute or materials and equipment subsequently approved by Engineer prior to the submittal of Bids and identified by Addendum. No item of material or equipment will be considered by Engineer as an "or-equal" or substitute unless written request for approval has been submitted by Bidder and has been received by Engineer at least 15 days prior to the date for receipt of Bids. Each such request shall comply with the requirements of Paragraphs 7.04 and 7.05 of the General Conditions. The burden of proof of the merit of the proposed item is upon Bidder. Engineer's decision of approval or disapproval of a proposed item will be final. If Engineer approves any such proposed item, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon approvals made in any other manner.

11.02 All prices that Bidder sets forth in its Bid shall be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as

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supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of "or-equal" or substitution requests are made at Bidder's sole risk.

ARTICLE 12 – SUBCONTRACTORS, SUPPLIERS, AND OTHERS

12.01 A Bidder shall be prepared to retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of the Work if required by the Bidding Documents (most commonly in the Specifications) to do so. If a prospective Bidder objects to retaining any such Subcontractor, Supplier, or other individual or entity, and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.

12.02 Subsequent to the submittal of the Bid, Owner may not require the Successful Bidder or Contractor to retain any Subcontractor, Supplier, or other individual or entity against which Contractor has reasonable objection.

12.03 All bidders shall submit to Owner with Bid a list of the Subcontractors or Suppliers proposed for the Work. If requested by Owner, such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, or other individual or entity. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, in which case apparent Successful Bidder shall submit a substitute, Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.

12.04 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, or other individuals or entities. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to subsequent revocation of such acceptance as provided in Paragraph 7.06 of the General Conditions.

ARTICLE 13 – PREPARATION OF BID

13.01 The Bid Form is included with the Bidding Documents.

A. All blanks on the Bid Form shall be completed in ink and the Bid Form signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid price shall be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.

B. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words "No Bid" or "Not Applicable."

13.02 A Bid by a corporation shall be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation shall be shown. The corporate seal shall be affixed and attested by the corporate secretary or an assistant corporate secretary.

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13.03 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown.

13.04 A Bid by a limited liability company shall be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm shall be shown.

13.05 A Bid by an individual shall show the Bidder's name and official address.

13.06 A Bid by a joint venture shall be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The official address of the joint venture shall be shown.

13.07 All names shall be printed in ink below the signatures.

13.08 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.

13.09 Postal and e-mail addresses and telephone number for communications regarding the Bid shall be shown.

13.10 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located, or Bidder shall covenant in writing to obtain such authority and qualification prior to award of the Contract and attach such covenant to the Bid. Bidder's state contractor license number, if any, shall also be shown on the Bid Form.

ARTICLE 14 – BASIS OF BID

14.01 *Unit Price*

A. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the unit price section of the Bid Form.

B. The "Bid Price" (sometimes referred to as the extended price) for each unit price Bid item will be the product of the "Estimated Quantity" (which Owner or its representative has set forth in the Bid Form) for the item and the corresponding "Bid Unit Price" offered by the Bidder. The total of all unit price Bid items will be the sum of these "Bid Prices"; such total will be used by Owner for Bid comparison purposes. The final quantities and Contract Price will be determined in accordance with Paragraph 13.03 of the General Conditions.

C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

14.02 *Allowances*

A. For cash allowances the Bid price shall include such amounts as the Bidder deems proper for Contractor's overhead, costs, profit, and other expenses on account of cash allowances, if any, named in the Contract Documents, in accordance with Paragraph 13.02.B of the General Conditions.

ARTICLE 15 – SUBMITTAL OF BID

15.01 A Bid shall be received no later than the date and time prescribed and at the place indicated in the advertisement or invitation to bid and shall be enclosed in a plainly marked package with the

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Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, and shall be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate package plainly marked on the outside with the notation:

BID ENCLOSED

KE White Tower Disinfection Project

Bids may be submitted by UPS or hand delivery only at the Public Works building:

R. Lassiter or D. Bell

City of Elizabeth City

410 Pritchard Street

Elizabeth City, NC 27909

15.02 Bids received after the date and time prescribed for the opening of bids, or not submitted at the correct location or in the designated manner, will not be accepted and will be returned to the Bidder unopened.

ARTICLE 16 – MODIFICATION AND WITHDRAWAL OF BID

16.01 A Bid may be withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.

16.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 16.01 and submit a new Bid prior to the date and time for the opening of Bids.

16.03 If within 72 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid security will be returned; all in accordance with North Carolina General Stature 143-129.1. Thereafter, if the Work is rebid, that Bidder will be disqualified from further bidding on the Work.

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ARTICLE 17 – OPENING OF BIDS

17.01 Bids will be opened at the time and place indicated in the advertisement or invitation to bid and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

ARTICLE 18 – BIDS TO REMAIN SUBJECT TO ACCEPTANCE

18.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 19 – EVALUATION OF BIDS AND AWARD OF CONTRACT

19.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible. If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, then the Owner will reject the Bid as nonresponsive; provided that Owner also reserves the right to waive all minor informalities not involving price, time, or changes in the Work.

19.02 If Owner awards the contract for the Work, such award shall be to the responsible Bidder whose bid is in the best interests of the Owner.

19.03 Evaluation of Bids

A. In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.

B. For the determination of the apparent low Bidder when unit price bids are submitted, Bids will be compared on the basis of the total of the products of the estimated quantity of each item and unit price Bid for that item, together with any lump sum items.

19.04 In evaluating whether a Bidder is responsible, Owner will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.

19.05 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.

ARTICLE 20 – BONDS AND INSURANCE

20.01 Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds and insurance. When the Successful Bidder delivers the Agreement (executed by Successful Bidder) to Owner, it shall be accompanied by required bonds and insurance documentation.

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ARTICLE 21 – SIGNING OF AGREEMENT

21.01 When Owner issues a Notice of Award to the Successful Bidder, it shall be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 15 days thereafter, Successful Bidder shall execute and deliver the required number of counterparts of the Agreement (and any bonds and insurance documentation required to be delivered by the Contract Documents) to Owner. Within ten days thereafter, Owner shall deliver one fully executed counterpart of the Agreement to Successful Bidder, together with printed and electronic copies of the Contract Documents as stated in Paragraph 2.02 of the General Conditions.

ARTICLE 22 – SALES AND USE TAXES

22.01 The Contractor shall pay all applicable sales, consumer, use and other similar taxes required by law. The Contractor is responsible for reviewing the pertinent State Statutes involving the sales tax and sales tax exemption and complying with all requirements. The Contractor shall include all Federal, State, and local taxes in his bid. The Contractor shall indemnify, defend and hold harmless, Owner, Engineer and their employees, agents and representatives from and against any and all claims, damages, losses, penalties, fines and tax liabilities whatsoever resulting from Contractor's failure to include such taxes in his bid, pay any such tax, or comply with any applicable tax requirements or statutes.

ARTICLE 23 – RETAINAGE

23.01 Provisions concerning Contractor's rights to deposit securities in lieu of retainage are set forth in the Agreement.

ARTICLE 24 – CONTRACTS TO BE ASSIGNED

24.01 Not Used

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SECTION 00 03 00

INFORMATION AVAILABLE TO BIDDERS

The following information is available:

Prior to reviewing the information and/or Report(s), interested Bidders will be required to sign a release form stating that it is understood the information is for general information purposes only; no warranties or guarantees are implied. A copy of the report(s) is attached to the end of this section.

"CONTRACTOR" hereby acknowledges and agrees that the following information and/or report(s) are provided by OWNER solely for general information purposes and are not part of the Contract Documents; no warranties or guarantees are implied.

CONTRACTOR: _____

(Name of Company)

Accepted By: _____

(Name of the CONTRACTOR's Representative)

Title: _____

(Title of the CONTRACTOR's Representative)

Date: _____

END OF SECTION

SECTION 00 03 40

NON-COLLUSIVE AFFIDAVIT

_____ being first duly sworn, deposes and says that:

1. He/She is the _____, (OWNER, Partner, Officer, Representative or Agent) of _____ (the Bidder that has submitted the attached Bid);
2. He/She is fully informed respecting the preparation and contents of the attached Bid and of all pertinent circumstances respecting such Bid;
3. Such Bid is genuine and is not a collusive or sham Bid;
4. Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affidavit, have in any way colluded, conspired, connived or agreed, directly or indirectly, with any other Bidder, firm, or person to submit a collusive or sham Bid in connection with the Work for which the attached Bid has been submitted; or to refrain from bidding in connection with such Work; or have in any manner, directly or indirectly, sought by agreement or collusion, or communication, or conference with any Bidder, firm, or person to fix the price or prices in the attached Bid or of any other Bidder, or to fix any overhead, profit, or cost elements of the Bid price or the Bid price of any other Bidder, or to secure through any collusion, conspiracy, connivance, or unlawful agreement any advantage against (Recipient), or any person interested in the proposed Work;
5. The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance, or unlawful agreement on the part of the Bidder or any other of its agents, representatives, owners, employees or parties in interest, including this affidavit.

Dated: _____

(CONTRACTOR)

By: _____

State Of: _____

County Of: _____

Subscribed and sworn to before me this _____ Day of _____

Notary Public

My commission expires: _____

END OF SECTION

SECTION 00 03 50

AUTHORITY TO EXECUTE CONTRACT

If the Bidder is a Corporation, attach to this page a certified copy of corporate resolutions of the Board of Directors of the Corporation authorizing an officer of the Corporation to execute the Agreement contained within this document on behalf of the Corporation.

END OF SECTION

City of Elizabeth City
KE White Water Tower
Disinfection Improvements

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ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to:

R. Lassiter or D. Bell
City of Elizabeth City
410 Pritchard Street
Elizabeth City, NC 27909

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

ARTICLE 2 – BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 5 consecutive calendar days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 – BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

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

Addendum No.	**Addendum, Date**
_____	_____
_____	_____
_____	_____

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

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

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

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to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.

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

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

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

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

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

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

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 Bidder certifies that:

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

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

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

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

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

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at

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artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

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

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

ARTICLE 5 – BASIS OF BID

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

See Attached Bid Form

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

ARTICLE 6 – TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete within 30 consecutive calendar days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within 60 consecutive calendar days after the date when the Contract Times commence to run.

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

ARTICLE 7 – ATTACHMENTS TO THIS BID

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

A. Required Bid security; in an amount of five (5) percent (%) of the total price bid in the form of a (CIRCLE ONE):

Bid Bond

Certified Check

Cashier's Check

B. 00 03 00 - Information Available to Bidder's - Acknowledgement

C. 00 03 40 - Non-collusive Affidavit

D. 00 04 10 - Bid Form - Addenda Acknowledgement

E. 00 04 12 - E-Verify Affidavit

F. 00 04 20 – Bidders Qualifications Forms

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G. Contractor License

H. 00 04 21 - DBE Affidavits (If Required)

1. Affidavit A - Listing of Good Faith Efforts

2. Affidavit B - Intent to Perform Contract With Own Workforce

ARTICLE 8 – DEFINED TERMS

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

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ARTICLE 9 – BID SUBMITTAL

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

_____

By:
[Signature] _____

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

Attest:
[Signature] _____

[Printed name] _____

Title: _____

Submittal Date: _____

Address for giving notices:

_____

_____

_____

Telephone Number: _____

Fax Number: _____

Contact Name and e-mail address: _____

_____

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

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City of Elizabeth City USCG Elizabeth City Water Quality Improvement				Base Bid Schedule	
Item No.	**Item Description**	**Unit**	**Est. Quan.**	**Unit Price**	**Extended Price**
1	Mobilization to include obtaining applicable building permits	LS	1	$	$
2	Installation of Equipment as supplied by the City of Elizabeth City. Including, but not limited to, wet installation of the mixer, Control Center, Smart Control Center, Hypochlorite Storage Tank, Chlorine Chemical Feed System, Liquid Ammonia Storage Tank, Ammonia Chemical Feed System, Submersible Pump, and Water Quality Station including design and supply of anchor bolts for equipment, mounting, wiring, and associated appurtenances for commissioning and testing of a complete and operable system.	LS	1	$	$
3	12.5% Sodium Hypochlorite Supply	GAL	120	$	$
4	40% Liquid Ammonium Sulfate Supply	GAL	60	$	$
5	Labeling of the site including chemical storage tanks and panels to meet local regulating agency requirements.	LS	1	$	$
6	All interconnected piping, tubing, and casing pipe necessary for system connections, including between chemical storage accessories, chemical skids, water supply, and water piping from the booster pump outlet to the tank hatch. This line item should include valves, Fittings and appurtenances not specified in Bid Note 3 as provided by the City of Elizabeth City.	LS	1	$	$
7	Electrical Conduit, wiring, electrical material (including disconnect switches) between control panel, hypochlorite tank, metering pumps, and SCADA as specified on the plans	LS	1	$	$
8	All required stainless steel straps for casing pipe(s) support including electrical conduits, two (2) chemical conduits, and sample line conduit.	LS	1	$	$
9	Insulation and freeze protection for all tubing and all piping external to the reservoir.	LS	1	$	$
				Total Base Bid	$

(Write Out In Words)

Award of the contract shall be in accordance with North Carolina General Statute Chapter 143, Article 8 of the State Public Contracts Code and City of Elizabeth City Purchasing Manual including Resolution R94084 and award shall be based on the Total Bid Shown above.

Additive Bid Item No. 1:

Description: All work associated with the installation of a second capped 7/16" nylon reinforced PVC chemical carrier pipe within the 1.5" SCH 80 PVC casing pipe and a second capped 3/8" nylon reinforced PVC chemical carrier pipe within the 1.5" SCH 80 PVC casing pipe. The casing pipes will remain unchanged, but the additive bid should take into account any deduction necessary for reduced freeze protection. The casing pipes, a single 7/16" nylon reinforced PVC carrier pipe, and a single 3/8" nylon reinforced PVC carrier pipe are shown on plans prepared by WithersRavenel dated 5/3/2025.

Total Additive Bid Item No. 1	$

(Write Out In Words)

Bid Notes:

1. Refer to Special Provisions for incidental which may not be listed.
2. On acceptance of this bid for said work, the undersigned does or do hereby bind themselves to enter into a written contract within ten (10) days of award with the said authority, and to perform said work for the consideration above named.
3. It should be noted that the City of Elizabeth City has purchased the following items through sole-source. The contractor shall include installation and testing of these items within their bid total only:

a. PWM250 Mixer Wet Assembly, including the mixer, 2HP motor, power cable, replacement chain and injection stems.
b. Control Center with SCADA Compatibility, including NEMA 4 Enclosure, light indicators, and cooling fan.
c. 230VAC single phase, rated to 3.0 HP Variable Frequency Drive
d. SCADA outputs including RS-485 dry contact connections, digital output signal indicating motor running, fault, and remove motor on/off.
e. 130' of Flat-jacketed 4 conductor cable.
f. Smart Control Center including Programmable Logic Controller, LCD touchscreen, two wire twisted cable, RS-485 port only, SCADA connections only, and Type 4 rated enclosure.
g. Chlorine Chemical Feed Skid including a single pump on skid, a spare pump, SCH 80 PVC (on the skid only), secondary containment, controller including connection ports only, calibration column, pressure relief valve, wye strainer, pressure transmitter, and back pressure regulator.
h. Liquid Ammonium Sulfate Storage Tank including tank fittings and level transmitter.
i. Ammonia Chemical Feed Skid including a single pump on skid, a spare pump, SCH 80 PVC (on the skid only), secondary containment, controller including connection ports only, calibration column, pressure relief valve, wye strainer, pressure transmitter, and back pressure regulator.
j. Water Quality Station including 3/8" push connect, RS-485 connection, and Type 3R rated enclosure.
k. Submersible Sample pump.

SECTION 00 04 12

E-VERIFY AFFIDAVIT

State of _____

County of _____

NOW COMES Affiant, first being sworn, deposes and says as follows:

1. I have submitted a bid for contract or desire to enter into a contract with the City of Elizabeth City;
2. As part of my duties and responsibilities pursuant to said bid and/or contract, I attest that I am aware of and in compliance with the requirements of E-Verify, Article 2 of Chapter 64 of the North Carolina General Statutes, to include (mark which applies):

   ☐ After hiring an employee to work in the United States I verify the work authorization of said employee through E-Verify and retain the record of the verification of work authorization while the employee is employed and for one year thereafter; or

   ☐ I employ less than twenty-five (25) employees in the State of North Carolina.
3. As part of my duties and responsibilities pursuant to said bid and/or contract, I attest that to the best of my knowledge any subcontractors employed as a part of this bid and/or contract are in compliance with the requirements of E-Verify, Article 2 of Chapter 64 of the North Carolina General Statutes, to include (mark which applies):

   ☐ After hiring an employee to work in the United States the subcontractor verifies the work authorization of said employee through E-Verify and retain the record of the verification of work authorization while the employee is employed and for one year thereafter; or

   ☐ Employ less than twenty-five (25) employees in the State of North Carolina.

Specify subcontractor _____

This the _____ day of _____ 20 _____

_____

Affiant

Sworn to and subscribed before me, this the _____ day of _____ 20 _____

[OFFICIAL SEAL]

_____ Notary Public

My Commission Expires _____

END OF SECTION

SECTION 00 04 20

BIDDERS QUALIFICATIONS FORMS

(Submit with necessary attachments along with bidding documents.)

The undersigned warrants the truth and accuracy of all statements and answers herein contained. Include additional sheets if necessary.

How many years has your organization been in business as a (circle one) General Contractor/Subcontractor?

Describe and give the date and owner of the last project that you have completed similar in type, size, and nature as the one proposed?

List any projects that you have completed similar in type, size, and nature as the one proposed.

Name of Project 1: _____

Location: _____

OWNER: _____

Telephone No.: _____

ENGINEER: _____

Date Started: _____ Date Completed: _____

Value of Contract: _____

Description of Project: _____

_____

_____

_____

Name of Project 2: _____

Location: _____

OWNER: _____

Telephone No.: _____

ENGINEER: _____

Date Started: _____ Date Completed: _____

Value of Contract: _____

Description of Project: _____

_____

_____

_____

Name of Project 3: _____

Location: _____

OWNER: _____

Telephone No.: _____

ENGINEER: _____

Date Started: _____ Date Completed: _____

Value of Contract: _____

Description of Project: _____

_____

_____

_____

Have you ever failed to complete work awarded to you? If so, where and why?

Name three individuals or corporations for which you have performed work and to which you refer: (Attach additional sheets if necessary)

Have you personally inspected the site of the proposed work? Describe any anticipated problems with the site and your proposed solutions: (Attach additional sheets if necessary)

Will you Subcontract any part of this Work? If so, please list the names and addresses of the subcontractors to be used for the portions of the work listed below. Additional information will be required in accordance with the Instructions to Bidders, Article 12.

Subcontractor Name	Service Provided

Please list the names and addresses of the suppliers to be used for the Project. Additional information will be required in accordance with the Instructions to Bidders, Article 12.

Supplier Name	Product(s) Provided

List your organization's Insurance Interstate Experience Modification Rate (EMR) for the three most recent years.

_____ _____ _____

State the true and exact, correct, and complete name under which you do business.

Bidder Is:

_____

(Bidder Name)

_____

(Individual's Signature)

_____

(Individual's Name)

END OF SECTION

BID BOND

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

BIDDER *(Name and Address)*:

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

OWNER *(Name and Address)*:

City of Elizabeth City

410 Pritchard Street

Elizabeth City, NC 27909

BID

Bid Due Date: **May 29, 2025**

Description *(Project Name— Include Location)*: KE White Tower Disinfection Project – City of Elizabeth City, North Carolina

The project consists of installation of a Monoclor® Residual Control System (RCS) within the KE White Elevated Water Tower. The proposed booster pump disinfection improvement system includes a submerged tank mixer, water quality sampling system, submerged pump, injector assembly, hypochlorite storage tank, liquid ammonium storage tank, individual dosing skids for each chemical, and all associated appurtenances including, but not limited to, piping, control panels, chemical and electrical conduit. The booster pump disinfection system materials are to be provided by the City as detailed on the plan. All remaining materials are to be provided by the contractor.

BOND

Bond Number:

Date:

Penal sum $

(Words) (Figures)

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

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

Note: Addresses are to be used for giving any required notice.

Provide execution by any additional parties, such as joint venturers, if necessary.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and

assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond shall be Owner's sole and exclusive remedy upon default of Bidder.

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

3. This obligation shall be null and void if:

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

3.2 All Bids are rejected by Owner, or

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

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

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

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

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

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

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

10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any

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

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

EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

NOTICE OF AWARD

Date of Issuance:		
Owner:	City of Elizabeth City	Owner's Contract No.:
Engineer:	WithersRavenel	Engineer's Project No.: 23-1097-004
Project:	KE White Water Tower Disinfection Improvements	Contract Name:
Bidder:	(Contractor)	
Bidder's Address:	(Contractor Address 1)	
	(Contractor Address 2)	
	(Contractor Address 3)	

TO BIDDER:

You are notified that Owner has accepted your Bid dated May 29, 2025 for the above Contract, and that you are the Successful Bidder and are awarded a Contract for: KE White Water Tower Disinfection Improvements project.

The Contract Price of the awarded Contract is: (Contract Amount $)

(three) copies of the proposed Performance Bond, Payment Bond, and Agreement accompany this Notice of Award.

(three) sets of the fully executed Contract Documents and Drawings will be delivered separately or otherwise made available to you immediately after execution. You must comply with the following conditions precedent within 15 days of the date of receipt of this Notice of Award:

1. Deliver to Owner (three) counterparts of the Agreement, fully executed by Bidder.
2. Deliver with the executed Agreement(s) the Contract security *[e.g., performance and payment bonds]* and insurance documentation as specified in the Instructions to Bidders and General Conditions, Articles 2 and 6.

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited.

Within ten days after you comply with the above conditions, Owner will return to you one fully executed counterpart of the Agreement, together with any additional copies of the Contract Documents as indicated in Paragraph 2.02 of the General Conditions.

Owner:	City of Elizabeth City	Contractor:	
	Authorized Signature		Authorized Signature
By:		By:	
Title:		Title:	
Date:		Date:	

Copy:Engineer

AGREEMENT
BETWEEN OWNER AND CONTRACTOR
FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

THIS AGREEMENT is by and between City of Elizabeth City ("Owner") and (Contractor) ("Contractor").

Owner and Contractor hereby agree as follows:

ARTICLE 1 – WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

The project consists of installation of a Monoclor® Residual Control System (RCS) within the KE White Elevated Water Tower. The proposed booster pump disinfection improvement system includes a submerged tank mixer, water quality sampling system, submerged pump, injector assembly, hypochlorite storage tank, liquid ammonium storage tank, individual dosing skids for each chemical, and all associated appurtenances including, but not limited to, piping, control panels, chemical and electrical conduit. The booster pump disinfection system materials are to be provided by the City as detailed on the plan. All remaining materials are to be provided by the contractor.

ARTICLE 2 – THE PROJECT

The Project, of which the Work under the Contract Documents is a part, is known as the USCG Elizabeth City Water Quality Improvement project.

ARTICLE 3 – ENGINEER

3.01 The Project has been designed by WithersRavenel.

3.02 The Owner has retained WithersRavenel ("Engineer") to act as Owner's representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 – CONTRACT TIMES

4.01 *Time of the Essence*

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 *Contract Times: Days*

A. The Work will be substantially completed within 30 consecutive calendar days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General

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Conditions, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within 60 consecutive calendar days after the date when the Contract Times commence to run.

4.03 *Liquidated Damages*

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with the Contract. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

1. Substantial Completion: Contractor shall pay Owner $500 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified in Paragraph 4.02.A above for Substantial Completion until the Work is substantially complete.

2. Completion of Remaining Work: After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner $500 for each day that expires after such time until the Work is completed and ready for final payment.

3. Liquidated damages for failing to timely attain Substantial Completion and final completion are not additive and will not be imposed concurrently.

ARTICLE 5 – CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents the amounts that follow, subject to adjustment under the Contract:

A. For all Unit Price Work, an amount equal to the sum of the extended prices (established for each separately identified item of Unit Price Work by multiplying the unit price times the actual quantity of that item) as shown on the Bid form. The extended prices for Unit Price Work set forth as of the Effective Date of the Contract are based on estimated quantities. As provided in Paragraph 13.03 of the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by Engineer.

ARTICLE 6 – PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

A. Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the 25th day of each month during

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performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Engineer may determine or Owner may withhold, including but not limited to liquidated damages, in accordance with Paragraph 14.02 of the General Conditions.

    a. 95% of Work completed (with the balance being retainage); and

    b. 95% of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

2. When 50% of the Work of the original Contract has been completed and in the opinion of the Owner the Contractor continues to perform satisfactorily and nonconforming work identified in writing prior to that time by the Engineer or OWNER has been corrected by the Contractor and accepted by the Owner, the Owner with written consent of surety will adjust future partial payments so that 2½% of the original Contract Price is retained.

3. The project shall be deemed 50% complete when the Contractor's gross project invoices, excluding the value of materials stored off-site, equals or exceeds 50% of the original value of the contract, except the value of materials stored on-site shall not exceed 20% of the Contractor's gross invoices for the purpose of determining whether the project is 50% complete.

4. If the Owner determines it is appropriate to reduce retainage, the method used for such adjustment shall be to fix retainage at 2½% of the original Contract amount (when the work is 50% complete) and to pay all subsequent Partial Payment Requests to the full approved amount. The intent of such an adjustment is to gradually reduce retainage to 2½% of the original Contract amount when the work is 100% complete. Following 50% completion of the project, the Owner may also withhold additional retainage from any subsequent periodic payment, not to exceed 5%, in order to allow the Owner to retain 2½% total retainage through the completion of the project.

5. If the Owner determines the Contractor's performance is unsatisfactory, the Owner may reinstate retainage for each subsequent periodic payment application up to a maximum amount of 5% of the original Contract amount.

6. Within 60 days after the submission of a final pay application, the Owner with written consent of the surety shall release to the Contractor all retainage on payments held by the Owner if (1) the Owner receives a certificate of substantial completion from the Engineer, or (2) the Owner receives beneficial occupancy or use of the project. However, the Owner may retain sufficient funds to secure completion of the project or corrections on any work. If the Owner retains funds, the amount retained shall not be more than 2½ times the Engineer's estimated value of the work to be completed or

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corrected. Any reduction in the amount of the retainage on payments shall be with the written consent of the Contractor's surety.

7. Retainer provisions contained in Contractor's subcontracts may not exceed the terms and conditions for retainage provided herein. Contractors are further required to satisfy the retainage provisions of N.C.G.S. 143-134.1(b2) with regard to subcontracts for early finishing trades (structural steel, piling, caisson, and demolition) and to coordinate the release of retainage for such trades from the retainage held by the Owner from the Contractor pursuant to statute.

8. Nothing shall prevent the Owner from the withholding payment to the Contractor in addition to the amounts identified herein for unsatisfactory job progress, defective construction not remedied, disputed work, or third-party claims filed against the Owner or reasonable evidence that a third-party claim will be filed.

6.03 *Final Payment*

A. Upon final completion and acceptance of the Work in accordance with Paragraph 15.06 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 15.06.

ARTICLE 7 – INTEREST

7.01 All amounts not paid when due shall bear interest at the rate of 8 percent per annum.

ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS

8.01 In order to induce Owner to enter into this Contract, Contractor makes the following representations:

A. Contractor has examined and carefully studied the Contract Documents, and any data and reference items identified in the Contract Documents.

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

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

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

E. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the

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Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (3) Contractor's safety precautions and programs.

F. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.

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

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

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

J. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

ARTICLE 9 – CONTRACT DOCUMENTS

9.01 *Contents*

A. The Contract Documents consist of the following:

1. This Agreement
2. Performance bond
3. Payment bond
4. General Conditions
5. Supplementary Conditions
6. Specifications as listed in the table of contents of the Project Manual
7. Construction Drawings dated May 3, 2025.
8. Addenda (numbers to , inclusive)
9. Exhibits to this Agreement (enumerated as follows):
    a. Contractor's Bid
10. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
    a. Notice to Proceed.
    b. Work Change Directives.
    c. Change Orders.
    d. Field Orders.

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B. The documents listed in Paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 9.

D. The Contract Documents may only be amended, modified, or supplemented as provided in the General Conditions.

ARTICLE 10 – MISCELLANEOUS

10.01 *Terms*

A. Terms used in this Agreement will have the meanings stated in the General Conditions and the Supplementary Conditions.

10.02 *Assignment of Contract*

A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

10.03 *Successors and Assigns*

A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

10.04 *Severability*

A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

10.05 *Contractor's Certifications*

A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 10.05:

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

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

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

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

10.06 *Other Provisions*

A. Owner stipulates that if the General Conditions that are made a part of this Contract are based on EJCDC® C-700, Standard General Conditions for the Construction Contract, published by the Engineers Joint Contract Documents Committee®, and if Owner is the party that has furnished said General Conditions, then Owner has plainly shown all modifications to the standard wording of such published document to the Contractor, through a process such as highlighting or “track changes” (redline/strikeout), or in the Supplementary Conditions.

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IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

This Agreement will be effective on _____ (**which is the Effective Date of the Contract**).

OWNER:	CONTRACTOR:
City of Elizabeth City	(Contractor)
By:	By:
Title:	Title:
	(If Contractor is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)
Attest:	Attest:
Title:	Title:
Address for giving notices:	Address for giving notices:
410 Pritchard Street	(Contractor Address 1)
Elizabeth City, NC 27909	(Contractor Address 2)
	(Contractor Address 3)
	License No.: *(where applicable)*
(If Owner is a corporation, attach evidence of authority to sign. If Owner is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)	*NOTE TO USER: Use in those states or other jurisdictions where applicable or required.*

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SECTION 00 05 30

CERTIFICATE OF OWNER'S FINANCE OFFICER

This instrument has been preaudited in the manner required by the Local Government Budget and Fiscal Control Act.

By: _____

Signature of Owner's Finance Officer

_____

(Print Name & Title)

_____

Date

END OF SECTION

SECTION 00 05 40

CERTIFICATE OF OWNER'S ATTORNEY

I, the undersigned, hereby certify that I have examined the foregoing instrument and bond and approve the same as to their form.

By: _____

Signature of Owner's Attorney

_____

(Print Name & Title)

_____

Date

END OF SECTION

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NOTICE TO PROCEED

Owner:	City of Elizabeth City	Owner's Contract No.:	
Contractor:	(Contractor)	Contractor's Project No.:	
Engineer:	WithersRavenel	Engineer's Project No.:	23-1097-004
Project:	USCG Elizabeth City Water Quality Improvement	Contract Name:	
		Effective Date of Contract:	(Effective Date of Agreement)

TO CONTRACTOR:

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on (Notice to Proceed Date).

On that date, Contractor shall start performing its obligations under the Contract Documents. No Work shall be done at the Site prior to such date. In accordance with the Agreement, the number of days to achieve Substantial Completion is 30 consecutive calendar days, and the number of days to achieve readiness for final payment is 60 consecutive calendar days.

Before starting any Work at the Site, Contractor must comply with the following:

Paragraph 2.01 of the General Conditions provides that you must deliver the required bonds and evidence of insurance (with copies to Engineer and other identified additional insureds and loss payees) in accordance with the Contract Documents.

Owner:	*City of Elizabeth City*	Contractor:	
	Authorized Signature		Authorized Signature
By:	Dwan Bell, Public Utilities	By:	
Title:		Title:	

Date:		Date:	

Copy: Engineer

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PERFORMANCE BOND

CONTRACTOR *(name and address)*:

(Contractor)

(Contractor Address 1)

(Contractor Address 2)

(Contractor Address 3)

SURETY *(name and address of principal place of business)*:

OWNER *(name and address)*:

City of Elizabeth City

410 Pritchard Street

Elizabeth City, NC 27909

CONSTRUCTION CONTRACT

Effective Date Of Agreement:	(Effective Date of Agreement)
Amount:	(Contract Amount $)
Description *(name and location)*:	KE White Water Tower Disinfection Improvements - City of Elizabeth City, North Carolina

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The project consists of installation of a Monoclor® Residual Control System (RCS) within the KE White Elevated Water Tower. The proposed booster pump disinfection improvement system includes a submerged tank mixer, water quality sampling system, submerged pump, injector assembly, hypochlorite storage tank, liquid ammonium storage tank, individual dosing skids for each chemical, and all associated appurtenances including, but not limited to, piping, control panels, chemical and electrical conduit. The booster pump disinfection system materials are to be provided by the City as detailed on the plan. All remaining materials are to be provided by the contractor.

BOND

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:

Amount:

Modifications to this Bond Form: ☐ None ☐ See Paragraph 16

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

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CONTRACTOR AS PRINCIPAL	**SURETY**
(Seal)	(Seal)
Contractor's Name and Corporate Seal	Surety's Name and Corporate Seal
By:	By:
Signature	Signature (Attach Power of Attorney)
Print Name	Print Name
Title	Title
Attest:	Attest:
Signature	Signature
Title	Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

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1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after:

3.1 The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

3.2 The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

3.3 The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:

7.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

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7.2 additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and

7.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.

9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.

10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

11. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

14. Definitions

14.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

14.2 Construction Contract: The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

14.3 Contractor Default: Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

14.4 Owner Default: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

14.5 Contract Documents: All the documents that comprise the agreement between the Owner and Contractor.

15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

16. Modifications to this Bond are as follows:

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PAYMENT BOND

CONTRACTOR *(name and address)*:

(Contractor)

(Contractor Address 1)

(Contractor Address 2)

(Contractor Address 3)

SURETY *(name and address of principal place of business)*:

OWNER *(name and address)*:

City of Elizabeth City

410 Pritchard Street

Elizabeth City, NC 27909

CONSTRUCTION CONTRACT

Effective Date of Agreement:	(Effective Date of Agreement)
Amount:	(Contract Amount $)
Description *(name and location)*:	KE White Water Tower Disinfection Improvements - City of Elizabeth City, North Carolina The project consists of installation of a Monoclor® Residual Control System (RCS) within the KE White Elevated Water Tower. The proposed booster pump disinfection improvement system includes a submerged tank mixer, water quality sampling system, submerged pump, injector assembly, hypochlorite storage tank, liquid ammonium storage tank, individual dosing skids for each chemical, and all associated appurtenances including, but not limited to, piping, control panels, chemical and electrical conduit. The booster pump disinfection system materials are to be provided by the City as detailed on the plan. All remaining materials are to be provided by the contractor.

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BOND

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:

Amount:

Modifications to this Bond Form: ☐ None ☐ See Paragraph 18

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

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CONTRACTOR AS PRINCIPAL **SURETY**

(Seal) (Seal)

Contractor's Name and Corporate Seal Surety's Name and Corporate Seal

By: By:

Signature Signature (Attach Power of Attorney)

Print Name Print Name

Title Title

Attest: Attest:

Signature Signature

Title Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

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1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.

4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.

5. The Surety's obligations to a Claimant under this Bond shall arise after the following:

    5.1 Claimants who do not have a direct contract with the Contractor,

        5.1.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and

        5.1.2 have sent a Claim to the Surety (at the address described in Paragraph 13).

    5.2 Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).

6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.

7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

    7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

    7.2 Pay or arrange for payment of any undisputed amounts.

    7.3 The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

8. The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

9. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

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10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.

11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

12. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

13. Notice and Claims to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

16. **Definitions**

16.1 **Claim:** A written statement by the Claimant including at a minimum:

1. The name of the Claimant;
2. The name of the person for whom the labor was done, or materials or equipment furnished;
3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
4. A brief description of the labor, materials, or equipment furnished;
5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
7. The total amount of previous payments received by the Claimant; and
8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.

16.2 **Claimant:** An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

16.3 **Construction Contract:** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes

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made to the agreement and the Contract Documents.

16.4 **Owner Default**: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

16.5 **Contract Documents:** All the documents that comprise the agreement between the Owner and Contractor.

17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

18. Modifications to this Bond are as follows:

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SECTION 00 06 16

CERTIFICATES OF INSURANCE

(Attach Certificates of Insurance to this Section)

END OF SECTION

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Contractor's Application for Payment No.

	Application Period:	Application Date:
To (Owner): City of Elizabeth City	From (Contractor):	Via (Engineer): WithersRavenel
Project: KE White Water Tower Disinfection Improvements	Contract: (Contractor)	Funding Project No.:
Owner's Contract No.:	Contractor's Project No.:	Engineer's Project No.: 23-1097-004

Application For Payment

Change Order Summary

Approved Change Orders		
Number	Additions	Deductions
TOTALS		
NET CHANGE BY CHANGE ORDERS		

1. ORIGINAL CONTRACT PRICE			$
2. Net change by Change Orders			$
3. Current Contract Price (Line 1 ± 2)			$
4. TOTAL COMPLETED AND STORED TO DATE (Column F total on Progress Estimates)			$
5. RETAINAGE:			
a.	**X**	**Work Completed**	$
b.	**X**	**Stored Material**	$
c. Total Retainage (Line 5.a + Line 5.b)			$
6. AMOUNT ELIGIBLE TO DATE (Line 4 - Line 5.c)			$
7. LESS PREVIOUS PAYMENTS (Line 6 from prior Application)			$
8. AMOUNT DUE THIS APPLICATION			$
9. BALANCE TO FINISH, PLUS RETAINAGE (Column G total on Progress Estimates + Line 5.c above)			$

Contractor's Certification

The undersigned Contractor certifies, to the best of its knowledge, the following:
(1) All previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with the Work covered by prior Applications for Payment;
(2) Title to all Work, materials and equipment incorporated in said Work, or otherwise listed in or covered by this Application for Payment, will pass to Owner at time of payment free and clear of all Liens, security interests, and encumbrances (except such as are covered by a bond acceptable to Owner indemnifying Owner against any such Liens, security interest, or encumbrances); and
(3) All the Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.

Contractor Signature

By:	Date:

Payment of: $ _____
(Line 8 or other - attach explanation of the other amount)

is recommended by: _____ _____
(Engineer) (Date)

Payment of: $ _____
(Line 8 or other - attach explanation of the other amount)

is approved by: _____ _____
(Owner) (Date)

Approved by: _____ _____
Funding or Financing Entity (if applicable) (Date)

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Progress Estimate - Lump Sum Work

Contractor's Application

For (Contract): (Contractor)	Application Number:
Application Period:	Application Date:

			Work Completed		E	F		G
A		B	C	D				
Specification Section No.	Description	Scheduled Value ($)	From Previous Application (C+D)	This Period	Materials Presently Stored (not in C or D)	Total Completed and Stored to Date (C + D + E)	% (F / B)	Balance to Finish (B - F)

Progress Estimate - Unit Price Work

Contractor's Application

For (Contract): (Contractor)								Application Number:			
Application Period:								Application Date:			
A					B	C	D	E	F		
Item		Contract Information				Estimated Quantity Installed	Value of Work Installed to Date	Materials Presently Stored (not in C)	Total Completed and Stored to Date (D + E)	% (F / B)	Balance to Finish (B - F)
Bid Item No.	Description	Item Quantity	Units	Unit Price	Total Value of Item ($)						
	Totals										

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Stored Material Summary

Contractor's Application

For (Contract): (Contractor)								Application Number:			
Application Period:								Application Date:			
A		B	C		D		E		F		G
Bid Item No.	Supplier Invoice No.	Submittal No. (with Specification Section No.)	Storage Location	Description of Materials or Equipment Stored	Stored Previously: Date Placed into Storage (Month/Year)	Stored Previously: Amount ($)	Amount Stored this Month ($)	Subtotal Amount Completed and Stored to Date (D + E)	Incorporated in Work: Date (Month/ Year)	Incorporated in Work: Amount ($)	Materials Remaining in Storage ($) (D + E - F)
				Totals							

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APPENDIX E

MBE DOCUMENTATION FOR CONTRACT PAYMENTS

Prime Contractor/Architect: _____

Address & Phone: _____

Project Name: _____

SCO Project ID: _____

Pay Application #: _____ Period: _____

The following is a list of payments made to Minority Business Enterprises on this project for the above-mentioned period.

MBE FIRM NAME	* TYPE OF MBE	AMOUNT PAID THIS MONTH (With This Pay App)	TOTAL PAYMENTS TO DATE	TOTAL AMOUNT COMMITTED

*Minority categories: Black (B), Hispanic (H), Asian American (AA), American Indian (AI), White Female (WF), Socially and Economically Disadvantaged (SED)

Approved/Certified By:

_____ _____

Name Title

_____ _____

Date Signature

SUBMIT WITH EACH PAY REQUEST - FINAL PAYMENT - FINAL REPORT

CONTRACTOR'S SALES TAX REPORT
North Carolina State and Local Sales Tax and Use Tax

OWNER:	City of Elizabeth City	CONTRACTOR:	(Contractor)
ADDRESS:	410 Pritchard Street	ADDRESS:	(Contractor Address 1)
	PO Box 347		(Contractor Address 2)
	Elizabeth City, NC 27907		
PROJECT:		PERIOD:	

VENDOR	ADDRESS	INVOICE NUMBER	DATE	INVOICE AMOUNT	NORTH CAROLINA TAX	COUNTY TAX	COUNTY

CONTRACTOR'S SALES TAX REPORT North Carolina State and Local Sales Tax and Use Tax							
OWNER:	City of Elizabeth City			CONTRACTOR:	(Contractor)		
ADDRESS:	410 Pritchard Street			ADDRESS:	(Contractor Address 1)		
	PO Box 347				(Contractor Address 2)		
	Elizabeth City, NC 27907						
PROJECT:				PERIOD:			
VENDOR	ADDRESS	INVOICE NUMBER	DATE	INVOICE AMOUNT	NORTH CAROLINA TAX	COUNTY TAX	COUNTY
TOTAL							

*Complete one sheet for each County in which Purchases were made.

SIGNATURE: _____

_____

Title _____

Subscribed and sworn to me this _____ day of _____

Notary Public _____

My Commission Expires _____

APPENDIX E

MBE DOCUMENTATION FOR CONTRACT PAYMENTS

Prime Contractor/Architect: _____

Address & Phone: _____

Project Name: _____

SCO Project ID: _____

Pay Application #: _____ Period: _____

The following is a list of payments made to Minority Business Enterprises on this project for the above-mentioned period.

MBE FIRM NAME	* TYPE OF MBE	AMOUNT PAID THIS MONTH (With This Pay App)	TOTAL PAYMENTS TO DATE	TOTAL AMOUNT COMMITTED

*Minority categories: Black (B), Hispanic (H), Asian American (AA), American Indian (AI), White Female (WF), Socially and Economically Disadvantaged (SED)

Approved/Certified By:

_____ _____

Name Title

_____ _____

Date Signature

SUBMIT WITH EACH PAY REQUEST - FINAL PAYMENT - FINAL REPORT

EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner:	City of Elizabeth City	Owner's Contract No.:	
Contractor:	(Contractor)	Contractor's Project No.:	
Engineer:	WithersRavenel	Engineer's Project No.:	23-1097-004
Project:	KE White Water Tower Disinfection Improvements	Contract Name:	

This [preliminary] [final] Certificate of Substantial Completion applies to:

☐ All Work ☐ The following specified portions of the Work:

Date of Substantial Completion

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Work or portion thereof designated above is hereby established, subject to the provisions of the Contract pertaining to Substantial Completion. The date of Substantial Completion in the final Certificate of Substantial Completion marks the commencement of the contractual correction period and applicable warranties required by the Contract.

A punch list of items to be completed or corrected is attached to this Certificate. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance, and warranties upon Owner's use or occupancy of the Work shall be as provided in the Contract, except as amended as follows: *[Note: Amendments of contractual responsibilities recorded in this Certificate should be the product of mutual agreement of Owner and Contractor; see Paragraph 15.03.D of the General Conditions.]*

Amendments to Owner's responsibilities: ☐ None

☐ As follows

Amendments to Contractor's responsibilities:

☐ None

☐ As follows:

The following documents are attached to and made a part of this Certificate: *[punch list; others]*

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents, nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract.

EXECUTED BY ENGINEER:	RECEIVED:	RECEIVED:
By: _____	By: _____	By: _____
(Authorized signature)	Owner (Authorized	Contractor (Authorized
Title: _____	Title: _____	Title: _____
Date _____	Date _____	Date _____

SECTION 00 06 30

CONTRACTOR'S AFFIDAVIT OF RELEASE OF LIENS

City of Elizabeth City

To: Owner

KE White Water Tower Disinfection Improvements

Project:

(Effective Date of Agreement)

Contract Date:

The undersigned hereby certifies that to the best of the undersigned's knowledge, information and belief, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all Subcontractors, all suppliers of materials and equipment, and all performers of Work, labor or services who have or may have liens or encumbrances or the right to assert liens or encumbrances against any property of the Owner arising in any manner out of the performance of the Contract referenced above.

Exceptions:

Supporting Documents Attached Hereto:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.

(CONTRACTOR)

(Contractor Address 1)

Address: _____

(Contractor Address 2)

_____

(Contractor Address 3)

_____

By: _____

Notary: _____

State Of: _____

County Of: _____

Subscribed and sworn to before me this _____ Day of _____

Printed Name: _____

My commission expires: _____

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

Issued and Published Jointly by

ACEC
AMERICAN COUNCIL OF ENGINEERING COMPANIES

ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

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To prepare supplementary conditions that are coordinated with the General Conditions, use EJCDC's Guide to the Preparation of Supplementary Conditions (EJCDC® C-800, 2013 Edition). The full EJCDC Construction series of documents is discussed in the Commentary on the 2013 EJCDC Construction Documents (EJCDC® C-001, 2013 Edition).

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.

3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

5. *Bidder*—An individual or entity that submits a Bid to Owner.

6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.

7. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.

8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.

9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.

10. *Claim*—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal; or seeking resolution of a contractual issue that Engineer

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has declined to address. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. ("CERCLA"); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5501 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. ("RCRA"); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.

12. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.

13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.

14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents. .

15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.

16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.

17. *Cost of the Work*—See Paragraph 13.01 for definition.

18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.

19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.

20. *Engineer*—The individual or entity named as such in the Agreement.

21. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.

22. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.

23. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

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24. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.

25. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.

26. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.

27. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.

28. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.

29. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.

30. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

31. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.

32. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or "RPR" includes any assistants or field staff of Resident Project Representative.

33. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.

34. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals and the performance of related construction activities.

35. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

36. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

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37. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for the use of Contractor.

38. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.

39. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.

40. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

41. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.

42. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.

43. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.

44. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.

45. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

46. *Unit Price Work*—Work to be paid for on the basis of unit prices.

47. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

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48. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 *Terminology*

A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives*:

1. The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.

C. *Day*:

1. The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective*:

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

a. does not conform to the Contract Documents; or

b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

c. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or 15.04).

E. *Furnish, Install, Perform, Provide*:

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

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3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words "furnish," "install," "perform," or "provide," then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

A. *Bonds*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. *Evidence of Contractor's Insurance*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.

C. *Evidence of Owner's Insurance*: After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.

B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;

2. a preliminary Schedule of Submittals; and

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3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.

B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Initial Acceptance of Schedules*

A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

2.06 *Electronic Transmittals*

A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.

B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.

C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient's use of software application packages, operating systems, or

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computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents.

C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.

D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.

E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

3.02 *Reference Standards*

A. Standards Specifications, Codes, Laws and Regulations

1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard specification, manual, reference standard, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*:

1. *Contractor's Verification of Figures and Field Measurements*: Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict,

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error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents*: If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies*:

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:

a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.

B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.

C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

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3.05 *Reuse of Documents*

A. Contractor and its Subcontractors and Suppliers shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or

2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to such date.

4.03 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

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2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.

B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.

C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:

1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;

2. abnormal weather conditions;

3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and

4. acts of war or terrorism.

D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.

E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.

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G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*:

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.

2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part

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by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

B. *Removal of Debris During Performance of the Work*: During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning*: Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading of Structures*: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;

2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and

3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

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5.04 *Differing Subsurface or Physical Conditions*

A. *Notice by Contractor*: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:

1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or

2. is of such a nature as to require a change in the Drawings or Specifications; or

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

B. *Engineer's Review*: After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

C. *Owner's Statement to Contractor Regarding Site Condition*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.

D. *Possible Price and Times Adjustments*:

1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;

b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,

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c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:

a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or

b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or

c. Contractor failed to give the written notice as required by Paragraph 5.04.A.

3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.

4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

5.05 *Underground Facilities*

A. *Contractor's Responsibilities*: The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and

2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;

b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;

c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and

d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.

B. *Notice by Contractor*: If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor shall, promptly after

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becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

C. *Engineer's Review*: Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

D. *Owner's Statement to Contractor Regarding Underground Facility*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.

E. *Possible Price and Times Adjustments*:

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

    a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;

    b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;

    c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and

    d. Contractor gave the notice required in Paragraph 5.05.B.

2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.

3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

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5.06 *Hazardous Environmental Conditions at Site*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and

2. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.

D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.

E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

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F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.

G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.

H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.H shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

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ARTICLE 6 – BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.

B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

C. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds in the required amounts.

D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements above.

E. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.

F. Upon request, Owner shall provide a copy of the payment bond to any Subcontractor, Supplier, or other person or entity claiming to have furnished labor or materials used in the performance of the Work.

6.02 *Insurance—General Provisions*

A. Owner and Contractor shall obtain and maintain insurance as required in this Article and in the Supplementary Conditions.

B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.

C. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is

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maintaining the policies, coverages, and endorsements required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

E. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.

F. If either party does not purchase or maintain all of the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.

G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner's termination rights under Article 16.

H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price shall be adjusted accordingly.

I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests.

J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

6.03 *Contractor's Insurance*

A. *Workers' Compensation*: Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts.

2. United States Longshoreman and Harbor Workers' Compensation Act and Jones Act coverage (if applicable).

3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).

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4. Foreign voluntary worker compensation (if applicable).

B. *Commercial General Liability—Claims Covered*: Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:

1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.

2. claims for damages insured by reasonably available personal injury liability coverage.

3. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.

C. *Commercial General Liability—Form and Content*: Contractor's commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:

1. Products and completed operations coverage:

a. Such insurance shall be maintained for three years after final payment.

b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.

2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.

3. Broad form property damage coverage.

4. Severability of interest.

5. Underground, explosion, and collapse coverage.

6. Personal injury coverage.

7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.

8. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.

D. *Automobile liability*: Contractor shall purchase and maintain automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis.

E. *Umbrella or excess liability*: Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.

F. *Contractor's pollution liability insurance*: Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result

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of pollution conditions arising from Contractor's operations and completed operations. This insurance shall be maintained for no less than three years after final completion.

G. *Additional insureds*: The Contractor's commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.

H. *Contractor's professional liability insurance*: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.

I. *General provisions*: The policies of insurance required by this Paragraph 6.03 shall:

1. include at least the specific coverages provided in this Article.

2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.

3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.

4. remain in effect at least until final payment (and longer if expressly required in this Article) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.

5. be appropriate for the Work being performed and provide protection from claims that may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable.

J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

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6.04 *Owner's Liability Insurance*

A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

B. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

6.05 *Property Insurance*

A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder's risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as "insureds."

2. be written on a builder's risk "all risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.

3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.

4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).

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5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).

6. extend to cover damage or loss to insured property while in transit.

7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder's risk insurance.

8. allow for the waiver of the insurer's subrogation rights, as set forth below.

9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.

10. not include a co-insurance clause.

11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.

12. include performance/hot testing and start-up.

13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.

B. *Notice of Cancellation or Change*: All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.

C. *Deductibles*: The purchaser of any required builder's risk or property insurance shall pay for costs not covered because of the application of a policy deductible.

D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.

E. *Additional Insurance*: If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.05, it may do so at Contractor's expense.

F. *Insurance of Other Property*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

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6.06 *Waiver of Rights*

A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder's risk policy, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all Subcontractors, all individuals or entities identified in the Supplementary Conditions as insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.

B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.

D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by builder's risk insurance and any other property insurance applicable to the Work.

6.07 *Receipt and Application of Property Insurance Proceeds*

A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.05 will be adjusted and settled with the named insured that purchased the

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policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.05 shall distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.

C. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

7.01 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.02 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.

B. All materials and equipment incorporated into the Work shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and

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guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.04 *"Or Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.

1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an "or equal" item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that:

1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;

3) it has a proven record of performance and availability of responsive service; and

4) it is not objectionable to Owner.

b. Contractor certifies that, if approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times; and

2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.

C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal", which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

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D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request shall result in any change in Contract Price. The Engineer's denial of an "or-equal" request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.

E. *Treatment as a Substitution Request*: If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer considered the proposed item as a substitute pursuant to Paragraph 7.05.

7.05 *Substitutes*

A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.

1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.

2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

a. shall certify that the proposed substitute item will:

1) perform adequately the functions and achieve the results called for by the general design,

2) be similar in substance to that specified, and

3) be suited to the same use as that specified.

b. will state:

1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,

2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and

3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.

c. will identify:

1) all variations of the proposed substitute item from that specified, and

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2) available engineering, sales, maintenance, repair, and replacement services.

d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.

B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.

C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.

F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

7.06 *Concerning Subcontractors, Suppliers, and Others*

A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.

B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.

C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.

D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.

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E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.

F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.

G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.

I. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.

J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.

K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.

L. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.

N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.

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O. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor

2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

7.07 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.08 *Permits*

A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work

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7.09 *Taxes*

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.10 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.11 *Record Documents*

A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.12 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:

1. all persons on the Site or who may be affected by the Work;

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2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.

C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.

D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.13 *Safety Representative*

A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

7.14 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or

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exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

7.16 *Shop Drawings, Samples, and Other Submittals*

A. *Shop Drawing and Sample Submittal Requirements*:

1. Before submitting a Shop Drawing or Sample, Contractor shall have:

a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.

B. *Submittal Procedures for Shop Drawings and Samples*: Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.

1. *Shop Drawings*:

a. Contractor shall submit the number of copies required in the Specifications.

b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to

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provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.D.

2. *Samples*:

   a. Contractor shall submit the number of Samples required in the Specifications.

   b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.

3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Other Submittals*: Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.

D. *Engineer's Review*:

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.

3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

4. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.

5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.

6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.

7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.

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8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.

E. *Resubmittal Procedures*:

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.

3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

7.17 *Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.

B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;

2. recommendation by Engineer or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. use or occupancy of the Work or any part thereof by Owner;

5. any review and approval of a Shop Drawing or Sample submittal;

6. the issuance of a notice of acceptability by Engineer;

7. any inspection, test, or approval by others; or

8. any correction of defective Work by Owner.

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D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.

B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:

1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

7.19 *Delegation of Professional Design Services*

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.

B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop

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Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.

E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

ARTICLE 8 – OTHER WORK AT THE SITE

8.01 *Other Work*

A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.

B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.

C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

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8.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:

1. the identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;

2. an itemization of the specific matters to be covered by such authority and responsibility; and

3. the extent of such authority and responsibilities.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this paragraph.

C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.

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D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9 – OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Replacement of Engineer*

A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents shall be that of the former Engineer.

9.03 *Furnish Data*

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.

B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.

C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

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9.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.

B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.08. Particularly, but without limitation, during

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or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Project Representative*

A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 10.08. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent, or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

10.04 *Rejecting Defective Work*

A. Engineer has the authority to reject Work in accordance with Article 14.

10.05 *Shop Drawings, Change Orders and Payments*

A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.

B. Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.

C. Engineer's authority as to Change Orders is set forth in Article 11.

D. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.06 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.07 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.08 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

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B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.

10.09 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer has been informed.

ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

11.01 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.

1. *Change Orders*:

a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.

b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.

2. *Work Change Directives*: A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an

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adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.

3. *Field Orders*: Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.02 *Owner-Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.03 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.

11.04 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.

B. An adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on

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the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).

C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;

b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five percent;

c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.01.C.2.a and 11.01.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;

d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;

e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

11.05 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.

B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

11.06 *Change Proposals*

A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under

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the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.

1. *Procedures*: Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.

2. *Engineer's Action*: Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

3. *Binding Decision*: Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.

B. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

11.07 *Execution of Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders covering:

1. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;

2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;

3. changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.02, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and

4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.

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B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

11.08 *Notification to Surety*

A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12 – CLAIMS

12.01 *Claims*

A. *Claims Process*: The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:

1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;

2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and

3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.

B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.

D. *Mediation*:

1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.

2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim

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submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.

E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.

F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.

G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:

1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.

B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable

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thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

    a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

    b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

    c. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

    d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.

    e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

    f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 6.05), provided such losses and damages have resulted from causes

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other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.

i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded*: The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee*: When the Work as a whole is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 11.04.C.

E. *Documentation*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

13.02 *Allowances*

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

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B. *Cash Allowances*: Contractor agrees that:

1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. *Contingency Allowance*: Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

13.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph.

E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:

1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;

2. there is no corresponding adjustment with respect to any other item of Work; and

3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

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ARTICLE 14 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

14.02 *Tests, Inspections, and Approvals*

A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.

B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:

1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;

2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;

3. by manufacturers of equipment furnished under the Contract Documents;

4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and

5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.

F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to

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cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

A. *Contractor's Obligation*: It is Contractor's obligation to assure that the Work is not defective.

B. *Engineer's Authority*: Engineer has the authority to determine whether Work is defective, and to reject defective Work.

C. *Notice of Defects*: Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.

D. *Correction, or Removal and Replacement*: Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.

E. *Preservation of Warranties*: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

F. *Costs and Damages*: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

A. Engineer has the authority to require special inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

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B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.

C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.

1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.

2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.

C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will

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include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 *Progress Payments*

A. *Basis for Progress Payments*: The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.

B. *Applications for Payments*:

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens, and evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications*:

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

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a. the Work has progressed to the point indicated;

b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and

c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or

b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

a. to supervise, direct, or control the Work, or

b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or

d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or

e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.

6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:

a. the Work is defective, requiring correction or replacement;

b. the Contract Price has been reduced by Change Orders;

c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

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e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due*:

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. *Reductions in Payment by Owner*:

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:

a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;

c. Contractor has failed to provide and maintain required bonds or insurance;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;

e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;

f. the Work is defective, requiring correction or replacement;

g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

h. the Contract Price has been reduced by Change Orders;

i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;

j. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;

k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;

l. there are other items entitling Owner to a set off against the amount recommended.

2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount

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remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

15.03 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

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E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.

2. At any time Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *Final Payment*

A. *Application for Payment*:

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of

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inspection, annotated record documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

   a. all documentation called for in the Contract Documents;

   b. consent of the surety, if any, to final payment;

   c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

   d. a list of all disputes that Contractor believes are unsettled; and

   e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. *Engineer's Review of Application and Acceptance*:

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to the provisions of Paragraph 15.07. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Completion of Work*: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.

D. *Payment Becomes Due*: Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation,

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including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

15.07 *Waiver of Claims*

A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.

B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

15.08 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. correct the defective repairs to the Site or such other adjacent areas;

2. correct such defective Work;

3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).

C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

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E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule);

2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;

3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or

4. Contractor's repeated disregard of the authority of Owner or Engineer.

B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:

1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and

2. enforce the rights available to Owner under any applicable performance bond.

C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.

D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.

E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses,

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and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.

G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate For Convenience*

A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and

3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.

B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for

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expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

A. *Disputes Subject to Final Resolution*: The following disputed matters are subject to final resolution under the provisions of this Article:

1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and

2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after final payment has been made.

B. *Final Resolution of Disputes*: For any dispute subject to resolution under this Article, Owner or Contractor may:

1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or

2. agree with the other party to submit the dispute to another dispute resolution process; or

3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18 – MISCELLANEOUS

18.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or

2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

18.02 *Computation of Times*

A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

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18.04 *Limitation of Damages*

A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

18.07 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

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SECTION 00 08 00

SUPPLEMENTARY CONDITIONS

PART 1 CONTENTS

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These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract NSPE-ASCE-ACEC Document EJCDC C-700, 2013 Edition and other provisions of the Contract Documents as indicated below. All provisions not so amended or supplemented remain in full force and effect.

The terms used in these Supplementary Conditions have the same meanings indicated in the Standard General Conditions of the Construction Contract. Additional terms used in these Supplementary Conditions have the meanings indicated below, which are applicable to both the singular and plural thereof.

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

SC 1.01.A.3 INSERT AT THE END OF THE PARAGRAPH TO READ AS FOLLOWS:

The Application for Payment form to be used on this Project is EJCDC No. C-620. Contractor may use their standard computerized forms for providing detail payment breakdown as an attachment to summary sheet. Agency must approve all Applications for Payment before payment is made.

SC 1.01.A.8 INSERT AT THE END OF THE PARAGRAPH TO READ AS FOLLOWS:

The Change Order form to be used on this Project is EJCDC No. C-941. Agency approval is required before Change Orders are effective.

SC 1.01.A.48 ADD NEW DEFINITIONS AFTER DEFINITION 1.01.A.48. OF THE GENERAL CONDITIONS TO READ AS FOLLOWS:

A.49. The term "minority business" means a business:

a. In which at least fifty-one percent (51%) is owned by one or more minority persons or socially and economically disadvantaged individuals, or in the case of a corporation, in which at least fifty-one percent (51%) of the stock is owned by one or more minority persons or socially and economically disadvantaged individuals; and

b. Of which the management and daily business operations are controlled by one or more of the minority persons or socially and economically disadvantaged individuals who own it.

A.50. The term "minority person" means a person who is a citizen or lawful permanent resident of the United States and who is:

a. Black, that is, a person having origins in any of the black racial groups in Africa;

b. Hispanic, that is, a person of Spanish or Portuguese culture with origins in Mexico, South or Central America, or the Caribbean Islands,

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regardless of race;

c. Asian American, that is, a person having origins in any of the original peoples of the Far East, Southeast Asia and Asia, the Indian subcontinent, or the Pacific Islands;

d. American Indian, that is, a person having origins in any of the original Indian peoples of North America; or

e. Female.

A.51. The term "socially and economically disadvantaged individual" means the same as defined in 15 U.S.C. 637; "Socially disadvantaged individuals are those who have been subjected to racial or ethnic prejudice or cultural bias because of their identity as a member of a group without regard to their individual qualities". "Economically disadvantaged individuals are those socially disadvantaged individuals whose ability to compete in the free enterprise system has been impaired due to diminished capital and credit opportunities as compared to others in the same business area who are not socially disadvantaged."

A.52. Notice of Violation - A written notification from a governmental agency that the Owner has violated a law or regulation that the agency has jurisdiction over. Notice will take the form used by the agency and may outline action to be taken by the Owner to correct the violation and may include a monetary fine.

A.53. Regular Working Hours - Regular working hours for the project are defined as 8:00 am to 5:00 pm, Eastern Standard Time.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

SC 4.05.C.2 Add a new paragraph after paragraph 4.05.C.2. of the General Conditions to read as follows:

(a) **Abnormal weather is defined as precipitation that is greater than the 5-year average. The 5-year average shall be based on the Local Climatological Data provided by the National Oceanic and Atmospheric Administration for the time in question and station closest to the project area.**

(i) **As a precondition to CONTRACTOR making a claim for a delay arising out of abnormal weather conditions, CONTRACTOR shall submit data from the National Oceanic Atmospheric Administration (NOAA) showing the number of days where precipitation or other inclement weather occurred during the period for which the claim is made along with daily weather logs which must be kept at the job site and which must indicate that adverse or abnormal weather or site conditions**

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precluded at least four-hours of Work at the site during daylight hours. CONTRACTOR agrees that a comparison of: (1) the number of days of precipitation for the month or months in question during the Project; and (2) the average number of days where precipitation for the month or months in question during the previous five years is a proper comparison by which to determine CONTRACTOR's entitlement for extension of time for weather delays. CONTRACTOR acknowledges that it has taken weather conditions into account in agreeing to perform the Work within the Contract Times, and that CONTRACTOR shall only be allowed an extension of time based upon the comparison set forth in this Article. Notwithstanding anything else contained in this Article or this Agreement, CONTRACTOR shall not be entitled to an extension of time unless it can show that the abnormal weather or site conditions specifically affected the critical path, and it meets all of the requirements for such a claim under this Agreement.

(ii) **Notwithstanding anything else to the contrary, in the event that CONTRACTOR believes that it has been delayed in the completion of the Work for reasons over which it has no reasonable control, then CONTRACTOR shall inform OWNER in writing of the reason for such delay and the estimated amount of such delay within five-days after the commencement of the event giving rise to the delay. Unless CONTRACTOR complies with the requirements of this Article, it shall not be entitled to any claim for delay, extension of the Contract Times, or additional compensation for its claim. If CONTRACTOR makes any claim for delay, CONTRACTOR shall specifically set forth how and why the delay in question affected the critical path, including a diagram showing such effect.**

(iii) **The CONTRACTOR shall not be entitled to additional compensation as a result of time extensions.**

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

SC 5.03 Delete Paragraphs 5.03.A and 5.03.B in their entirety and insert the following:

A. No reports of explorations or tests of subsurface conditions at or adjacent to the Site, or drawings of physical conditions relating to existing surface or subsurface structures at the Site, are known to Owner.

SC 5.06 Delete Paragraphs 5.06.A and 5.06.B in their entirety and insert the following:

A. No reports or drawings related to Hazardous Environmental Conditions at the Site are known to Owner.

B. Not Used.

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ARTICLE 6 – BONDS AND INSURANCE

SC-6.02 Add the following paragraph immediately after Paragraph 6.02.B:

1. Contractor may obtain worker's compensation insurance from an insurance company that has not been rated by A.M. Best, provided that such company (a) is domiciled in the state in which the project is located, (b) is certified or authorized as a worker's compensation insurance provider by the appropriate state agency, and (c) has been accepted to provide worker's compensation insurance for similar projects by the state within the last 12 months.

SC 6.03 Add the following new paragraph immediately after Paragraph 6.03.J:

K. The limits of liability for the insurance required by Paragraph 6.03 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

1. Workers' Compensation, and related coverages under Paragraphs 6.03.A.1 and A.2 of the General Conditions:

State:		**Statutory**
Federal, if applicable (e.g., Longshoreman's):		**Statutory**
Jones Act coverage, if applicable:		
Bodily injury by accident, each accident	**$**	
Bodily injury by disease, aggregate	**$**	
Employer's Liability:		
Bodily injury, each accident	**$**	**500,000**
Bodily injury by disease, each employee	**$**	**500,000**
Bodily injury/disease aggregate	**$**	**500,000**
For work performed in monopolistic states, stop-gap liability coverage shall be endorsed to either the worker's compensation or commercial general liability policy with a minimum limit of:	**$**	**500,000**
Foreign voluntary worker compensation		**Statutory**

2. Contractor's Commercial General Liability under Paragraphs 6.03.B and 6.03.C of the General Conditions:

General Aggregate	**$**	**2,000,000**

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Products - Completed Operations Aggregate	**$**	**1,000,000**
Personal and Advertising Injury	**$**	**1,000,000**
Each Occurrence (Bodily Injury and Property Damage)	**$**	**1,000,000**

3. Automobile Liability under Paragraph 6.03.D. of the General Conditions:

Bodily Injury:		
Each person	**$**	**1,000,000**
Each accident	**$**	**1,000,000**
Property Damage:		
Each accident	**$**	**1,000,000**
[or]		
Combined Single Limit of	**$**	**1,000,000**

4. Excess or Umbrella Liability:

Per Occurrence	**$**	**5,000,000**
General Aggregate	**$**	**5,000,000**

5. Contractor's Pollution Liability:

Each Occurrence	**$**	
General Aggregate	**$**	

☒ **If box is checked, Contractor is not required to provide Contractor's Pollution Liability insurance under this Contract**

6. Additional Insureds: In addition to Owner and Engineer, include as additional insureds the following: [Additional Insured]

SC 6.05.A. Delete Paragraph 6.05.A of the General Conditions and substitute the following in its place:

Contractor shall provide and maintain installation floater insurance for property under the care, custody, or control of Contractor. The installation floater insurance shall be a broad form or "all risk" policy providing coverage for all materials, supplies, machinery, fixtures, and equipment that will be incorporated into the Work. Coverage under the Contractor's installation floater will include:

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1. any loss to property while in transit,

2. any loss at the Site, and

3. any loss while in storage, both on-site and off-site.

Coverage cannot be contingent on an external cause or risk, or limited to property for which the Contractor is legally liable. The Contractor will be solely responsible for any deductible carried under this coverage and claims on materials, supplies, machinery, fixture, and equipment that will be incorporated into the Work while in transit or in storage. This policy will include a waiver of subrogation applicable to Owner, Contractor, Engineer, all Subcontractors, and the officers, directors, partners, employees, agents and other consultants and subcontractors of any of them.

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

SC-7.02.B. Add the following new subparagraphs immediately after Paragraph 7.02.B:

1. Regular working hours will be Monday –Friday 8am-5 pm.

2. Owner's legal holidays are New Years Day, Martin Luther King Day, Good Friday, Memorial Day, Juneteenth July 4th, Labor Day, Veterans Day, Thanksgiving, Christmas Eve, Christmas Day. These holiday's will be confirmed at the pre-construction conference.

SC-7.02.C. Add the following new paragraph immediately after Paragraph 7.02.B:

Contractor shall be responsible for the cost of any overtime pay or other expense incurred by the Owner for Engineer's services (including those of the Resident Project Representative, if any), Owner's representative, and construction observation services, occasioned by the performance of Work on Saturday, Sunday, any legal holiday, or as overtime on any regular work day. If Contractor is responsible but does not pay, or if the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under Article 15.

SC-7.02.C. Add the following new subparagraphs immediately after Paragraph 7.02.B:

1. For purposes of administering the foregoing requirement, additional overtime costs are defined as $245.00 per hour for Engineer and $145.00 per hour for Resident Project Representative.

D. Limitation on Value of Subcontracts – The policy of the OWNER requires that the total value of all subcontracted work shall not exceed 50 percent of the total value of the Contract. The intent of this policy is to require that the CONTRACTOR perform at least 50 percent of the work with its own forces and equipment.

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

SC-10.03 Add the following new paragraphs immediately after Paragraph 10.03.A:

B. The responsibilities of the Resident Project Representative (RPR) are detailed in Specification Section 01 05 50 – Responsibilities of Resident Project Representative.

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ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

SC 13.03.E Delete Paragraph 13.03.E in its entirety and insert the following in its place:

E. The unit price of an item of Unit Price Work shall be subject to reevaluation and adjustment under the following conditions:

1. if the extended price of a particular item of Unit Price Work amounts to _25_ percent or more of the Contract Price (based on estimated quantities at the time of Contract formation) and the variation in the quantity of that particular item of Unit Price Work actually furnished or performed by Contractor differs by more than _25_ percent from the estimated quantity of such item indicated in the Agreement; and

2. if there is no corresponding adjustment with respect to any other item of Work; and

3. if Contractor believes that Contractor has incurred additional expense as a result thereof, Contractor may submit a Change Proposal, or if Owner believes that the quantity variation entitles Owner to an adjustment in the unit price, Owner may make a Claim, seeking an adjustment in the Contract Price.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

SC 15.01.C Add the following new paragraph immediately after Paragraph 15.01.C.6.e

7. The Owner will, within ten (10) days of presentation of an approved Application for Payment, review, approve, and submit the Application for Payment to the funding agency.

SC 15.01.D Delete Paragraph 15.01.D in its entirety and insert the following in its place:

D. *Payment Becomes Due*:

1. Within three (3) workdays of the receipt of funds the Owner will pay the Contractor a progress payment on the basis of the approved Application for Payment less the retainage.

SC 15.03.B Add the following new subparagraph to Paragraph 15.03.B:

1. If some or all of the Work has been determined not to be at a point of Substantial Completion and will require re-inspection or re-testing by Engineer, the cost of such re-inspection or re-testing, including the cost of time, travel and living expenses, shall be paid by Contractor to Owner. If Contractor does not pay, or the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under Article 15.

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ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

SC-17.02 Add the following new paragraph immediately after Paragraph 17.01.

SC-17.02 Mediation

A. All matters subject to final resolution under this Article will be decided by mediation in accordance with the rules set forth in Section 000810 – Dispute Resolution.

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SECTION 00 08 10

DISPUTE RESOLUTION

RULES IMPLEMENTING MEDIATED SETTLEMENT CONFERENCES IN NORTH CAROLINA PUBLIC CONSTRUCTION PROJECTS

ADOPTED

FEBRUARY 26, 2002

TABLE OF RULES

A. RULE

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    a. Purpose of Mandatory Settlement Conferences
    b. Initiating the Dispute Resolution Process
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8. Rule Making
9. Definitions
10. Time Limits

1. RULE 1. INITIATING MEDIATED SETTLEMENT CONFERENCES

   a. Purpose of Mandatory Settlement Conferences. Pursuant to G.S. 143-128(f1) 143-135.26(11), these Rules are promulgated to implement a system of settlement events which are designated to focus the parties' attention on settlement rather than on claim preparation and to provide a structured opportunity for settlement negotiations to take place. Nothing herein is intended to limit or prevent the parties from engaging in settlement procedures voluntarily at any time prior to or during commencement of the dispute resolution process.

   b. Initiating the Dispute Resolution Process

      1) Any party to a public construction contract governed by Article 8. Ch. 143 of the General Statutes and identified in G.S. 143-128(f1) and who is a party to a dispute arising out of the construction process in which the amount in controversy is at least $15,000 may submit a written request to the public owner for mediation of the dispute.

      2) Prior to submission of a written request for mediation to the public owner, the parties requesting mediation,

         a) If a prime contractor, must have first submitted its claim to the Project Designer for review as set forth in Exhibit A. If the dispute is not resolved through the Project Designer's instructions, then the dispute becomes ripe for mediation in the Formal Dispute Resolution Process, and the party may submit his written request for mediation to the public owner.

         b) If the party requesting mediation is a subcontractor, it must first have submitted its claim for mediation to the prime contractor with whom it has a contract. If the dispute is not resolved through the Prime Contractor's involvement, then the dispute becomes ripe for mediation in the Formal Dispute Resolution Process, and the party may submit its written request for mediation to the public owner.

         c) If the party requesting mediation is the Project Designer, then it must first submit its claim to the public owner to resolve. If the dispute is not resolved with the public owner's involvement, then the Project Designers' dispute is ripe for mediation in the Formal Dispute Resolution Process, and the Project Designer may submit its written request to the public owner for mediation.

2. RULE 2. SELECTION OF MEDIATOR

   a. Selection of Certified Mediator by Agreement of the Parties. The parties may select a mediator certified pursuant to the Rules by agreement within 21 days of requesting mediation. The requesting party shall file with the State Construction Office (hereinafter collectively referred to as the "SCO") or public owner if a non-State project a Notice of Selection of Mediator by Agreement within 10 days of the request; however, any party may file the notice. Such notice shall state the name, address and telephone number of the mediator selected; state the rate of compensation of the mediator; state that the mediator and

opposing counsel have agreed upon the selection and rate of compensation; and state that the mediator is certified pursuant to these Rules.

b. Nomination and Public Owner Approval of a Non-Certified Mediator. The parties may select a mediator who does not meet the certification requirements of these rules but who, in the opinion of the parties and the SCO or public owner, is otherwise qualified by training or experience to mediate the action.

c. If the parties select a non-certified mediator, the requesting party shall file with the SCO a Nomination of Non-Certified Mediator within 10 days of the request. Such

d. nomination shall state the name, address and telephone number of the mediator; state the training, experience or other qualifications of the mediator; state the rate of compensation of the mediator; and state that the mediator and opposing counsel have agreed upon the selection and rate of compensation.

e. The SCO or public owner shall rule on said nomination, shall approve or disapprove of the parties' nomination and shall notify the parties of its decision.

f. Appointment of Mediator by the SCO. If the parties cannot agree upon the selection of a mediator, the party or party's attorney shall so notify the SCO or public owner and request, on behalf of the parties, that the SCO or public owner appoint a mediator. The request for appointment must be filed within 10 days after request to mediate and shall state that the parties have had a full and frank discussion concerning the selection of a mediator and have been unable to agree. The request shall state whether any party prefers a certified attorney mediator, and if so, the SCO or public owner shall appoint a certified attorney mediator. If no preference is expressed, the SCO or public owner may appoint a certified attorney mediator or a certified non- attorney mediator.

g. Mediator Information Directory. To assist the parties in the selection of a mediator by agreement, the parties are free to utilize the list of certified mediators maintained in any county participating in the Superior Court Mediation Settlement Conference Program.

h. Disqualification of Mediator. Any party may request replacement of the mediator by the SCO or public owner for good cause. Nothing in this provision shall preclude mediators from disqualifying themselves.

3. RULE 3. THE MEDIATED SETTLEMENT CONFERENCE

a. Where Conference is to be Held. Unless all parties and the mediator otherwise agree, the mediated settlement conference shall be held in the county where the project is located. The mediator shall be responsible for reserving a place and making arrangements for the conference and for giving timely notice of the time and location of the conference to all attorneys, unrepresented parties and other persons and entities required to attend.

b. When Conference is to be Held. The deadline for completion of the mediation shall be not less than 30 days nor more than 60 days after the naming of the mediator.

c. Request to Extend Deadline for Completion. A party, or the mediator, may request the SCO or public owner to extend the deadline for completion of the conference. Such request shall state the reasons the extension is sought and shall be served by the moving party upon the other parties and the mediator. If any party does not consent to the request, said party shall promptly communicate its objection to the SCO or public owner.

d. The SCO or public owner may grant the request by setting a new deadline for completion of the conference.

e. Recesses. The mediator may recess the conference at any time and may set times for reconvening. If the time for reconvening is set before the conference is recessed, no further notification is required for persons present at the conference.

f. The mediated settlement conference shall not be cause for the delay of the construction project which is the focus of the dispute.

4. RULE 4. DUTIES OF PARTIES AND OTHER PARTICIPANTS IN FORMAL DISPUTE RESOLUTION PROCESS

a. Attendance

1) All parties to the dispute originally presented to the Designer or Prime Contractor for initial resolution must attend the mediation. Failure of a party

2) to a construction contract to attend the mediation will result in the public owner's withholding of monthly payment to that party until such party attends the mediation.

3) Attendance shall constitute physical attendance, not by telephone or other electronic means. Any attendee on behalf of a party must have authority from that party to bind it to any agreement reached as a result of the mediation.

4) Attorneys on behalf of parties may attend the mediation but are not required to do so.

5) Sureties or insurance company representatives are not required to attend the mediation unless any monies paid or to be paid as a result of any agreement reached as a result of mediation require their presence or acquiescence. If such agreement or presence is required, then authorized representatives of the surety or insurance company must attend the mediation.

b. Finalizing Agreement. If an agreement is reached in the conference, parties to the agreement shall reduce its terms to writing and sign it along with their counsel.

c. The mediation fee shall be paid in accordance with G.S. 143-128{g).

d. Failure to compensate mediator. Any party's failure to compensate the mediators in accordance with G.S. 143-128(f1) shall subject that party to a withholding of said amount of money from the party's monthly payment by the public owner.

e. Should the public owner fail to compensate the mediator, it shall hereby be subject to a civil cause of action from the mediator for the 1/3 portion of the mediator's total fee as required by G.S. 143-128(f1).

5. RULE 5. AUTHORITY AND DUTIES OF MEDIATORS

a. Authority of Mediator

1) Control of Conference. The mediator shall at all times be in control of the conference and the procedures to be followed.

2) Private Consultation. The mediator may communicate privately with any participant or counsel prior to and during the conference. The fact that private communications have occurred with a participant shall be disclosed to all other participants at the beginning of the conference.

3) Scheduling the Conference. The mediator shall make a good faith effort to schedule the conference at a time that is convenient with the participants, attorneys, and mediator. In the absence of agreement, the mediator shall select the date for the conference.

b. Duties of Mediator

1) The mediator shall define and describe the following at the beginning of the conference:

a) The process of mediation;

b) The difference between mediation and other forms of conflict resolution;

c) The costs of the mediated settlement conference;

d) That the mediated settlement conference is not a trial, the mediator is not a judge, and the parties retain their legal rights if they do not reach settlement;

e) The circumstances under which the mediator may meet and communicate privately with any of the parties or with any other person;

f) Whether and under what conditions communications with the mediator will be held in confidence during the conference;

g) The inadmissibility of conduct and statements as provided by G.S. 7A-38.1(1);

h) The duties and responsibilities of the mediator and the participants; and

i) That any agreement reached will be reached by mutual consent.

2) Disclosure. The mediator has a duty to be impartial and to advise all participants of any circumstance bearing on possible bias, prejudice, or partiality.

3) Declaring Impasse. It is the duty of the mediator timely to determine that an impasse exists and that the conference should end.

4) Reporting Results of Conference. The mediator shall report to the SCO or public owner within 10 days of the conference whether or not an agreement

was reached by the parties. If an agreement was reached, the report shall state the nature of said agreement. The mediator's report shall inform the SCO or public owner of the absence of any party known to the mediator to have been absent from the mediated settlement conference without permission. The SCO or public owner may require the mediator to provide statistical data for evaluation of the mediated settlement conference program.

5) Scheduling and Holding the Conference. It is the duty of the mediator to schedule the conference and conduct it prior to the deadline of completion set by the rules. Deadlines for completion of the conference shall be strictly observed by the mediator unless said time limit is changed by a written order of the SCO or public owner.

6. RULE 6. COMPENSATION OF THE MEDIATOR

a. By Agreement. When the mediator is stipulated by the parties, compensation shall be as agreed upon between the parties and the mediator provided that the provision of G.S. 143-128(f1) are observed.

b. By Appointment. When the mediator is appointed by the SCO or public owner, the parties shall compensate the mediator for mediation services at the rate in accordance with the rate charged for Superior Court mediation. The parties shall also pay to the mediator a one-time per case administrative rate in accordance with the rate charged for Superior Court mediation, which is due upon appointment.

7. RULE 7. MEDIATOR CERTIFICATION

All mediators certified in the Formal Dispute Resolution Program shall be properly certified in accordance with the rules certifying mediators in Superior Court in North Carolina. *When selecting mediators, the parties may designate a preference for mediators with a background in construction law or public construction contracting. Such requirements, while preferred, are not mandatory under these rules.

All mediators chosen must either demonstrate they are certified in accordance with the Rules Implementing Scheduled Mediated Settlement Conference in Superior Court or must gain the consent of the SCO or public owner to mediate any dispute in accordance with these rules.

*Except when otherwise allowed by the SCO or public owner upon the request of the parties to the mediation.

8. RULE 8. RULE MAKING

These Rules are subject to amendment by rule making by the State Building Commission.

These Rules are mandated for State projects when the contracting state entity has not otherwise adopted its own dispute resolution provision. These rules are optional for all other projects subject to Article 8, Ch. 143 of the General Statutes.

9. RULE 9. DEFINITIONS

When the phrase "SCO or public owner" is used in these rules, "SCO" shall apply to state projects, "public owner" shall apply to non-state public projects.

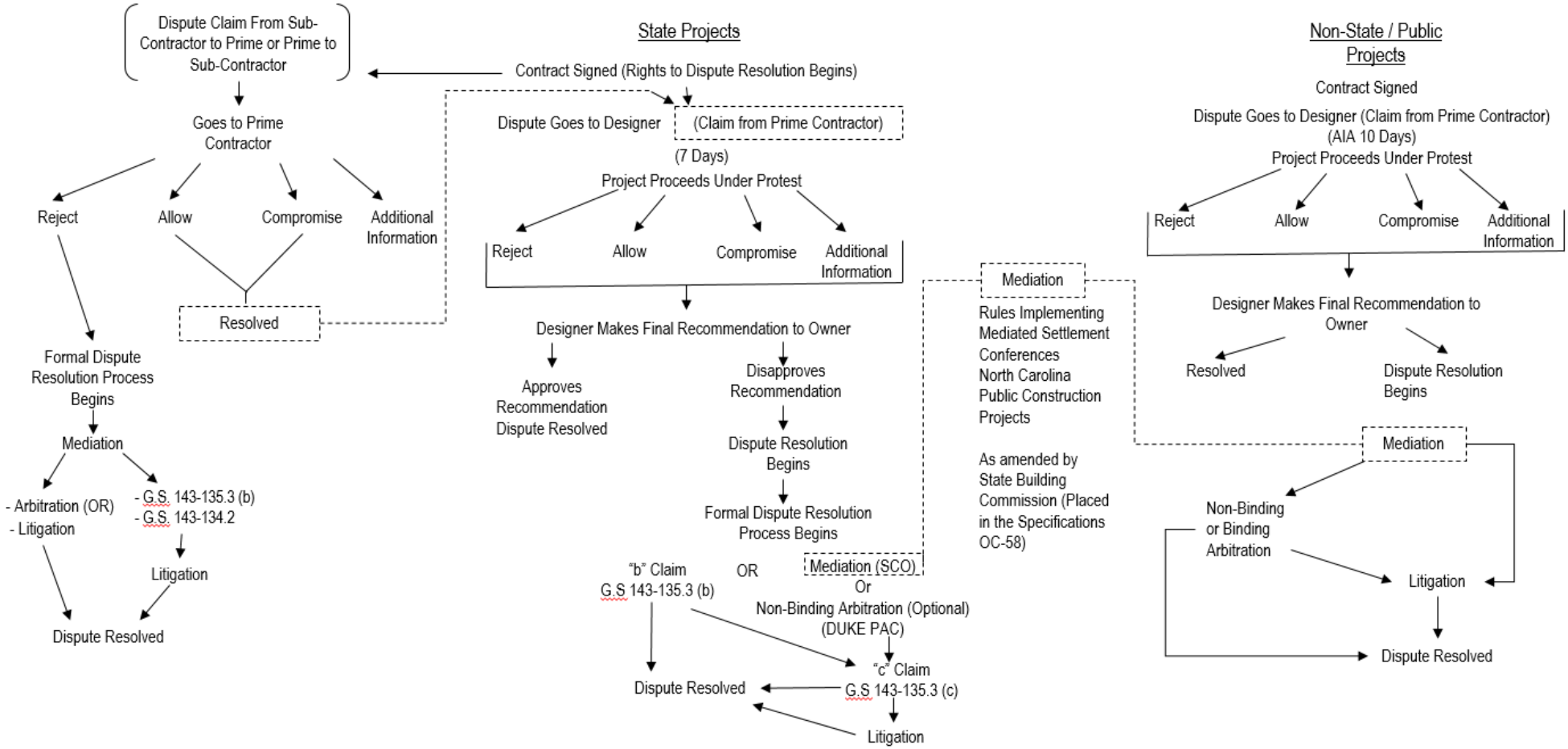
10. RULE 10. TIME LIMITS

On state contracts, any time limit provided for by these Rules may be waived or extended by the SCO for good cause shown.

On non-state contracts, any time limit provided for by these Rules may be waived or extended by the mediator it appoints for good cause shown. If the mediator has not yet been appointed, the designer of record shall decide all waivers or extensions of time for good cause shown.

Exhibit A

Dispute Resolution



SECTION 00 09 00

ADDENDA

(Attach Addenda to this Section)

END OF SECTION

EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

Work Change Directive No.

Date of Issuance:		Effective Date:
Owner:	City of Elizabeth City	Owner's Contract No.:
Contractor:	(Contractor)	Contractor's Project
Engineer:	WithersRavenel	Engineer's Project No.: 23-1097-004
Project:	KE White Water Tower Disinfection	Contract Name:

Contractor is directed to proceed promptly with the following change(s):

Description:

Attachments: *[List documents supporting change]*

Purpose for Work Change Directive:

Directive to proceed promptly with the Work described herein, prior to agreeing to changes on Contract Price and Contract Time, is issued due to: *[check one or both of the following]*

☐ Non-agreement on pricing of proposed change.

☐ Necessity to proceed for schedule or other Project reasons.

Estimated Change in Contract Price and Contract Times (non-binding, preliminary):

Contract Price $ [increase] [decrease].

Contract Time days [increase] [decrease].

Basis of estimated change in Contract Price:

☐ Lump Sum ☐ Unit Price

☐ Cost of the Work ☐ Other

RECOMMENDED:	AUTHORIZED BY:	RECEIVED:
By:	By:	By:

Engineer (Authorized Signature)	Owner (Authorized Signature)	Contractor (Authorized Signature)
Title:	Title:	Title:
Date:	Date:	Date:

Approved by Funding Agency (if applicable)

By: Date:

Title:

EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

Change Order No. _____

Date of Issuance:		Effective Date:
Owner:	City of Elizabeth City	Owner's Contract No.:
Contractor:	(Contractor)	Contractor's Project No.:
Engineer:	WithersRavenel	Engineer's Project No.: 23-1097-004
Project:	KE White Water Tower Disinfection Improvements	Contract Name:

The Contract is modified as follows upon execution of this Change Order:

Description:

Attachments: *[List documents supporting change]*

CHANGE IN CONTRACT PRICE	**CHANGE IN CONTRACT TIMES**
	[note changes in Milestones if applicable]
Original Contract Price:	Original Contract Times:
	Substantial Completion: _____
$_____	Ready for Final Payment: _____
	days or dates
[Increase] [Decrease] from previously approved Change Orders No. __ to No. __ :	[Increase] [Decrease] from previously approved Change Orders No. __ to No. __:
	Substantial Completion: _____

$_____	Ready for Final Payment: _____ ____ days
Contract Price prior to this Change Order: $_____	Contract Times prior to this Change Order: Substantial Completion: _____ ____ Ready for Final Payment: _____days or dates
[Increase] [Decrease] of this Change Order: $_____	[Increase] [Decrease] of this Change Order: Substantial Completion: Ready for Final Payment:
Contract Price incorporating this Change Order: $_____	Contract Times with all approved Change Orders: Substantial Completion: Ready for Final Payment:

RECOMMENDED:	ACCEPTED:	ACCEPTED:
By: _____	By: _____	By: _____
Engineer (if required)	Owner (Authorized Signature)	Contractor (Authorized Signature)
Title: _____	Title: _____	Title: _____
Date: _____	Date: _____	Date: _____

Approved by Funding Agency (if applicable)

By: _____ Date: _____

Title: _____

EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

Field Order No. _____

Date of Issuance:		Effective Date:	
Owner:	City of Elizabeth City	Owner's Contract No.:	
Contractor:	(Contractor)	Contractor's Project No.:	
Engineer:	WithersRavenel	Engineer's Project No.:	23-1097-004
Project:	KE White Water Tower Disinfection Improvements	Contract Name:	

Contractor is hereby directed to promptly execute this Field Order, issued in accordance with General Conditions Paragraph 11.01, for minor changes in the Work without changes in Contract Price or Contract Times. If Contractor considers that a change in Contract Price or Contract Times is required, submit a Change Proposal before proceeding with this Work.

Reference:

_____ Specification(s)

_____ Drawing(s) / Detail(s)

Description:

Attachments:

ISSUED:	RECEIVED:
By: _____	By: _____
Engineer (Authorized Signature)	Contractor (Authorized Signature)

Title: _____	Title: _____
Date: _____	Date: _____

Copy to: Owner

Minority Business Participation Forms

GUIDELINES FOR RECRUITMENT AND SELECTION OF MINORITY BUSINESSES FOR PARTICIPATION IN STATE CONSTRUCTION CONTRACTS

In accordance with G.S. 143-128.2 (effective January 1, 2002) these guidelines establish goals for minority participation in single-prime bidding, separate-prime bidding, construction manager at risk, and alternative contracting methods, on State construction projects in the amount of $300,000 or more. The legislation provides that the State shall have a verifiable ten percent (10%) goal for participation by minority businesses in the total value of work for each project for which a contract or contracts are awarded. These requirements are published to accomplish that end.

SECTION A: INTENT

It is the intent of these guidelines that the State of North Carolina, as awarding authority for construction projects, and the contractors and subcontractors performing the construction contracts awarded shall cooperate and in good faith do all things legal, proper and reasonable to achieve the statutory goal of ten percent (10%) for participation by minority businesses in each construction project as mandated by GS 143-128.2. Nothing in these guidelines shall be construed to require contractors or awarding authorities to award contracts or subcontracts to or to make purchases of materials or equipment from minority-business contractors or minority-business subcontractors who do not submit the lowest responsible, responsive bid or bids.

SECTION B: DEFINITIONS

1. Minority - a person who is a citizen or lawful permanent resident of the United States and who is:
   a. Black, that is, a person having origins in any of the black racial groups in Africa;
   b. Hispanic, that is, a person of Spanish or Portuguese culture with origins in Mexico, South or Central America, or the Caribbean Islands, regardless of race;
   c. Asian American, that is, a person having origins in any of the original peoples of the Far East, Southeast Asia and Asia, the Indian subcontinent, the Pacific Islands;
   d. American Indian, that is, a person having origins in any of the original peoples of North America; or
   e. Female

2. Minority Business - means a business:
   a. In which at least fifty-one percent (51%) is owned by one or more minority persons, or in the case of a corporation, in which at least fifty-one percent (51%) of the stock is owned by one or more minority persons or socially and economically disadvantaged individuals; and
   b. Of which the management and daily business operations are controlled by one or more of the minority persons or socially and economically disadvantaged individuals who own it.

3. Socially and economically disadvantaged individual - means the same as defined in 15 U.S.C. 637. "Socially disadvantaged individuals are those who have been subjected to racial or ethnic prejudice or cultural bias because of their identity as a member of a group without regard to their individual qualities". "Economically disadvantaged individuals are those socially disadvantaged individuals whose ability to compete in the free enterprise system has been impaired due to diminished capital and credit opportunities as compared to others in the same business area who are not socially disadvantaged".

4. Public Entity - means State and all public subdivisions and local governmental units.

5. Owner - The State of North Carolina, through the Agency/Institution named in the contract.

6. Designer – Any person, firm, partnership, or corporation, which has contracted with the State of North Carolina to perform architectural or engineering, work.

7. Bidder - Any person, firm, partnership, corporation, association, or joint venture seeking to be awarded a public contract or subcontract.

8. Contract - A mutually binding legal relationship or any modification thereof obligating the seller to furnish equipment, materials or services, including construction, and obligating the buyer to pay for them.

9. Contractor - Any person, firm, partnership, corporation, association, or joint venture which has contracted with the State of North Carolina to perform construction work or repair.

10. Subcontractor - A firm under contract with the prime contractor or construction manager at risk for supplying materials or labor and materials and/or installation. The subcontractor may or may not provide materials in his subcontract.

SECTION C: RESPONSIBILITIES

1. Office for Historically Underutilized Businesses, Department of Administration (hereinafter referred to as HUB Office).

   The HUB Office has established a program, which allows interested persons or businesses qualifying as a minority business under G.S. 143-128.2, to obtain certification in the State of North Carolina procurement system. The information provided by the minority businesses will be used by the HUB Office to:
   a. Identify those areas of work for which there are minority businesses, as requested.
   b. Make available to interested parties a list of prospective minority business contractors and subcontractors.
   c. Assist in the determination of technical assistance needed by minority business contractors.

   In addition to being responsible for the certification/verification of minority businesses that want to participate in the State construction program, the HUB Office will:
   (1) Maintain a current list of minority businesses. The list shall include the areas of work in which each minority business is interested.
   (2) Inform minority businesses on how to identify and obtain contracting and subcontracting opportunities through the State Construction Office and other public entities.
   (3) Inform minority businesses of the contracting and subcontracting process for public construction building projects.
   (4) Work with the North Carolina trade and professional organizations to improve the ability of minority businesses to compete in the State construction projects.
   (5) The HUB Office also oversees the minority business program by:
      a. Monitoring compliance with the program requirements.
      b. Assisting in the implementation of training and technical assistance programs.
      c. Identifying and implementing outreach efforts to increase the utilization of minority businesses.
      d. Reporting the results of minority business utilization to the Secretary of the Department of Administration, the Governor, and the General Assembly.

2. State Construction Office
   The State Construction Office will be responsible for the following:

   a. Furnish to the HUB Office a minimum of twenty-one days prior to the bid opening the following:
      (1) Project description and location;
      (2) Locations where bidding documents may be reviewed;
      (3) Name of a representative of the owner who can be contacted during the advertising period to advise who the prospective bidders are;
      (4) Date, time and location of the bid opening.
      (5) Date, time and location of prebid conference, if scheduled.

   b. Attending scheduled prebid conference, if necessary, to clarify requirements of the general statutes regarding minority-business participation, including the bidders' responsibilities.

c. Reviewing the apparent low bidders' statutory compliance with the requirements listed in the proposal, that must be complied with, if the bid is to be considered as responsive, prior to award of contracts. The State reserves the right to reject any or all bids and to waive informalities.
d. Reviewing of minority business requirements at Preconstruction conference**.**
e. Monitoring of contractors' compliance with minority business requirements in the contract documents during construction.
f. Provide statistical data and required reports to the HUB Office.
g. Resolve any protest and disputes arising after implementation of the plan, in conjunction with the HUB Office.

3. Owner
Before awarding a contract, owner shall do the following:

a. Develop and implement a minority business participation outreach plan to identify minority businesses that can perform public building projects and to implement outreach efforts to encourage minority business participation in these projects to include education, recruitment, and interaction between minority businesses and non-minority businesses.
b. Attend the scheduled prebid conference.
c. At least 10 days prior to the scheduled day of bid opening, notify minority businesses that have requested notices from the public entity for public construction or repair work and minority businesses that otherwise indicated to the Office for Historically Underutilized Businesses an interest in the type of work being bid or the potential contracting opportunities listed in the proposal. The notification shall include the following:
    1. A description of the work for which the bid is being solicited.
    2. The date, time, and location where bids are to be submitted.
    3. The name of the individual within the owner's organization who will be available to answer questions about the project.
    4. Where bid documents may be reviewed.
    5. Any special requirements that may exist.
d. Utilize other media, as appropriate, likely to inform potential minority businesses of the bid being sought.
e. Maintain documentation of any contacts, correspondence, or conversation with minority business firms made in an attempt to meet the goals.
f. Review, jointly with the designer, all requirements of G.S. 143-128.2(c) and G.S. 143-128.2(f) – (i.e. bidders' proposals for identification of the minority businesses that will be utilized with corresponding total dollar value of the bid and affidavit listing good faith efforts, or affidavit of self-performance of work, if the contractor will perform work under contract by its own workforce) - prior to recommendation of award to the State Construction Office.
g. Evaluate documentation to determine good faith effort has been achieved for minority business utilization prior to recommendation of award to State Construction Office.
h. Review prime contractors' pay applications for compliance with minority business utilization commitments prior to payment**.**
i. Make documentation showing evidence of implementation of Owner's responsibilities available for review by State Construction Office and HUB Office, upon request

4. Designer
Under the single-prime bidding, separate prime bidding, construction manager at risk, or alternative contracting method, the designer will:

a. Attend the scheduled prebid conference to explain minority business requirements to the prospective bidders.
b. Assist the owner to identify and notify prospective minority business prime and subcontractors of potential contracting opportunities.
c. Maintain documentation of any contacts, correspondence, or conversation with minority business firms made in an attempt to meet the goals.
d. Review jointly with the owner, all requirements of G.S. 143-128.2(c) and G.S.143-128.2(f) – (i.e. bidders' proposals for identification of the minority businesses that will be utilized with

corresponding total dollar value of the bid and affidavit listing Good Faith Efforts, or affidavit of self-performance of work, if the contractor will perform work under contract by its own workforce) - prior to recommendation of award.

e. During construction phase of the project, review "MBE Documentation for Contract Payment" – (Appendix E) for compliance with minority business utilization commitments. Submit Appendix E form with monthly pay applications to the owner and forward copies to the State Construction Office.
f. Make documentation showing evidence of implementation of Designer's responsibilities available for review by State Construction Office and HUB Office, upon request.

5. Prime Contractor(s), CM at Risk, and Its First-Tier Subcontractors
Under the single-prime bidding, the separate-prime biding, construction manager at risk and alternative contracting methods, contractor(s) will:

a. Attend the scheduled prebid conference.
b. Identify or determine those work areas of a subcontract where minority businesses may have an interest in performing subcontract work.
c. At least ten (10) days prior to the scheduled day of bid opening, notify minority businesses of potential subcontracting opportunities listed in the proposal. The notification will include the following:
   (1) A description of the work for which the subbid is being solicited.
   (2) The date, time and location where subbids are to be submitted.
   (3) The name of the individual within the company who will be available to answer questions about the project.
   (4) Where bid documents may be reviewed.
   (5) Any special requirements that may exist, such as insurance, licenses, bonds and financial arrangements.

   If there are more than three (3) minority businesses in the general locality of the project who offer similar contracting or subcontracting services in the specific trade, the contractor(s) shall notify three (3), but may contact more, if the contractor(s) so desires.
d. During the bidding process, comply with the contractor(s) requirements listed in the proposal for minority participation.
e. Identify on the bid**,** the minority businesses that will be utilized on the project with corresponding total dollar value of the bid and affidavit listing good faith efforts as required by G.S. 143-128.2(c) and G.S. 143-128.2(f).
f. Make documentation showing evidence of implementation of PM, CM-at-Risk and First-Tier Subcontractor responsibilities available for review by State Construction Office and HUB Office, upon request.
g. Upon being named the apparent low bidder, the Bidder shall provide one of the following: (1) an affidavit (Affidavit C) that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the applicable goal; (2) if the percentage is not equal to the applicable goal, then documentation of all good faith efforts taken to meet the goal. Failure to comply with these requirements is grounds for rejection of the bid and award to the next lowest responsible and responsive bidder.
h. The contractor(s) shall identify the name(s) of minority business subcontractor(s) and corresponding dollar amount of work on the schedule of values. The schedule of values shall be provided as required in Article 31 of the General Conditions of the Contract to facilitate payments to the subcontractors.
i. The contractor(s) shall submit with each monthly pay request(s) and final payment(s), "MBE Documentation for Contract Payment" – (Appendix E), for designer's review.
j. During the construction of a project, at any time**,** if it becomes necessary to replace a minority business subcontractor, immediately advise the owner, State Construction Office, and the Director of the HUB Office in writing**,** of the circumstances involved. The prime contractor shall make a good faith effort to replace a minority business subcontractor with another minority business subcontractor.

k. If during the construction of a project additional subcontracting opportunities become available, make a good faith effort to solicit subbids from minority businesses.
l. It is the intent of these requirements apply to all contractors performing as prime contractor and first tier subcontractor under construction manager at risk on state projects.

6. Minority Business Responsibilities
While minority businesses are not required to become certified in order to participate in the State construction projects, it is recommended that they become certified and should take advantage of the appropriate technical assistance that is made available. In addition, minority businesses who are contacted by owners or bidders must respond promptly whether or not they wish to submit a bid.

SECTION 4: DISPUTE PROCEDURES
It is the policy of this state that disputes that involves a person's rights, duties or privileges, should be settled through informal procedures. To that end, minority business disputes arising under these guidelines should be resolved as governed under G.S. 143-128(g).

SECTION 5: These guidelines shall apply upon promulgation on state construction projects. Copies of these guidelines may be obtained from the Department of Administration, State Construction Office, (physical address) 301 North Wilmington Street, Suite 450, NC Education Building, Raleigh, North Carolina, 27601-2827, (mail address) 1307 Mail Service Center, Raleigh, North Carolina, 27699-1307, phone (919) 807-4100, Website: www.nc-sco.com

SECTION 6: In addition to these guidelines, there will be issued with each construction bid package provisions for contractual compliance providing minority business participation in the state construction program.

MINORITY BUSINESS CONTRACT PROVISIONS (CONSTRUCTION)

APPLICATION:

The **Guidelines for Recruitment and Selection of Minority Businesses for Participation in State Construction Contracts** are hereby made a part of these contract documents. These guidelines shall apply to all contractors regardless of ownership. Copies of these guidelines may be obtained from the Department of Administration, State Construction Office, (physical address) 301 North Wilmington Street, Suite 450, NC Education Building, Raleigh, North Carolina, 27601-2827, (mail address) 1307 Mail Service Center, Raleigh, North Carolina, 27699-1307, phone (919) 807-4100, Website: http://www.nc-sco.com

MINORITY BUSINESS SUBCONTRACT GOALS:

The goals for participation by minority firms as subcontractors on this project have been set at 10%.

The bidder must identify on its bid, the minority businesses that will be utilized on the project with corresponding total dollar value of the bid and affidavit (Affidavit A) listing good faith efforts **or** affidavit (Affidavit B) of self-performance of work, if the bidder will perform work under contract by its own workforce, as required by G.S. 143-128.2(c) and G.S. 143-128.2(f).

The lowest responsible, responsive bidder must provide Affidavit C, that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the applicable goal.

OR

Provide Affidavit D, that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, **with documentation of Good Faith Effort, if the percentage is not equal to the applicable goal.**

OR

Provide Affidavit B, which includes sufficient information for the State to determine that the bidder does not customarily subcontract work on this type project.

The above information must be provided as required. Failure to submit these documents is grounds for rejection of the bid.

MINIMUM COMPLIANCE REQUIREMENTS:

All written statements, affidavits or intentions made by the Bidder shall become a part of the agreement between the Contractor and the State for performance of this contract. Failure to comply with any of these statements, affidavits or intentions, or with the minority business Guidelines shall constitute a breach of the contract. A finding by the State that any information submitted either prior to award of the contract or during the performance of the contract is inaccurate, false or incomplete, shall also constitute a breach of the contract. Any such breach may result in termination of the contract in accordance with the termination provisions contained in the contract. It shall be solely at the option of the State whether to terminate the contract for breach.

In determining whether a contractor has made Good Faith Efforts, the State will evaluate all efforts made by the Contractor and will determine compliance in regard to quantity, intensity, and results of these efforts. Good Faith Efforts include:

(1) Contacting minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor or available on State or local government maintained lists at least 10 days before the bid or proposal date and notifying them of the nature and scope of the work to be performed.

(2) Making the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bid or proposals are due.

(3) Breaking down or combining elements of work into economically feasible units to facilitate minority participation.

(4) Working with minority trade, community, or contractor organizations identified by the Office for Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.

(5) Attending any prebid meetings scheduled by the public owner.

(6) Providing assistance in getting required bonding or insurance or providing alternatives to bonding or insurance for subcontractors.

(7) Negotiating in good faith with interested minority businesses and not rejecting them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.

(8) Providing assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisting minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.

(9) Negotiating joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.

(10) Providing quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

Identification of HUB Certified/ Minority Business Participation

I,_____,
(Name of Bidder)
do hereby certify that on this project, we will use the following HUB Certified/ minority business as construction subcontractors, vendors, suppliers or providers of professional services.

Firm Name, Address and Phone #	Work Type	*Minority Category	**HUB Certified (Y/N)

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

**** HUB Certification with the state HUB Office required to be counted toward state participation goals.**

The total value of minority business contracting will be ($)_____.

State of North Carolina AFFIDAVIT A – Listing of Good Faith Efforts

County of _____

(Name of Bidder)

Affidavit of_____

I have made a good faith effort to comply under the following areas checked:

Bidders must earn at least 50 points from the good faith efforts listed for their bid to be considered responsive. (1 NC Administrative Code 30 I.0101)

- ❑ **1 – (10 pts)** Contacted minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor, or available on State or local government maintained lists, at least 10 days before the bid date and notified them of the nature and scope of the work to be performed.
- ❑ **2 --(10 pts)** Made the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bids are due.
- ❑ **3** – **(15 pts)** Broken down or combined elements of work into economically feasible units to facilitate minority participation.
- ❑ **4 – (10 pts)** Worked with minority trade, community, or contractor organizations identified by the Office of Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.
- ❑ **5** – **(10 pts)** Attended prebid meetings scheduled by the public owner.
- ❑ **6** – **(20 pts)** Provided assistance in getting required bonding or insurance or provided alternatives to bonding or insurance for subcontractors.
- ❑ **7 – (15 pts)** Negotiated in good faith with interested minority businesses and did not reject them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.
- ❑ **8** – **(25 pts)** Provided assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisted minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.
- ❑ **9** – **(20 pts)** Negotiated joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.
- ❑ **10 - (20 pts)** Provided quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

The undersigned, if apparent low bidder, will enter into a formal agreement with the firms listed in the Identification of Minority Business Participation schedule conditional upon scope of contract to be executed with the Owner. Substitution of contractors must be in accordance with GS143-128.2(d) Failure to abide by this statutory provision will constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of the minority business commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:_____ Name of Authorized Officer:_____

Signature:_____

Title:_____

SEAL

State of_____, County of_____

Subscribed and sworn to before me this _____day of _____20____

Notary Public_____

My commission expires _____

State of North Carolina --AFFIDAVIT B-- Intent to Perform Contract with Own Workforce.

County of _____

Affidavit of _____
(Name of Bidder)

I hereby certify that it is our intent to perform 100% of the work required for the _____

_____ contract.
(Name of Project)

In making this certification, the Bidder states that the Bidder does not customarily subcontract elements of this type project, and normally performs and has the capability to perform and will perform all elements of the work on this project with his/her own current work forces; and

The Bidder agrees to provide any additional information or documentation requested by the owner in support of the above statement. The Bidder agrees to make a Good Faith Effort to utilize minority suppliers where possible.

The undersigned hereby certifies that he or she has read this certification and is authorized to bind the Bidder to the commitments herein contained.

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____

SEAL

State of _____, County of _____

Subscribed and sworn to before me this _____ day of _____ 20___

Notary Public _____

My commission expires _____

State of North Carolina - AFFIDAVIT C - Portion of the Work to be Performed by HUB Certified/Minority Businesses

County of _____

(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the portion of the work to be executed by HUB certified/minority businesses as defined in GS143-128.2(g) and 128.4(a),(b),(e) is equal to or greater than 10% of the bidders total contract price, then the bidder must complete this affidavit.
This affidavit shall be provided by the apparent lowest responsible, responsive bidder within **72 hours** after notification of being low bidder.

Affidavit of _____ I do hereby certify that on the
(Name of Bidder)

_____
(Project Name)

Project ID#_____ Amount of Bid $_____

I will expend a minimum of _____% of the total dollar amount of the contract with minority business enterprises. Minority businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below.

Attach additional sheets if required

Name and Phone Number	*Minority Category	**HUB Certified Y/N	Work Description	Dollar Value

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

**** HUB Certification with the state HUB Office required to be counted toward state participation goals.**

Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:_____ Name of Authorized Officer:_____

SEAL

Signature:_____

Title:_____

State of _____, County of _____
Subscribed and sworn to before me this _____day of _____20____
Notary Public_____
My commission expires_____

State of North Carolina AFFIDAVIT D – Good Faith Efforts

County of _____

(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the goal of 10% participation by HUB Certified/ minority business **is not** achieved, the Bidder shall provide the following documentation to the Owner of his good faith efforts:

Affidavit of _____ I do hereby certify that on the
(Name of Bidder)

_____
(Project Name)

Project ID#_____ Amount of Bid $_____

I will expend a minimum of _____% of the total dollar amount of the contract with HUB certified/ minority business enterprises. Minority businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below. (Attach additional sheets if required)

Name and Phone Number	*Minority Category	**HUB Certified Y/N	Work Description	Dollar Value

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

**** HUB Certification with the state HUB Office required to be counted toward state participation goals.**

Examples of documentation that may be required to demonstrate the Bidder's good faith efforts to meet the goals set forth in these provisions include, but are not necessarily limited to, the following:

A. Copies of solicitations for quotes to at least three (3) minority business firms from the source list provided by the State for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to be subcontracted, location where bid documents can be reviewed, representative of the Prime Bidder to contact, and location, date and time when quotes must be received.

B. Copies of quotes or responses received from each firm responding to the solicitation.

C. A telephone log of follow-up calls to each firm sent a solicitation.

D. For subcontracts where a minority business firm is not considered the lowest responsible sub-bidder, copies of quotes received from all firms submitting quotes for that particular subcontract.

E. Documentation of any contacts or correspondence to minority business, community, or contractor organizations in an attempt to meet the goal.

F. Copy of pre-bid roster

G. Letter documenting efforts to provide assistance in obtaining required bonding or insurance for minority business.

H. Letter detailing reasons for rejection of minority business due to lack of qualification.

I. Letter documenting proposed assistance offered to minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letter of credit, including waiving credit that is ordinarily required.

Failure to provide the documentation as listed in these provisions may result in rejection of the bid and award to the next lowest responsible and responsive bidder.

Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:_____ Name of Authorized Officer:_____

Signature:_____

Title:_____

SEAL

State of _____, County of _____

Subscribed and sworn to before me this _____day of _____20____

Notary Public_____

My commission expires _____

Technical Specifications

SECTION 013000 - ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Coordination and Project conditions.

B. Preconstruction meeting.

C. Progress meetings.

D. Preinstallation meetings.

E. Closeout meeting.

1.2 COORDINATION AND PROJECT CONDITIONS

A. Coordinate scheduling, submittals, and Work of various Sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Verify that utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate Work of various Sections having interdependent responsibilities for installing, connecting to, and placing operating equipment in service.

C. Coordinate space requirements, supports, and installation of utilities. Use spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

1. Coordination Drawings: Prepare as required to coordinate all portions of Work. Show relationship and integration of different construction elements that require coordination during fabrication or installation to fit in space provided or to function as intended. Indicate locations where space is limited for installation and access. Also, indicate locations where sequencing and coordination of installations are important.

D. Coordination Meetings: In addition to other meetings specified in this Section, hold coordination meetings with personnel and subcontractors to ensure coordination of Work.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of Work of separate Sections in preparation for Substantial Completion and for portions of Work designated for OWNER's partial occupancy.

G. After OWNER's occupancy of premises, coordinate access to Site for correction of defective Work and Work not complying with Contract Documents, to minimize disruption of OWNER's activities.

1.3 PRECONSTRUCTION MEETING

A. ENGINEER will schedule and preside over meeting after Notice of Award.

B. Attendance Required: ENGINEER, OWNER, Resident Project Representative, Construction Manager, major subcontractors, and CONTRACTOR.

C. Minimum Agenda:

1. Scope and understanding of work.
2. Submission of executed bonds and insurance certificates.
3. Distribution of Contract Documents.
4. Submission of list of subcontractors, list of products, schedule of values, and Progress Schedule.
5. Designation of personnel representing parties in Contract, and ENGINEER.
6. Communication procedures:
    a. Contact List and emergency contact number with parties' information including cell numbers, emails, and names.
    b. Prior to beginning work, the CONTRACTOR shall notify the WithersRavenel (WR) representative.
7. Procedures and processing of requests for interpretations, field decisions, field orders, submittals, substitutions, Applications for Payments, proposal request, Change Orders, and Contract closeout procedures.
8. Scheduling.
9. Critical Work sequencing.
10. Scheduling activities of Geotechnical Engineer, if applicable.

1.4 PROGRESS MEETINGS

A. ENGINEER will make arrangements for meetings, prepare agenda with copies for participants, and preside over meetings.

B. Attendance Required: Job superintendent, major subcontractors, CONTRACTOR and suppliers, and ENGINEER, OWNER, as appropriate to agenda topics for each meeting.

C. Minimum Agenda:

1. Review minutes of previous meetings.
2. Review of Work progress
3. Field observations and decisions.
4. Identification of problems impeding planned progress.
5. Review of submittal schedule and status of submittals.
6. Review of off-Site fabrication and delivery schedules.
7. Maintenance of Progress Schedule
8. Corrective measures to regain projected schedules
9. Planned progress during succeeding work period
10. Coordination of projected progress
11. Maintenance of quality and work standards
12. Effect of proposed changes on Progress Schedule and coordination
13. Other business relating to Work.

1.5 PREINSTALLATION MEETINGS

A. When required in individual Specification Sections, convene preinstallation meetings at Project Site before starting Work of specific Section.

B. Require attendance of parties directly affecting, or affected by, Work of specific Section.

C. Notify ENGINEER four days in advance of meeting date.

D. Prepare agenda and preside over meeting:

1. Review conditions of installation, preparation, and procedures.
2. Review coordination with related Work.

E. Record minutes and distribute copies to participants within two days after meeting, to ENGINEER, OWNER, and those affected by decisions made.

1.6 CLOSEOUT MEETING

A. Schedule Project closeout meeting with sufficient time to prepare for requesting Substantial Completion. Preside over meeting and be responsible for minutes.

B. Attendance Required: CONTRACTOR, Construction Manager, major subcontractors, ENGINEER, OWNER, and others appropriate to agenda.

C. Notify ENGINEER four days in advance of meeting date.

D. Minimum Agenda:

1. Start-up of facilities and systems.
2. Operations and maintenance manuals.
3. Testing, adjusting, and balancing.
4. System demonstration and observation.
5. Operation and maintenance instructions for OWNER's personnel.
6. CONTRACTOR's inspection of Work.
7. CONTRACTOR's preparation of an initial "punch list."
8. Procedure to request ENGINEER inspection to determine date of Substantial Completion.
9. Completion time for correcting deficiencies.
10. Inspections by authorities having jurisdiction.
11. Certificate of Occupancy and transfer of insurance responsibilities.
12. Partial release of retainage.
13. Final cleaning.
14. Preparation for final inspection.
15. Closeout Submittals:

a. Project record documents.
b. Operating and maintenance documents.
c. Operating and maintenance materials.
d. Affidavits.

16. Final Application for Payment.
17. Lien Release documentation.
18. Warranty Information.
19. CONTRACTOR's demobilization of Site.
20. Maintenance.

E. Record minutes and distribute copies to participants within two days after meeting, to ENGINEER, OWNER, and those affected by decisions made.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION

END OF SECTION 013000

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Definitions.

B. Submittal procedures.

C. Proposed product list.

D. Product data.

E. Use of electronic CAD files of Project Drawings.

F. Progress Schedule

G. Shop Drawing Register

H. Shop Drawings.

I. Samples.

J. Design data.

K. Certified Shop Test reports.

L. Certificates.

M. Manufacturer's instructions.

N. Manufacturer's field reports.

O. Erection Drawings.

P. Construction photographs.

Q. CONTRACTOR review.

R. ENGINEER review.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require ENGINEER's responsive action.

B. Informational Submittals: Written and graphic information and physical Samples that do not require ENGINEER's responsive action. Submittals may be rejected for not complying with requirements.

1.3 SUBMITTAL PROCEDURES

A. Transmit each submittal with ENGINEER-accepted form.

B. CONTRACTOR shall be required to keep and publish a submittal log for reference by interested parties.

C. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.

D. Identify: Project, CONTRACTOR, Subcontractor and supplier, pertinent Drawing and detail number, and Specification Section number appropriate to submittal.

E. Apply CONTRACTOR's stamp, signed or initialed, certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is according to requirements of the Work and Contract Documents.

F. Schedule submittals to expedite Project and submit electronic submittals via email as PDF electronic files. Coordinate submission of related items.

G. For each submittal for review, allow 15 calendar days excluding delivery time to and from CONTRACTOR.

H. Identify variations in Contract Documents and product or system limitations that may be detrimental to successful performance of completed Work.

I. Allow space on submittals for CONTRACTOR and ENGINEER review stamps.

J. When revised for resubmission, identify changes made since previous submission.

K. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.

L. Incomplete Submittals: ENGINEER will not review. Complete submittals for each item are required. Delays resulting from incomplete submittals are not the responsibility of ENGINEER.

1.4 PROPOSED PRODUCT LIST

A. Within 15 calendar days after date of Notice to Proceed, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, indicate manufacturer, trade name, model or catalog designation, and reference standards.

1.5 PRODUCT DATA

A. Product Data: Action Submittal: Submit to ENGINEER for review for assessing conformance with information given and design concept expressed in Contract Documents.

B. Submit electronic submittals via email as PDF electronic files.

C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

E. After review, produce copies and distribute.

1.6 ELECTRONIC CAD FILES OF PROJECT DRAWINGS

A. Electronic CAD Files of Project Drawings: May only be used to expedite production of Shop Drawings for the Project. Use for other Projects or purposes is not allowed.

B. Electronic CAD Files of Project Drawings: Distributed only under the following conditions:

1. Use of files is solely at receiver's risk and by opening/using transmitted information, user accepts terms of ENGINEER’s end user license agreement. ENGINEER does not warrant accuracy of files. Receiving files in electronic form does not relieve receiver of responsibilities for measurements, dimensions, and quantities set forth in Contract Documents. In the event of ambiguity, discrepancy, or conflict between information on electronic media and that in Contract Documents, notify ENGINEER of discrepancy and use information in hard-copy Drawings and Specifications.
2. CAD files do not necessarily represent the latest Contract Documents, existing conditions, and as-built conditions. Receiver is responsible for determining and complying with these conditions and for incorporating addenda and modifications.
3. User is responsible for removing information not normally provided on Shop Drawings and removing references to Contract Documents. Shop Drawings submitted with information associated with other trades or with references to Contract Documents will not be reviewed and will be immediately returned.
4. Receiver shall not hold ENGINEER responsible for data or file clean-up required to make files usable, nor for error or malfunction in translation, interpretation, or use of this electronic information.
5. Receiver shall understand that even though ENGINEER has computer virus scanning software to detect presence of computer viruses, there is no guarantee that computer viruses are not present in files or in electronic media.
6. Receiver shall not hold ENGINEER responsible for such viruses or their consequences and shall hold ENGINEER harmless against costs, losses, or damage caused by presence of computer virus in files or media.
7. Receiver shall not distribute drawings to unauthorized third parties without the written permission of ENGINEER. Drawings shall remain the property of the ENGINEER under Common Copyright Laws.

1.7 PROGRESS SCHEDULE

A. Within 15 days after issuance of the Notice to Proceed, the CONTRACTOR shall prepare and submit an electronic copy of his proposed progress schedule to the ENGINEER for review and approval.

B. If so required, the schedule shall be revised until it is approved by the ENGINEER.

C. Schedule shall be updated monthly, depicting progress to the last day of the month.

D. An electronic copy of the updated schedule shall be submitted to the ENGINEER not later than the fifth day of the month with the application for progress payment.

E. The application for progress payment shall be considered incomplete until the updated schedule is received.

F. Schedule shall be prepared in the form of a horizontal bar chart showing the proposed sequence of the work in sufficient detail and identifying construction activities consistent with the CONTRACTOR's schedule of values in the application for progress payment.

G. Schedule shall be time scaled, identifying the first day of each week, with the estimated start and complete date of each stage of the work to complete the Project within the Contract time.

H. Updated schedule shall show all changes since the previous schedule.

I. All revisions to the schedule must have the prior approval of the ENGINEER.

1.8 SHOP DRAWING REGISTER

A. CONTRACTOR shall prepare and submit an electronic copy of his schedule of shop drawings or shop drawing register to the ENGINEER for review and approval. The shop drawing register shall include all items and information that the CONTRACTOR is required to submit for the ENGINEER to review throughout the course of the project. This shall include all equipment and materials for the project, required CONTRACTOR, subcontractor, or manufacturer qualifications, warranty submittals, etc.

B. If so required, the schedule shall be revised until it is approved by the ENGINEER.

C. Schedule shall be updated monthly.

D. CONTRACTOR shall prepare and submit an electronic copy of the updated schedule to the ENGINEER not later than the fifth day of every month with the application for progress payment.

E. The application for progress payment shall be considered incomplete until the updated schedule is received.

F. The updated schedule shall be based on the Progress Schedule developed under the requirements of Section 1.7 of this Section.

G. Schedule shall be in tabular form with appropriate spaces to insert the following information for principal items of equipment and materials:
   1. Date on which Shop Drawings and other information are requested and received from the manufacturer or other appropriate source.
   2. Date on which certification/information is received from the manufacturer or other appropriate source and transmitted to the ENGINEER.
   3. Date on which Shop Drawings and other information are submitted to the ENGINEER and returned by the ENGINEER for revision.
   4. Date on which Shop Drawings and other information are revised by manufacturer and resubmitted to the ENGINEER.
   5. Date on which Shop Drawings and other information are returned by ENGINEER annotated in accordance with ENGINEER review.
   6. Date on which accepted Shop Drawings and other information are transmitted to manufacturer or other appropriate recipient.
   7. Date of manufacturer's scheduled delivery.
   8. Date on which delivery is made.

1.9 SHOP DRAWINGS

A. Shop Drawings: Action Submittal: Submit to ENGINEER for assessing conformance with information given and design concept expressed in Contract Documents.

B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. When required by individual Specification Sections, provide Shop Drawings signed and sealed by a Professional Engineer registered in the state of North Carolina responsible for designing components shown on Shop Drawings.

   1. Include signed and sealed calculations to support design.
   2. Submit Shop Drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
   3. Make revisions and provide additional information when required by authorities having jurisdiction.

D. Submit electronic submittals via email as PDF electronic files.

E. After review, produce copies and distribute.

1.10 SAMPLES

A. Samples: Action Submittal: Submit to ENGINEER for assessing conformance with information given and design concept expressed in Contract Documents.

B. Samples for Selection as Specified in Product Sections:

   1. Submit to ENGINEER for aesthetic, color, and finish selection.
   2. Submit Samples of finishes, textures, and patterns for ENGINEER selection.

C. Submit Samples to illustrate functional and aesthetic characteristics of products, with integral parts and attachment devices. Coordinate Sample submittals for interfacing work.

D. Include identification on each Sample, with full Project information.

E. Submit number of Samples specified in individual Specification Sections; ENGINEER will retain one Sample.

F. Reviewed Samples that may be used in the Work are indicated in individual Specification Sections.

G. After review, produce copies and distribute.

1.11 DESIGN DATA

A. Informational Submittal: Submit data for ENGINEER's knowledge as Contract administrator or for OWNER.

B. Submit information for assessing conformance with information given and design concept expressed in Contract Documents.

1.12 CERTIFIED SHOP TEST REPORTS

A. Each piece of equipment for which pressure, head, capacity, rating, efficiency, performance, function, or special requirements are specified or implied shall be tested in the shop of the manufacturer in a manner which shall conclusively prove that its characteristics comply fully with the requirements of the Contract Documents and applicable test codes and standards.

B. The CONTRACTOR shall secure from the manufacturers legible electronic copies of the actual test data, the interpreted results and a complete description of the testing facilities and testing setup, all accompanied by a certificate of authenticity sworn to by a responsible official of the manufacturing company and notarized.

C. These reports shall be forwarded to the ENGINEER for review.

D. In the event any equipment fails to meet the test requirements, the manufacturer shall make all necessary changes, adjustments or replacements and the tests shall be repeated, at no additional cost to the OWNER or ENGINEER, until the equipment test requirements are acceptable to the ENGINEER.

E. No equipment shall be shipped to the Project until the ENGINEER notifies the CONTRACTOR, in writing, that the shop test reports are acceptable.

F. Copies of certified test data shall be incorporated into the Record Working Drawings.

1.13 CERTIFICATES

A. Informational Submittal: Submit certification by manufacturer, installation/application Subcontractor, or CONTRACTOR to ENGINEER, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or product but must be acceptable to ENGINEER.

1.14 MANUFACTURER'S INSTRUCTIONS

A. Informational Submittal: Submit manufacturer's installation instructions for ENGINEER's knowledge as Contract administrator or for OWNER.

B. Submit printed instructions for delivery, storage, assembly, installation, startup, adjusting, and finishing, to ENGINEER in quantities specified for Product Data.

C. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.15 MANUFACTURER'S FIELD REPORTS

A. Informational Submittal: Submit reports for ENGINEER's knowledge as Contract administrator or for OWNER.

B. Submit report in duplicate within 5 days of observation to ENGINEER for information.

C. Submit reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

1.16 ERECTION DRAWINGS

A. Informational Submittal: Submit Drawings for ENGINEER's knowledge as Contract administrator or for OWNER.

B. Submit Drawings for information assessing conformance with information given and design concept expressed in Contract Documents.

C. Data indicating inappropriate or unacceptable Work may be subject to action by ENGINEER or OWNER.

1.17 CONSTRUCTION PHOTOGRAPHS

A. Provide photographs of Site and construction throughout progress of Work produced by an experienced photographer acceptable to ENGINEER.

B. Each month submit photographs with Application for Payment.

C. Take photographs as evidence of existing Project conditions. Preconstruction site documentation shall include, but not be limited to the following:

1. Record video and/or photographs along centerline of proposed pipe trench; minimum one photograph for each 50 feet of pipe trench.
2. Show mailboxes, curbing, lawns, driveways, signs, culverts, and other existing site features.
3. Include Project description, date taken, and sequential number on back of each photograph.

D. Digital Images: Deliver complete set of digital image electronic files on USB-Drive or other acceptable method to OWNER with Project record documents. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as sensor, uncropped.

1. Digital Images: Uncompressed JPG format, produced by digital camera with minimum sensor size of 4.0 megapixels, and image resolution of not less than 1024 by 768 pixels.
2. Date and Time: Include date and time in filename for each image.

1.18 CONTRACTOR REVIEW

A. Review for compliance with Contract Documents and approve submittals before transmitting to ENGINEER.

B. CONTRACTOR: Responsible for:

1. Determination and verification of materials including manufacturer's catalog numbers.
2. Determination and verification of field measurements and field construction criteria.
3. Checking and coordinating information in submittal with requirements of Work and of Contract Documents.
4. Determination of accuracy and completeness of dimensions and quantities.
5. Confirmation and coordination of dimensions and field conditions at Site.
6. Construction means, techniques, sequences, and procedures.
7. Safety precautions.
8. Coordination and performance of Work of all trades.
9. Reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.
10. Determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto.
11. Determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work.
12. Determined and verified all information relative to CONTRACTOR's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

C. Stamp, sign or initial, and date each submittal to certify compliance with requirements of Contract Documents.

D. Do not fabricate products or begin Work for which submittals are required until verification that submittals have been reviewed by ENGINEER.

E. No Work shall be performed that is not in accordance with standard manufacturer's installation instructions without the manufacturer’s certification of an alternate method.

1.19 ENGINEER REVIEW

A. Do not make "mass submittals" to ENGINEER. "Mass submittals" are defined as six or more submittals or items in one day or 20 or more submittals or items in one week. If "mass submittals" are received, ENGINEER's review time stated above will be extended as necessary to perform proper review. ENGINEER will review "mass submittals" based on priority determined by ENGINEER after consultation with OWNER and CONTRACTOR.

B. Informational submittals and other similar data are for ENGINEER's information, do not require ENGINEER's responsive action, and may not be reviewed or returned with comment.

C. Submittals made by CONTRACTOR that are not required by Contract Documents may be returned without action.

D. Submittal approval does not authorize changes to Contract requirements unless accompanied by written Change Order or Construction Change Directive.

E. OWNER may withhold monies due to CONTRACTOR to cover additional costs beyond the second submittal review.

F. ENGINEER's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

G. ENGINEER's review shall in no way relieve the CONTRACTOR of any of their responsibilities under the Contract.

H. An acceptance of a submittal shall be interpreted to mean that the ENGINEER has no specific objections to the submitted material, subject to conformance with the Contract Drawings and Specifications.

I. ENGINEER's review will be confined to general arrangement and compliance with the Contract Drawings and Specifications only, and will not be for the purpose of checking dimensions, weights, clearances, fittings, tolerances, interferences, coordination of trades, etc.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Quality control.

B. Tolerances.

C. References.

D. Labeling.

E. Mockup requirements.

F. Testing and inspection services.

G. Manufacturers' field services.

1.2 QUALITY CONTROL

A. Monitor quality control over suppliers, manufacturers, products, services, Site conditions, and workmanship, to produce Work of specified quality.

B. Comply with specified standards as the minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

C. Perform Work using persons qualified to produce required and specified quality.

D. Supervise performance of Work in such manner and by such means to ensure that Work, whether completed or in progress, will not be subjected to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.

1.3 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerance errors to accumulate.

B. Comply with manufacturers' recommended tolerances and tolerance requirements in reference standards. When such tolerances conflict with Contract Documents, request clarification from ENGINEER before proceeding.

1.4 REFERENCES

A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard except when more rigid requirements are specified or are required by applicable codes or authorities having jurisdiction.

B. Conform to reference standard by date of issue current as of date of Contract Documents except where specific date is established by code.

C. Obtain copies of standards and maintain on Site when required by product Specification Sections.

D. When requirements of indicated reference standards conflict with Contract Documents, request clarification from ENGINEER before proceeding.

E. Neither contractual relationships, duties, or responsibilities of parties in Contract nor those of ENGINEER shall be altered from Contract Documents by mention or inference in reference documents.

1.5 LABELING

A. Attach label from agency approved by authorities having jurisdiction for products, assemblies, and systems required to be labeled by applicable code.

B. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label:

1. Model number.
2. Serial number.
3. Performance characteristics.

C. Manufacturer's Nameplates, Trademarks, Logos, and Other Identifying Marks on Products: Not allowed on surfaces exposed to view in public areas, interior or exterior.

1.6 MOCK-UP REQUIREMENTS

A. Tests will be performed under provisions identified in this Section and identified in individual product Specification Sections.

B. Assemble and erect specified or indicated items with specified or indicated attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mockups shall be comparison standard for remaining Work.

1.7 TESTING AND INSPECTION SERVICES

A. Employ and pay for services of an independent testing agency or laboratory acceptable to OWNER to perform specified testing.

1. Before starting Work, submit testing laboratory name, address, and telephone number, and names of full-time Professional Engineer and responsible officer.
2. Submit copy of report of laboratory facilities' inspection made by Materials Reference Laboratory of National Bureau of Standards during most recent inspection, with memorandum of remedies of deficiencies reported by inspection.

B. Independent firm will perform tests, inspections, and other services specified in individual Specification Sections and as required by ENGINEER, OWNER, and/or authorities having jurisdiction as applicable.

1. Laboratory: Licensed and authorized to operate in the state in which the project is to be constructed.

C. Reports shall be submitted by independent firm to ENGINEER, CONTRACTOR, and authorities having jurisdiction, indicating observations and results of tests and compliance or noncompliance with Contract Documents.

D. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.

1. Notify ENGINEER and an independent firm 48 hours before expected time for operations requiring services.
2. Make arrangements with independent firm and pay for additional Samples and tests required for CONTRACTOR's use.

E. Employment of testing agency or laboratory shall not relieve CONTRACTOR of obligation to perform Work according to requirements of Contract Documents.

F. Retesting or re-inspection required because of nonconformance with specified or indicated requirements shall be performed by same independent firm on instructions from ENGINEER. Payment for retesting or re-inspection will be charged to CONTRACTOR by deducting testing charges from Contract Sum/Price.

G. Agency Responsibilities:

1. Test Samples of mixes submitted by CONTRACTOR.
2. Provide qualified personnel at Site. Cooperate with ENGINEER and CONTRACTOR in performance of services.
3. Perform indicated sampling and testing of products according to specified standards.
4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
5. Promptly notify ENGINEER and CONTRACTOR of observed irregularities or nonconformance of Work or products.
6. Perform additional tests required by ENGINEER.
7. Attend preconstruction meetings and progress meetings.

H. Agency Reports: After each test, promptly submit electronic copies of report to ENGINEER, CONTRACTOR, and authorities having jurisdiction. When requested by ENGINEER, provide interpretation of test results.

I. Limits on Testing Authority:

1. Agency or laboratory may not release, revoke, alter, or enlarge any requirements of Contract Documents.
2. Agency or laboratory may not approve or accept any portion of the Work.
3. Agency or laboratory may not assume duties of CONTRACTOR.
4. Agency or laboratory has no authority to stop the Work.

1.8 MANUFACTURER'S FIELD SERVICES

A. When specified in individual specification Sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe Site conditions, conditions of surfaces and installation, quality of workmanship, startup of equipment, testing, adjusting, and balancing of equipment, and commissioning as applicable, and to initiate instructions when necessary.

B. Report observations and Site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturer's written instructions.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 014000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Products.

B. Product delivery requirements.

C. Product storage and handling requirements.

D. Product options.

1.2 PRODUCTS

A. At minimum, comply with specified requirements and reference standards.

B. Specified products define standard of quality, type, function, dimension, appearance, and performance required.

C. Furnish products of qualified manufacturers that are suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise. Confirm that manufacturer's production capacity can provide sufficient product, on time, to meet Project requirements.

D. Domestic Products: Except where specified otherwise, domestic products are required and interpreted to mean products mined, manufactured, fabricated, or produced in United States or its territories.

E. Do not use materials and equipment removed from existing premises except as specifically permitted by Contract Documents.

F. Furnish interchangeable components from same manufacturer for components being replaced.

1.3 PRODUCT DELIVERY REQUIREMENTS

A. Transport and handle products according to manufacturer's instructions.

B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle products; use methods to prevent soiling, disfigurement, or damage.

1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

A. Store and protect products according to manufacturer's instructions.

B. Store products with seals and labels intact and legible.

C. Store sensitive products in weathertight, climate-controlled enclosures in an environment suitable to product.

D. For exterior storage of fabricated products, place products on sloped supports aboveground.

E. Provide bonded off-Site storage and protection when Site does not permit on-Site storage or protection.

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.

H. Provide equipment and personnel to store products; use methods to prevent soiling, disfigurement, or damage.

I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.5 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Products complying with specified reference standards or description.

B. Products Specified by Naming One or More Manufacturers: Products of one or more manufacturers named and complying with Specifications; no options or substitutions allowed.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 016000

SECTION 017000 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Examination.

B. Preparation.

C. Coordination of OWNER's portion of the Work.

D. Field engineering.

E. Execution.

F. Cutting and patching.

G. Protecting installed construction.

H. Starting of systems.

I. Demonstration and instruction.

J. Closeout procedures.

K. Final adjustment of accounts.

L. Final application for payment.

M. Project record documents.

N. Operation and maintenance data.

O. Manual for materials and finishes.

P. Manual for equipment and systems.

Q. Spare parts and maintenance products.

R. Product warranties and product bonds.

S. Warranty requirements.

T. Final cleaning.

1.2 EXAMINATION

A. Verify that existing Site conditions and substrate surfaces are acceptable for subsequent Work.

B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.

C. Verify that utility services are available with correct characteristics and in correct locations.

1.3 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance according to manufacturer's instructions.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer-required or -recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

1.4 COORDINATION OF OWNER'S PORTION OF THE WORK

A. Site Access: Provide access to Project site for OWNER's construction personnel.

1. Refer to Section 015000 – Temporary Facilities and Controls required for OWNER-furnished, CONTRACTOR-installed products.

B. Coordination: Coordinate construction and operations of the Work with Work performed by OWNER's construction personnel.

1. Construction Schedule: Inform OWNER of CONTRACTOR's preferred construction schedule for OWNER's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify OWNER if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include OWNER's construction personnel at preinstallation conferences covering portions of the Work that are to receive OWNER's Work. Attend preinstallation conferences conducted by OWNER's construction personnel if portions of the Work depend on OWNER's construction.

1.5 FIELD ENGINEERING

A. Employ Professional Land Surveyor registered in the State in which the project is being constructed.

B. Locate and protect survey control and reference points. Promptly notify ENGINEER of discrepancies discovered.

C. Control datum for survey is indicated on Drawings.

D. Prior to beginning Work, verify and establish floor elevations of existing facilities to ensure that new Work will meet existing elevations in smooth and level alignment except where specifically detailed or indicated otherwise.

E. Verify setbacks and easements; confirm Drawing dimensions and elevations.

F. Provide field engineering services. Establish elevations, lines, and levels using recognized engineering survey practices.

G. Submit copy of Site drawing signed and sealed by Professional Land Surveyor licensed in the state in which the construction is being performed certifying elevations and locations of the Work are in conformance with Contract Documents.

H. Protect survey control points prior to starting Site Work; preserve permanent reference points during construction.

I. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to ENGINEER.

J. Final Property Survey: Refer to Section 010400 – Construction Surveying for detailed information related to survey requirements. Prior to Substantial Completion, prepare final property survey illustrating locations, dimensions, angles, and elevations of structures and Site Work that have resulted from construction indicating their relationship to permanent benchmarks and property lines.

1. Show significant features (real property) for Project.
2. Include certification on survey, signed by Professional Land Surveyor licensed in the state in which the construction is being performed, that principal metes, bounds, lines, levels, and elevations of Project are accurately shown.

1.6 EXECUTION

A. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

B. When manufacturer's installation instructions conflict with Contract Documents, request clarification from ENGINEER before proceeding.

C. Verify that field measurements are as indicated on approved Shop Drawings or as instructed by manufacturer.

D. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1. Secure Work true to line and level and within specified tolerances, or if not specified, industry-recognized tolerances.
2. Physically separate products in place, provide electrical insulation, or provide protective coatings to prevent galvanic action or corrosion between dissimilar metals.

3. Exposed Joints: Provide uniform joint width and arrange to obtain best visual effect. Refer questionable visual effect choices to ENGINEER for final decision.

1.7 CUTTING AND PATCHING

A. Employ skilled and experienced Installers to perform cutting and patching.

B. Submit written request in advance of cutting or altering elements affecting the following:

1. Structural integrity of element.
2. Integrity of weather-exposed or moisture-resistant elements.
3. Efficiency, maintenance, or safety of element.
4. Visual qualities of sight-exposed elements.
5. Work of OWNER or separate contractor.

C. Execute cutting, fitting, and patching including excavation and fill to complete Work and to accomplish the following:

1. Fit the several parts together, to integrate with other Work.
2. Uncover Work to install or correct ill-timed Work.
3. Remove and replace defective and nonconforming Work.
4. Remove samples of installed Work for testing.
5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.

D. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for assembly, refinish entire unit.

1.8 PROTECTING INSTALLED CONSTRUCTION

A. Protect installed Work and provide special protection where specified in individual Specification Sections.

B. Provide temporary and removable protection for installed products. Control activity in immediate Work area to prevent damage.

C. Use durable sheet materials to protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects where applicable.

D. Prohibit traffic or storage upon waterproofed or roofed surfaces.

E. Prohibit traffic from landscaped areas.

1.9 STARTING OF SYSTEMS

A. Coordinate schedule for startup of various equipment and systems.

B. Notify ENGINEER and OWNER seven days prior to startup of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

D. Verify that tests, meter readings, and electrical characteristics agree with those required by equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute startup under supervision of manufacturer's representative or CONTRACTORs' personnel according to manufacturer's instructions.

G. When specified in individual Specification Sections, require manufacturer to provide authorized representative who will be present at Site to inspect, check, and approve equipment or system installation prior to startup and will supervise placing equipment or system in operation.

1.10 DEMONSTRATION AND INSTRUCTION

A. Demonstrate operation and maintenance of products to OWNER's personnel two weeks prior to date of Substantial Completion.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

C. Use operation and maintenance manuals as basis for instruction. Review contents of manual with OWNER's personnel in detail to explain all aspects of operation and maintenance.

D. Demonstrate startup, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, and agreed location.

E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

1.11 CLOSEOUT PROCEDURES

A. Prerequisites to Substantial Completion: Complete following items before requesting Certification of Substantial Completion, either for entire Work or for portions of Work:

1. Submit maintenance manuals, Project record documents, digital images of construction photographs, and other similar final record data in compliance with this Section.
2. Complete facility startup, testing, adjusting, balancing of systems and equipment, demonstrations, and instructions to OWNER's operating and maintenance personnel as specified in compliance with this Section.
3. Conduct inspection to establish basis for request that Work is substantially complete. Create comprehensive list (initial punch list) indicating items to be completed or corrected, value of incomplete or nonconforming Work, reason for being incomplete, and date of anticipated completion for each item. Include copy of list with request for Certificate of Substantial Completion.

4. Obtain and submit releases enabling OWNER's full, unrestricted use of Project and access to services and utilities. Include certificate of occupancy, operating certificates, and similar releases from authorities having jurisdiction and utility companies.
5. Deliver tools, spare parts, extra stocks of material, and similar physical items to OWNER.
6. Make final change-over of locks eliminating construction master-key system and transmit keys directly to OWNER. Advise OWNER's personnel of change-over in security provisions.
7. Discontinue or change over and remove temporary facilities and services from Project Site, along with construction tools, mockups, and similar elements.
8. Perform final cleaning according to this Section.

B. Substantial Completion Inspection:

1. When CONTRACTOR considers Work to be substantially complete, submit to ENGINEER and OWNER:

    a. Written certificate that Work, or designated portion, is substantially complete.
    b. List of items to be completed or corrected (initial punch list).

2. Within 14 days after receipt of request for Substantial Completion, ENGINEER and/or OWNER will make inspection to determine whether Work or designated portion is substantially complete.

3. Should ENGINEER and/or OWNER determine that Work is not substantially complete:

    a. ENGINEER will promptly notify CONTRACTOR in writing, stating reasons for its opinion.
    b. CONTRACTOR shall remedy deficiencies in Work and send second written request for Substantial Completion to ENGINEER and OWNER.
    c. ENGINEER and/or OWNER will reinspect Work.

4. Reinspection Fees
    a. Should the ENGINEER perform reinspection due to failure of the Work to comply with the claims of status of completion made by the CONTRACTOR:
    b. OWNER will compensate the ENGINEER for such additional services.
    c. OWNER will deduct the amount of such compensation from the final payment to the CONTRACTOR.

5. When ENGINEER and/or OWNER finds that Work is substantially complete, ENGINEER will:

    a. Prepare Certificate of Substantial Completion, accompanied by CONTRACTOR's list of items to be completed or corrected as verified and amended by ENGINEER and OWNER (final punch list).
    b. Submit Certificate to OWNER and CONTRACTOR for their written acceptance of responsibilities assigned to them in Certificate.

6. After Work is substantially complete, CONTRACTOR shall:

    a. Allow OWNER occupancy of Project under provisions stated in Certificate of Substantial Completion.

b. Complete Work listed for completion or correction within time period stipulated.

C. Prerequisites for Final Completion: Complete following items before requesting final acceptance and final payment.

1. When CONTRACTOR considers Work to be complete, submit written certification that:

a. Contract Documents have been reviewed.
b. Work has been examined for compliance with Contract Documents.
c. Work has been completed according to Contract Documents.
d. Work is completed and ready for final inspection.

2. Submittals: Submit following:

a. Final punch list indicating all items have been completed or corrected.
b. Final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
c. Specified warranties, workmanship/maintenance bonds, maintenance agreements, and other similar documents.
d. Accounting statement for final changes to Contract Sum.
e. CONTRACTOR's affidavit of payment of debts and claims on AIA G706 - CONTRACTOR's Affidavit of Payment of Debts and Claims.
f. CONTRACTOR affidavit of release of liens on AIA G706A - CONTRACTOR's Affidavit of Release of Liens.
g. Consent of surety to final payment on AIA G707 - Consent of Surety to Final Payment Form.

1.12 FINAL ADJUSTMENT OF ACCOUNTS

A. Submit a final statement of accounting to the ENGINEER. The statement shall reflect the following:
1. All adjustments to the Contract Sum
2. The original Contract Sum
3. Additions and deductions resulting from the following:
a. Previous Change Orders
b. Allowances
c. Unit Prices
d. Deductions for uncorrected Work
e. Deductions for liquidated damages
f. Deductions for reinspection payments
g. Other adjustments
4. Total Contract Sum, as adjusted
5. Previous payments
6. Sum remaining due

B. ENGINEER will prepare a final Change Order, reflecting approved adjustments to the Contract Sum which were not previously made by Change Orders.

1.13 FINAL APPLICATION FOR PAYMENT

A. CONTRACTOR shall submit the final Application for Payment in accordance with procedures and requirements stated in the General Conditions of the Contract.

1.14 PROJECT RECORD DOCUMENTS

A. Maintain on Site one set of the following record documents; record actual revisions to the Work:

1. Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other modifications to the Contract.
5. Reviewed Shop Drawings, product data, and Samples.
6. Field Test Reports.
7. Construction photographs.
8. All construction related permits.
9. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by OWNER.

C. Specifications: Legibly mark and record, at each product Section, description of actual products installed, including the following:

1. Manufacturer's name and product model and number.
2. Product substitutions or alternates used.
3. Changes made by Addenda and modifications.

D. Record Drawings and Shop Drawings: No work shall be permanently concealed until the required information has been recorded. Legibly mark each item to record actual construction as follows:

1. Include Contract modifications such as Addenda, supplementary instructions, change directives, field orders, minor changes in the Work, and change orders.
2. Include locations of concealed elements of the Work.
3. Identify depth of buried utility lines and provide dimensions showing distances from permanent facility components that are parallel to utilities.
4. Actual installed pipe material, class, etc.
5. Dimension ends, corners, and junctions of buried utilities to permanent facility components using triangulation.
6. Identify and locate existing buried or concealed items encountered during Project.
7. Measured depths of foundations in relation to finish first floor datum.
8. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
9. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
10. Field changes of dimension and detail.
11. Details not on original Drawings.

E. Submit PDF electronic files of marked-up documents to ENGINEER with claim for final Application for Payment.

1.15 OPERATION AND MAINTENANCE DATA

A. Submit in PDF composite electronic indexed file.

B. Submit data bound in 8-1/2 x 11-inch text pages, three D side ring binders with durable plastic covers.

C. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS," title of Project, and subject matter of binder when multiple binders are required.

D. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

E. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

F. Contents: Prepare table of contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:

1. Part 1: Directory, listing names, addresses, and telephone numbers of ENGINEER, CONTRACTOR, subcontractors, and major equipment suppliers.
2. Part 2: Operation and maintenance instructions, arranged by system For each category, identify names, addresses, and telephone numbers of subcontractors and suppliers.
3. Part 3: Project documents and certificates.

1.16 MANUAL FOR MATERIALS AND FINISHES

A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. ENGINEER will review draft and return one copy with comments. ENGINEER and the OWNER shall be the sole judge of the acceptability and completeness of the manuals and may reject any submittal for insufficient information including incorrect references and/or the manner in which the material is assembled.

B. For equipment or component parts of equipment put into service during construction and operated by OWNER, submit documents within ten days after acceptance.

C. Submit one copy of completed volumes 15 days prior to final inspection. Draft copy be reviewed and returned after final inspection, with ENGINEER comments. Revise content of document sets as required prior to final submission.

D. Submit two sets of revised final volumes within ten days after final inspection.

E. Submit in PDF composite electronic indexed file of final manual within ten days after final inspection.

F. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Include information for re-ordering custom-manufactured products.

G. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

1.17 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. ENGINEER and the OWNER shall be the sole judge of the acceptability and completeness of the manuals and may reject any submittal for insufficient information including incorrect references and/or the manner in which the material is assembled.

B. ENGINEER will review draft and return one copy with comments.

C. For equipment, or component parts of equipment put into service during construction and operated by OWNER, submit documents within ten days after acceptance.

D. Submit one copy of completed volumes 15 days prior to final inspection. Draft copy will be reviewed and returned after final inspection, with ENGINEER comments. Revise content of document sets as required prior to final submission.

E. Submit two sets of revised final volumes within days after final inspection.

F. Submit in PDF composite electronic indexed file of final manual within ten days after final inspection.

G. Each Item of Equipment and Each System: Include description of unit or system and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.
   1. For pumps, the Operation and Maintenance manual cover sheets shall include the following:
      a. Manufacturer
      b. Manufacturer’s local representative with address and telephone number
      c. Source of spare parts with address and telephone number
      d. Operating conditions, i.e., rated capacity and TDH
      e. Model number, serial number, and impeller diameter

H. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; by label machine.

I. Operating Procedures: Include startup, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and special operating instructions.

J. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

K. Include servicing and lubrication schedule and list of lubricants required.

1.18 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Furnish spare parts, maintenance, and extra products in quantities specified in individual Specification Sections.

B. Deliver to Project Site and place in location as directed by OWNER; obtain receipt prior to final payment.

1.19 PRODUCT WARRANTIES AND PRODUCT BONDS

A. Obtain warranties and bonds executed in duplicate by responsible subcontractors, suppliers, and manufacturers within ten days after completion of applicable item of Work.

B. Execute and assemble transferable warranty documents and bonds from subcontractors, suppliers, and manufacturers.

C. Time of Submittals:

1. For equipment or component parts of equipment put into service during construction with OWNER's permission, submit documents within ten days after acceptance.

1.20 WARRANTY REQUIREMENTS

A. When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.

B. Reinstatement of Warranty
1. When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement.
2. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost
1. Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents.
2. The CONTRACTOR is responsible for the cost of replacing or rebuilding defective Work regardless of whether the OWNER has benefited from use of the Work through a portion of its anticipated useful service life.

D. Written warranties made to the OWNER are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the OWNER can enforce such other duties, obligations, rights, or remedies.

E. The OWNER reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the contract Documents.

F. The OWNER reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work until evidence is presented that entities required to countersign such commitments are willing to do so.

G. Manufacturer's disclaimers and limitations on product warranties do not relieve the CONTRACTOR of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the CONTRACTOR.

H. Each Prime CONTRACTOR is responsible for warranties related to its own Contract.

1.21 FINAL CLEANING

A. Execute final cleaning prior to final Project payment.

1. Employ experienced personnel or professional cleaning firm.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 017000

SECTION 079000 - JOINT PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sealants and joint backing.
2. Precompressed foam sealers.
3. Hollow gaskets.
4. Accessories.

1.2 REFERENCE STANDARDS

A. ASTM International:

1. ASTM C834 - Standard Specification for Latex Sealants.
2. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications.
3. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
4. ASTM C1193 - Standard Guide for Use of Joint Sealants.
5. ASTM D1056 - Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
6. ASTM D1667 - Standard Specification for Flexible Cellular Materials – Poly (Vinyl Chloride) Foam (Closed-Cell).
7. ASTM D2628 - Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.

1.3 COORDINATION

A. Section 013000 - Administrative Requirements: Requirements for coordination.

B. Coordinate Work of this Section with Sections referencing this Section.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer information indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer Instructions: Submit special procedures, surface preparation requirements, and perimeter conditions requiring special attention.

1.5 QUALITY ASSURANCE

A. Perform Work according to state and local standards.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store products according to manufacturer instructions.

D. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.7 AMBIENT CONDITIONS

A. Section 015000 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.

B. Maintain temperature and humidity as recommended by sealant manufacturer during and after installation.

1.8 WARRANTY

A. Section 017000 - Execution and Closeout Requirements: Requirements for warranties.

B. Include coverage for:

1. Installed sealants and accessories failing to achieve watertight seal.
2. Installed sealants and accessories exhibiting loss of adhesion or cohesion.
3. Sealants that do not cure.

PART 2 - PRODUCTS

2.1 JOINT SEALERS

A. Manufacturers:

1. Bostik, Inc.
2. DAP Products Inc.
3. Dayton Superior Specialty Chemicals.
4. EMSEAL Joint Systems, Ltd.

5. GE Construction Sealants; Momentive Performance Materials Inc.
6. LymTal International Inc.
7. Master Builders Solutions.
8. May National Associates, Inc.; a subsidiary of Sika Corporation.
9. Pacific Polymers®; ITW Polymers Sealants North America.
10. Pecora Corporation.
11. Permathane®/Acryl-R®; ITW Polymers Sealants North America.
12. Polymeric Systems, Inc.
13. Schul International Company, Inc.
14. Sealex, Inc.
15. Sherwin-Williams Company (The).
16. Sika Corporation.
17. The Dow Chemical Company.
18. Tremco Incorporated.
19. Willseal LLC.
20. Substitutions: As specified in Section 016000 - Product Requirements.

2.2 JOINT SEALERS BY APPLICATION

A. High-Performance General-Purpose Exterior (Nontraffic) Sealant:

1. Material: Silicone or Polyurethane.
2. Comply with ASTM C920, Grade NS, Class 25, Uses M, G, and A.
3. Type: Single- or multiple-component.
4. Color: Standard; match finished surfaces.
5. Applications:

    a. Control, expansion, and soft joints in masonry.
    b. Joints between concrete and other materials.
    c. Other exterior nontraffic joints for which no other sealant is indicated.

B. Exterior Compressible Gasket Expansion Joint Sealer:

1. Description: Hollow neoprene (polychloroprene) compression gasket.
2. Comply with ASTM D2628.
3. Color: Black.
4. Size and Shape: As indicated on Drawings.
5. Applications: Exterior wall and parking area expansion joints.

2.3 ACCESSORIES

A. Primer:

1. Type: Non-staining.
2. As recommended by sealant manufacturer to suit application.

B. Joint Cleaner:

1. Type: Non-corrosive and non-staining.

2. As recommended by sealant manufacturer.
3. Compatible with joint forming materials.

C. Joint Backing:

1. Description: Round foam rod, compatible with sealant.
2. Comply with ASTM D1056, sponge or expanded rubber.
3. Size: Oversized 30 to 50 percent larger than joint width.

D. Bond Breaker:

1. Description: Pressure-sensitive tape.
2. As recommended by sealant manufacturer to suit application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for application examination.

B. Verify that joint openings are ready to receive Work of this Section.

C. Verify that joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for application preparation.

B. Comply with ASTM C1193.

C. Remove loose materials and foreign matter that could impair adhesion of sealant.

D. Clean and prime joints.

E. Protect elements surrounding Work of this Section from damage or disfiguration.

3.3 APPLICATION

A. Comply with ASTM C1193.

B. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated on Drawings.

C. Install bond breaker where joint backing is not used.

D. Apply sealant free of air pockets, foreign embedded matter, ridges, and sags.

E. Joint Tooling: Concave unless otherwise detailed on Drawings.

F. Precompressed Foam Sealant:

1. Do not stretch.
2. Avoid joints except at corners, ends, and intersections.
3. Apply with face 1/8 to 1/4 inch below adjoining surface.

G. Compression Gaskets:

1. Avoid joints except at ends, corners, and intersections.
2. Seal joints with adhesive.
3. Install with face 1/8 to 1/4 inch below adjoining surface.

3.4 CLEANING

A. Section 017000 - Execution and Closeout Requirements: Requirements for cleaning.

B. Clean adjacent soiled surfaces.

3.5 PROTECTION

A. Section 017000 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Protect sealants until cured.

END OF SECTION 079000

SECTION 330110.58 - DISINFECTION OF WATER UTILITY PIPING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Scope of Work
   1. Furnish all labor, equipment, materials and incidentals necessary to perform and complete the disinfection of potable water lines and appurtenances in accordance with the plans. All products and procedures shall be of the type and class specified herein.

B. Section Includes:

   1. Disinfection of potable water distribution system.
   2. Testing and reporting of results.

1.2 REFERENCE STANDARDS

A. American Water Works Association:

   1. AWWA B300 - Hypochlorites.
   2. AWWA C651 - Disinfecting Water Mains.

B. North Carolina Administrative Code
   1. 15A NCAC 18C – Rules Governing Public Water Systems

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Disinfection Procedure:

   1. Submit description of procedure, including type of disinfectant and calculations indicating quantities of disinfectants required to produce specified chlorine concentration.

C. Product Data: Submit manufacturer information for proposed chemicals and treatment doses.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Certify that final water complies with disinfectant quality standards of authority having jurisdiction.

F. Test and Evaluation Reports: Indicate testing results comparative to specified requirements.

G. Field Quality-Control Submittals: Indicate results of CONTRACTOR-furnished tests and inspections.

1.4 CLOSEOUT SUBMITTALS

A. Section 017000 - Execution and Closeout Requirements: Requirements for submittals.

B. Disinfection Report:

1. Type and form of disinfectant used.
2. Date and time of disinfectant injection start and completion.
3. Test locations.
4. Name of person collecting samples.
5. Initial and 24-hour disinfectant residuals in treated water in ppm for each outlet tested.
6. Date and time of flushing start and completion.
7. Disinfectant residual after flushing in ppm for each outlet tested.

1.5 QUALITY ASSURANCE

A. Perform Work according to AWWA C651 and 15A NCAC 18C.

PART 2 - PRODUCTS

2.1 DISINFECTION CHEMICALS

A. Chemicals:
1. Sodium Chlorite: Comply with AWWA B300-10.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that piping system has been cleaned, inspected, and pressure tested.

C. Perform scheduling and disinfecting activity with startup, water pressure testing, adjusting and balancing, and demonstration procedures, including coordination with OWNER and ENGINEER and with related systems.

3.2 PROCEDURE

A. Provide required equipment to perform Work of this Section.
1. Taps shall be made at the extremities of the line for introducing sodium hypochlorite and for monitoring chlorine concentration and collecting samples.

B. Flush lines to remove sediment and other foreign matter.

C. Introduce sodium hypochlorite solution into piping system to provide a uniform distribution of chlorine throughout the piping system. Powdered hypochlorite and hypochlorite tablets shall not be added directly to piping systems.
   1. All pipe, valves, fittings, and appurtenances connected to and forming a part of a potable water supply shall be disinfected in accordance with the procedures described in AWWA C651 Section 4.4.3 (The Continuous Feed Method).
   2. A solution of water containing concentrated sodium hypochlorite with 5-15% available chlorine shall be introduced into the line by regulated pumping.
      a. The solution shall be of such concentration that the line shall have a uniform minimum concentration of not less than 25 ppm total chlorine immediately after introduction.
      b. The sodium hypochlorite solution shall be distributed in the piping system by manipulating the chemical feed pump, the introduction of potable water, hydrants and taps at the extremities of the line to produce an even distribution of chlorine throughout the piping system.
      c. Pipelines may, at the option of the CONTRACTOR and in coordination with the OWNER and ENGINEER, be chlorinated in sections isolated by means of gate valves or other approved means.
      d. All valves on the lines being disinfected shall be opened and closed several times during the disinfection contact period, except those used to isolate the pipe from the main system.
      e. Disinfecting shall take place in the presence of the ENGINEER.

D. The chlorine solution shall remain in contact with interior surfaces of the piping system for a period of 24 hours, minimum.
   1. Free residual chlorine after 24 hours shall be not less than 10 ppm.
   2. Disinfecting shall be repeated as often as necessary and as directed by the ENGINEER and/or the OWNER until the minimum requirements are reached.
   3. The CONTRACTOR shall exercise extreme caution to ensure that the sodium hypochlorite solution does not enter active water mains.

E. Disposal:
   1. Neutralize disinfectant solution before disposal.
   2. Legally dispose of disinfection solution off Project Site.

F. After final flushing and before the new main is connected to the distribution system two (2) consecutive samples, taken at least 24 hours apart (unless otherwise specified by authority having jurisdiction), shall be collected.
   1. After water mains have been disinfected and flushed, the CONTRACTOR shall collect samples for turbidity and bacteriological analysis. Payment for testing shall be borne by the CONTRACTOR.
   2. All sampling shall be done in the presence of the ENGINEER or a representative of a certified laboratory and shall follow proper chain of custody procedures.
   3. The requirements of AWWA C651 shall dictate the number and locations of samples to be collected and tested based on the length and configuration of the constructed system. No water samples shall be collected from a fire hydrant.
   4. Bacteriological tests shall be performed by a State Certified Laboratory.
   5. Test results shall be provided to the ENGINEER by the authorized testing agency/firm immediately upon completion of the testing procedure.
   6. If test results are unsatisfactory, the CONTRACTOR shall re-flush and re-sample the line at no additional cost to the OWNER. If check samples fail then the disinfection procedure

shall be repeated until two (2) consecutive tests, taken at least 24 hours apart (unless otherwise specified by authority having jurisdiction), provide acceptable results.

7. If bacteriological tests of the samples indicate that the water quality is satisfactory, the OWNER may elect to place the water mains in service.

G. Replace permanent system devices that were removed for disinfection.

3.3 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Requirements for inspecting and testing.

B. Section 017000 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

END OF SECTION 330110.58

SECTION 330505.31 - HYDROSTATIC TESTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Hydrostatic testing of pressure piping.

B. Scope of Work
   1. Furnish all labor, equipment, materials, and incidentals necessary to perform and complete hydrostatic testing of all piping in accordance with the plans. All testing materials and procedures shall be of the type specified herein.

1.2 REFERENCE STANDARDS

A. American Water Works Association:

   1. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
   2. AWWA C605 – Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings

B. North Carolina Administrative Code
   1. 15A NCAC 18C – Rules Governing Public Water Systems

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Submit following items prior to start of testing:

   1. Testing procedures.
   2. List of test equipment.
   3. Testing sequence schedule.
   4. Provisions for disposal of flushing and test water.
   5. Certification of test gage calibration.

C. Test and Evaluation Reports: Indicate results of piping tests.

D. Qualifications Statement:

   1. Submit qualifications for applicator.

1.4 QUALITY ASSURANCE

A. Perform Work according to 15A NCAC 18C and AWWA standards.

PART 2 - PRODUCTS

2.1 HYDROSTATIC TESTING

A. Equipment:

1. Pressure pump.
2. Pressure hose.
3. Water meter.
4. Test connections.
5. Pressure relief valve.
6. Pressure Gage: Calibrated to 0.1 psi.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that piping is ready for testing.

C. Verify that trenches are backfilled.

D. Verify that pressure piping thrust restraints have been installed.

3.2 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Requirements for inspecting and testing.

B. Section 017000 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

C. Testing shall be in accordance with authorities having jurisdiction. If there are no indicated testing requirements by authorities with jurisdiction, then Testing shall be in accordance with the below requirements.

D. Testing of Pressure Piping:

1. Test system according to AWWA C600 and following:
   a. All testing shall be performed in the presence of the Owner, the Engineer, or other authorized representative.
   b. Prior to testing any segment of pressure main, care shall be taken to prevent the pipe from moving while under pressure.
   c. Water for testing purposes will be provided by the Owner. Contractor shall follow all policies and procedures to obtain, measure, and pay for the use of testing water.

d. Water used for testing pressure main installations shall be disposed of in a near-by sanitary sewer, as authorized by the local sewer authority, or in another location in accordance with state and federal laws and regulations.
e. The pressure test may be performed concurrently or separately with the leakage test.
f. The pressure test shall be performed after the pressure main has been backfilled and at least seven days after the pouring of the last thrust block.
g. At no time shall more than 1,000 linear feet of main be tested except as approved by the Owner or Engineer.
h. Tests of insulated and concealed piping shall be made before the piping is covered or concealed. No leakage will be allowed under the above tests for piping under or in buildings.
i. The Contractor shall notify the Engineer when the work is ready for testing with all testing done in the presence of the Engineer. All labor, equipment, water, and materials, including meters and gauges shall be furnished by the Contractor at his own expense.
j. When hydrants are in the test section, the test shall be made against the main valve in the hydrant.

2. Pressure test piping system according to AWWA C600 (ductile iron pipe), C605 (PVC pipe), and following:
3. Test Pressure
   a. Not less than 150 psig, or not less than 1.25 times the working pressure of the pipe at the high point, or not less than 1.5 times the working pressure at the low point, whichever is greater.
   b. Conduct hydrostatic test for a minimum of two consecutive hours.
   c. Introduced water from a temporary connection made in the pressure main or as approved by Engineer and Owner.
   d. Slowly fill (approximately one foot per second) section to be tested with water; expel air from piping at high points. Pressure shall be applied to the main by means of a hand pump for small lines or by use of a mechanical pump for larger lines.
   e. If permanent air vents are not located at all high points, the Contractor shall install corporation cocks at such points so the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied.
   f. Raise pressure to specified test pressure. Test duration shall be 2 hours minimum.
   g. Leakage is defined as quantity of water supplied to piping necessary to maintain test pressure during period of test.
   h. Compute maximum allowable leakage using following formula:

$$L = \frac{SD\sqrt{P}}{C}$$

L = testing allowance, gph.
S = length of pipe tested, feet.
D = nominal diameter of pipe, inches.
P = average test pressure during hydrostatic test, psig.
C = 148,000.

i. If pipe under test contains sections of various diameters, calculate allowable leakage from sum of computed leakage for each size.

j. Leakage:

1) If test of pipe indicates leakage greater than allowed, locate source of leakage, make corrections, and retest until leakage is within allowable limits.

2) Correct visible leaks regardless of quantity of leakage.

3) The allowable leakage for various pipe sizes and test pressures is graphically represented below:

Allowable Makeup Water per 1,000 Feet of Pipeline (Gallons/Hour)														
Test Pressure (P.S.I.)	Pipe Diameter													
	2	3	4	6	8	10	12	14	16	18	20	24	30	36
100	0.14	0.20	0.27	0.41	0.54	0.68	0.81	0.95	1.08	1.22	1.35	1.62	2.03	2.43
125	0.15	0.23	0.30	0.45	0.60	0.76	0.91	1.06	1.21	1.36	1.51	1.81	2.27	2.72
150	0.17	0.25	0.33	0.50	0.66	0.83	0.99	1.16	1.32	1.49	1.66	1.99	2.48	2.98
175	0.18	0.27	0.36	0.54	0.72	0.89	1.07	1.25	1.43	1.61	1.79	2.15	2.68	3.22
200	0.19	0.29	0.38	0.57	0.76	0.96	1.15	1.34	1.53	1.72	1.91	2.29	2.87	3.44
225	0.20	0.30	0.41	0.61	0.81	1.01	1.22	1.42	1.62	1.82	2.03	2.43	3.04	3.65
250	0.21	0.32	0.43	0.64	0.85	1.07	1.28	1.50	1.71	1.92	2.14	2.56	3.21	3.85
275	0.22	0.34	0.45	0.67	0.90	1.12	1.34	1.57	1.79	2.02	2.24	2.69	3.36	4.03
300	0.23	0.35	0.47	0.70	0.94	1.17	1.40	1.64	1.87	2.11	2.34	2.81	3.51	4.21

4. Pressure test HDPE piping according to the following:

a. Test Pressure: Not less than 150 psig based on the elevation of the highest point of the line or section under test.

b. The pressure testing of an HDPE line section shall be tested separately from the PVC and DIP line sections.

c. Maximum duration for pressure test, including initial and final phase of the test, shall not exceed eight (8) hours. If the test is not completed due to leakage, equipment failure, etc., depressurize the test section and then allow it to "relax" for at least eight (8) hours before bringing the test section up to test pressure again.

d. Introduce water from a temporary connection made in the pressure main or as approved by Engineer and Owner. Bleed as much air as possible.

e. Slowly fill (approximately one foot per second) section to be tested with water; expel air from piping at high points. Pressure shall be applied to the main by means of a hand pump for small lines or by use of a mechanical pump for larger lines.

f. Initially, the pressure within the test section shall be raised to approximately 160 psi and then allowed to be idle (no additional make-up water to be injected) for approximately 3 hours. During this 3-hour period, the test section shall be allowed to stabilize and come to an equilibrium stage. No additional make-up water shall be injected to the test section during this 3-hour stabilization period unless the line

pressure drops below 140 psi. In this case, make-up water shall only be injected to the test section to maintain a minimum of 140 psi (during the 3-hour stabilization period).

g. The final phase of the pressure test shall involve injecting make-up water to achieve an "Initial test pressure" of 150 psi (minimum) / 155 psi (maximum). The test section is then allowed to be idle (no additional make-up water to be injected) for a period of 2 hours. After this 2-hour period, make-up water is injected to re-establish the "initial test pressure."

h. Maintain pressure within plus or minus 5 psi of test pressure.

i. Leakage is defined as the quantity of water necessary to maintain test pressure during period of test.

j. If pipe under test contains sections of various diameters, calculate allowable leakage from sum of computed leakage for each size.

k. Leakage:
   1) If test of pipe indicates leakage greater than allowed, locate source of leakage, make corrections, and retest until leakage is within allowable limits.
   2) Correct visible leaks regardless of quantity of leakage.
   3) The allowable leakage for various pipe sizes is graphically represented below. If the actual make-up water quantity is equal to or less than the allowable amount, the pressure test passes. If the actual make-up water quantities are greater than the allowable amount, the pressure test fails.

l. Hydrostatic Pressure Testing of Gravity Lines
   1) Where indicated on the drawings, gravity lines shall conform to materials, testing methods, and acceptability standards meeting water main standards. A hydrostatic pressure test shall be conducted in accordance with the testing requirements except that the test pressure shall be as indicated on the drawings. The test shall be performed prior to the installation of any services.

END OF SECTION 330505.31

SECTION 331413 - PUBLIC WATER UTILITY DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Scope of Work
1. Furnish all labor, equipment, materials, and incidentals necessary to install and complete installation of potable water lines and appurtenances in accordance with the plans. All pipe and appurtenance material shall be of the type and class specified herein.
2. All pipeline and appurtenance excavation, bedding, pipe laying, jointing and coupling of pipe joints shall be completed as described herein.

B. Section Includes:

1. Pipe materials and fittings for public water distribution systems.
2. Tapping sleeves and valves.
3. Positive-displacement meters.
4. Pipe support systems.
5. Bedding and cover materials.

1.2 REFERENCE STANDARDS

A. American Society of Mechanical Engineers:

1. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.

B. ASTM International:

1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
3. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
4. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
5. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
6. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

C. American Water Works Association:

1. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
2. AWWA C105 - Polyethylene Encasement for Ductile-Iron Pipe Systems.
3. AWWA C110 - Ductile-Iron and Gray-Iron Fittings.
4. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

5. AWWA C115 - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
6. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast.
7. AWWA C153 - Ductile-Iron Compact Fittings.
8. AWWA C206 - Field Welding of Steel Water Pipe.
9. AWWA C600 - Installation of Ductile-Iron Mains and Their Appurtenances.
10. AWWA C605 - Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings.
11. AWWA C606 - Grooved and Shouldered Joints.
12. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In., for Water Transmission and Distribution.

D. Manufacturers Standardization Society of the Valve and Fittings Industry:

1. MSS SP-60 - Connecting Flange Joints between Tapping Sleeves and Tapping Valves.

E. NSF International:

1. NSF 61 - Drinking Water System Components - Health Effects.
2. NSF 372 - Drinking Water System Components - Lead Content.

F. North Carolina Department of Transportation:
1. Standard Specifications for Roads & Structures, latest edition.

1.3 COORDINATION

A. Section 013000 - Administrative Requirements: Requirements for coordination.

B. Coordinate Work of this Section with utility Owner/Jurisdiction and Engineer.

C. Do not interrupt service to facilities occupied by Owner/Jurisdiction or others unless approved by the Engineer and Owner no fewer than 72 hours in advance of proposed interruption and after arranging to provide temporary water distribution service and fire flow protection.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit product technical information regarding pipe materials, pipe fittings, valves, hydrants, and other appurtenances.

C. Product technical information shall be furnished to the Engineer for his review and approval prior to installation of any materials. The Engineer may augment the technical information or product or request substitute products and technical information if, in his opinion, it will best serve the interest of the Owner/Jurisdiction.

D. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

E. Preconstruction Photographs and/or Video: Submit digital files of photographs and/or video of Work areas and material storage areas in accordance with Section 013300.00 Submittal Procedures.

1.5 CLOSEOUT SUBMITTALS

A. Section 017000 - Execution and Closeout Requirements

B. Project Record Documents: Record actual locations of piping, valves, connections, thrust restraints, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 QUALITY ASSURANCE

A. Perform Work according to 15A NCAC 18C.

B. Valves: Mark valve body with manufacturer's name and pressure rating.

C. Materials in Contact with Potable Water: Certified according to NSF 61 and NSF 372, including marking “NSF-pw” on piping.

D. Perform Work according to the following requirements:
1. Comply with all requirements of utility Owner including the tapping of water mains and backflow prevention.
2. Comply with all standards of authorities having jurisdiction for potable water service piping, including materials, installation, testing, and disinfection.
3. Comply with standards of authorities having jurisdiction for fire suppression water service piping, including materials, hose threads, installation, and testing.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

B. Installer: Company specializing in performing Work of this Section with minimum three years' documented experience in installation of liner materials.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements:

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Storage:

1. Store materials according to manufacturer instructions.
2. Block individual and stockpiled pipe lengths to prevent moving.
3. Do not place pipe or pipe materials on private property or in areas obstructing pedestrian or vehicle traffic.
4. Store PE and PVC materials out of sunlight.

D. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Plastic materials shall be supported to prevent sagging and bending.
3. Plastic materials shall be covered with tarps.
4. Provide additional protection according to manufacturer instructions.

1.9 EXISTING CONDITIONS

A. Field Measurements:

1. Verify field measurements prior to fabrication.
2. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 WATER PIPING

A. General Requirements

1. All materials shall be first quality with smooth interior and exterior surfaces, free from cracks, blisters, honeycombs, and other imperfections, and true to industry-specified shapes and forms throughout. All materials shall be subject to the inspection of the Engineer at the plant, trench, or other point of delivery, for the purpose of culling and rejecting material which does not conform to the requirements of these specifications. Such material shall be marked by the Engineer, and the Contractor shall remove it from the project site upon notice being received of its rejection.
2. The use of couplings will not be allowed except as necessary and approved by the Engineer.
3. When the work requires the use of a transition coupling, the use of such couplings shall be as approved by the Engineer. When the nominal diameter of the pipe does not change, an approved transition coupling may be used, as necessary. In these cases, a ductile iron, mechanical joint, solid sleeve shall be used to join these materials. The solid sleeve shall be as specified for fittings and shall be the long body type. The appropriate gaskets shall be selected based on the outside diameter(s) of the material(s) being joined. All gaskets shall be as specified. In all cases, the gap between the pipe sections being joined shall not exceed 0.25 inches.
4. Where the nominal diameter of an existing water line changes as part of a rehabilitation project, an appropriate ductile iron, mechanical joint reducer, as specified for fittings, shall be used to joint these materials. The appropriate gaskets shall be selected based on the outside diameter(s) of the material(s) being joined. All gaskets shall be as specified.

5. All rubber gaskets for DIP pipe and fittings shall be in accordance with AWWA C111 and ASTM F477 for PVC pipe and fittings. All gaskets shall be a product of the pipe manufacturer, made specifically for the pipe being installed, and shall match the shape and configuration of the joint.
6. Pipes shall be insulated to protect against freezing to 5-degrees Fahrenheit.
7. Gaskets
    a. Gasket material shall be Styrene Butadiene Copolymer (SBR) unless otherwise noted.

B. Pressure Class Polyvinyl Chloride (PVC) Pipe
1. Comply with AWWA C900 (4" through 60") DR18 or DR14.
2. Fittings shall be ductile iron mechanical joint as described herein.
3. Joints:
    a. The pipe shall have bell and spigot ends with push-on, O-ring rubber gasket, compression type joints meeting the requirements of ASTM D3139 and ASTM F477.
    b. The lubricant used in making up the joints shall be furnished by the pipe manufacturer and shall be NSF approved.
    c. Solvent-cement couplings are only permitted on above ground or exposed piping where specified by the Engineer. Solvent cement shall conform to ASTM D2564.

C. PVC: Scheduled PVC
1. Scheduled PVC shall be used only in above ground, interior plumbing.
2. Comply with ASTM D1784 and D1785.
3. Schedule: 40, 80, or as shown on the Drawings. All piping to be NSF Certified Nylon Reinforced PVC.
    a. SCHEDULE 80 PVC PIPE
        1) Chemical feed, interior and sampling piping shall conform to ASTM 1785, Schedule 80. Material used to produce the pipe, couplings and fittings shall conform to ASTM D-1784, Type 1, Grade 1, 2000 psi design stress. Fittings shall conform to ASTM D-2467 for socket type and ASTM D-2464 for threaded type.
    b. SCHEDULE 40 PVC PIPE
        1) Exterior piping for the non-potable water system shall be Schedule 40 PVC conforming to ASTM D-1785. Pipe and fittings shall be manufactured in conformance with ASTM D-1784, Type 1, Grade 1.

4. Fittings shall be ductile iron mechanical joint as described herein.
5. Joints:
    a. The pipe shall have bell and spigot ends with push-on, O-ring rubber gasket, compression type joints meeting the requirements of ASTM D3139 and ASTM F477.
    b. The lubricant used in making up the joints shall be furnished by the pipe manufacturer and shall be NSF approved.
    c. Solvent-cement couplings are only permitted on above ground or exposed piping. Solvent cement shall conform to ASTM D2564.

2.2 FITTINGS

A. General

1. All fittings for any type of water distribution piping shall be ductile iron.
2. All fittings shall be installed per manufacturer's installation instructions. This may include the removal of spacers depending upon the pipe material.
3. Compact mechanical joint fittings shall be used for subsurface installations and compact flanged fittings shall be used for above-ground installations.
4. Coating and Lining:
   a. Bituminous Coating: Comply with AWWA C110.
   b. Cement-Mortar Lining: Comply with AWWA C104.

B. 2" Ductile Iron Fittings
1. Material: Grade 65-45-12 ductile iron in accordance with ASTM A536. Fittings shall have deep bell push-on joints with gaskets meeting ASTM F477. Transition gaskets are not allowed.

C. 3" through 64" Ductile Iron Fittings
1. Material: Ductile iron; comply with AWWA C110.
2. Compact Fittings (mechanical joint and flanged): Comply with AWWA C153.

2.3 UNDERGROUND PIPE LOCATION

A. Warning Tape
1. Provide and install an early warning detection tape above all underground piping.
2. Tape shall be 3" wide by 4 mils thick. Tape shall be solid blue in color with continuously printed caption in black letters "CAUTION – BURIED WATER LINE BELOW". Tape shall have a minimum tensile strength in accordance with ASTM D882.
3. Install approximately 18" below ground and directly over pipeline.

B. Tracer Wire
1. Where specified, provide and install tracer wire meeting the following.
   a. Wire shall be a minimum #14 AWG high strength copper clad steel conductor wire secured to the pipe at 10' maximum spacing and rated for direct burial use at 30 volts.
   b. Wire shall be insulated with 30 mil, high density, high molecular weight polyethylene (HDPE).
   c. Wire break load shall be a minimum 250 lbs.
   d. Install wire at the 12 o'clock position, directly atop the pipeline.

C. Tracer Wire Access Point
1. A tracer wire testing station shall be installed in every valve box.

2.4 PIPE SUPPORTS AND ANCHORING

A. Metal for Pipe Support Brackets:
1. Material: Structural steel.
2. Finish: Galvanized.
3. Coating: Bituminous paint.

B. Metal Tie Rods and Clamps or Lugs:
1. Material: Stainless steel.

2.5 CONCRETE ENCASEMENT AND CRADLES

A. Concrete:
   1. Concrete design: As specified.
   2. Type: Reinforced, air entrained.
   3. Compressive Strength: 4,000 psi at 28 days.
   4. Finish: Rough troweled.
   5. Reinforce concrete as specified.

2.6 MATERIALS

A. Bedding and Backfill:
   1. General: No rock, boulders, stone or debris larger than four inches shall be allowed in the bedding or backfill material. Deficient or unsuitable bedding or backfill material shall be replaced or substituted with suitable bedding or backfill material. Excavated material intended for use as bedding or backfill shall not be used if exceedingly wet nor shall trenches be backfilled if flooded or excessively wet.
   2. Stone: Stone used for pipe bedding and trench stabilization shall meet the gradation requirements of standard aggregate size No. 67.
   3. Soil: Soils for bedding and backfill are described in the ASTM D2487 Figure 1 soils classification chart, and, for purposes of these Specifications, are grouped into five (5) categories as follows, according to their suitability
      a. Class I Soil -Angular, 6 to 40 mm (¼" to 1½'), graded stone, including a number of fill materials that have regional significance, such as coral, slag, cinders, crushed stone, and crushed shells.
      b. Class II Soil - Coarse sands and gravels with maximum particle size of 40 mm (1½"), including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil types GW, GP, SW, and SP are included in this class.
      c. Class III Soil - Fine sand and clayey gravels, including fine sands, sand clay mixtures, and gravel clay mixtures. Soil types GM, GC, SM, and SC are included in this class.
      d. Class IV Soil Silt, silty clays, and clays, including inorganic clays and silts of medium to high plasticity and liquid limits. Soil types MH, ML, CH, and CL are included in this class. These materials are not recommended for bedding, haunching, or initial backfill.
      e. Class V Soil - Includes the organic soils types OL, OH, and PT, as well as soils containing frozen earth, debris, rocks larger than 1½ inches in diameter, and other foreign materials. These materials are not recommended for bedding, haunching, or initial backfill for any of the accepted pipe materials.

2.7 ACCESSORIES

A. Steel Rods, Bolt, Lugs, and Brackets:
   1. Comply with ASTM A36 and A307.
   2. Grade A carbon steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that existing utility water main size, location, and invert are as indicated on Drawings.

C. Existing Utilities
1. The Contractor shall be required to excavate to determine the precise location of utilities or other underground obstructions which are shown on the Plans and/or marked by the utility owners. Such location and excavation shall be performed prior to installation of the pipeline.
2. The Contractor shall notify all utility owners prior to excavation as required by the 1985 Underground Damage Prevention Act. Utility owners who are members of NC 811 may be notified by calling 811 (toll free) before any excavation or drilling. The Contractor will be fully responsible for damage to any utilities if the Owners have not been properly notified as required by the Underground Damage Prevention Act. All damage to such structures and pipelines and all damage to property or persons resulting from damage to such structures and pipelines shall be borne by the Contractor and shall be completely repaired within a reasonable time. No claim shall be made against the Owner for damage or delay of the work on account of the proximity of, or the leakage from, such structures and pipelines. Where high pressure gas lines are to be crossed, they shall be uncovered by hand excavation methods before other excavation near them is started.
3. Utility Owners may, at their option, have representatives present to supervise excavation in the vicinity of their utilities. The cost of such supervision, if any, shall be borne by the Contractor.
4. Conflicts with underground utilities may necessitate changes in alignment and/or grade of this construction. The Contractor shall notify the Engineer promptly upon the discovery of such conditions. Changes in alignment and/or grade shall be approved by the Engineer before construction may proceed.
5. When underground obstructions not shown on the Plans are encountered, the Contractor shall promptly report the conflict to the Engineer and shall not proceed with construction until the conflict is resolved.

3.2 PREPARATION

A. Preconstruction Site Documentation shall be in accordance with Section 013300.00 – Submittal Procedures.

B. Pipe Cutting:
1. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.
2. Use only equipment specifically designed for pipe cutting; use of chisels or hand saws is not permitted.
3. Grind edges smooth with beveled end for push-on connections.
4. In the case of slip joint pipe, the cut ends shall be tapered with a portable grinder or coarse file to match the manufactured taper.

C. Remove scale and dirt on inside and outside of pipe before assembly.

D. Prepare pipe connections to equipment in accordance with equipment manufacturer's requirements.

3.3 INSTALLATION

A. General:
   1. Pipe and fittings shall be laid as shown on the Drawings.
   2. Contractor shall provide all materials, labor, tools, equipment and incidentals required for the excavation, installation, backfilling and testing of water mains and associated appurtenances.
   3. Do not use flanged pipe, fittings, or valves or unions for underground (buried) piping. Fittings and valves for underground (buried) piping shall be mechanical joint. Flanged pipe, fittings and valves and unions shall be used on aboveground piping and piping in vaults.
   4. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used as specified, unless otherwise indicated.
   5. All pipe fittings, valves, hydrants and accessories shall be carefully lowered into the trench with suitable equipment in a manner that will prevent damage to pipe and fittings. Under no circumstances shall pipe or accessories be dropped or dumped into the trench. Any defective, damaged, or unsound material shall be repaired or replaced as directed by the Engineer.

B. Bedding and Backfill:
   1. General:
      a. Place bedding material to the level shown on the Drawings.
      b. Work material carefully around the pipe to ensure adequate haunching.
      c. Minimum cover on pipes shall be 3 feet, unless otherwise required by authorities with jurisdiciton.
   2. PVC Pipe:
      a. After excavation is completed, bed with 4" of Class I, Class II, or No. 67 stone material to bring trench bottom to grade. Excavated native material may be used if material conforms to this specification.
      b. After the joint has been made, backfill to spring line of pipe with Class I, Class II, or No. 67 stone material. Additional bedding requirements are outlined in project drawings and shall be followed.
   3. Ductile Iron Pipe:
      a. After excavation and the joint has been made, bed with 4" of Class I, II, III, or IV bedding material. This may be the native trench bottom if material conforms to this specification.
      b. Compact backfill by hand tamping under the haunches of the pipe barrel to assure a firm circular bearing surface for the pipe taking care not to move or raise the pipe or in any way create a non-uniform bearing surface. Additional bedding requirements outlined in project drawings and shall be followed.
   4. Compaction:
      a. Backfill in 6- to 12-inch lifts. Tamp each lift carefully and uniformly so as to eliminate the possibility of lateral displacement of the pipeline.
      b. Compact pipe bedding and embedment material to 95% Standard Proctor.

C. Piping:
1. Comply with AWWA C600, C605, M41, and M23.
2. Handle and assemble pipe according to manufacturer instructions.
3. Steel Rods, Bolts, Lugs, and Brackets: Coat buried steel before backfilling.
4. Pipe Separation
   a. Lateral Separation of Sewers and Water Mains
5. Maintain 10 feet of horizontal separation between water main and sewer piping.
   a. If local conditions or barriers prevent a 10-foot separation:
      1) The water main shall be laid in a separate trench with the elevation of the bottom of the water main at least 18 inches above the top of the sewer; or
      2) The water main shall be laid in the same trench as the sewer with the water main located at one side on a bench of undisturbed earth, and with the elevation of the bottom of the water main at least 18 inches above the top of the sewer.
   b. Crossing a Water Main over a Sewer
      1) The water main shall be laid at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer, unless local conditions or barriers prevent an 18 inch vertical separation in which case both the water main and sewer shall be constructed of ferrous materials and with joints that are equivalent to water main standards for a distance of 10 feet on each side of the point of crossing.
   c. Crossing a Water Main under a Sewer
      1) Both the water main and the sewer shall be constructed of ferrous materials and with joints equivalent to water main standards for a distance of 10 feet on each side of the point of crossing. A section of water main pipe shall be centered at the point of crossing.
   d. Crossing a Storm Sewer
      1) All water lines shall have a minimum 12 inches of vertical separation from storm sewers.
6. Pipe Insulation
   a. All outdoor piping 4” in diameter and smaller which is not buried shall be insulated except where specifically stated otherwise on the Drawings or in these specifications.
   b. Provide heat tape and controls as recommended by manufacturer for temperatures down to -10º f. This requirement shall also apply to piping in vaults.
   c. The piping shall be insulated with 1” thick polyfoam with the insulation laminated to an outside jacket of PVC with a finished color of white. The material shall be furnished in standard 25’ rolls with insta-grip closure.
   d. Fittings and valves shall be insulated with preformed white insulated fitting covers with 1” thick polyurethane foam insert.
   e. Pipe insulation shall be wrapped around pipe and trac locked down in position. Insulation shall be held in place by sealing trac with fastener-weld or equal.
   f. All butt joints and fitting covers shall be sealed with silicone sealant and then taped in place to provide a vapor barrier.
   g. Installation procedures and accessory materials shall all be in accordance with the pipe insulation manufacturer’s written instructions.
7. Connection to Existing Water Main/System
   a. The Contractor shall make connection to the old mains when and as directed by the Engineer. In no case shall the Contractor shut off the water or operate the fire hydrants or gate valves of the old distribution system. In case it becomes necessary to delay the cut-off, such instructions shall be given and obeyed without recourse.

At no time shall the Contractor operate any valves, gates, pumps, etc. All of these operations must be done by Owner's personnel.

b. In making connections to the old distribution system, valves shall be set as shown on the plans or at such designated place as the Engineer may direct. If due to unforeseen conditions, these locations have to be changed or additional valves or fittings added, the Contractor shall install the valves or fittings at the new locations upon approval by the Engineer. Payment for special fittings or couplings will not be made unless approved by the Engineer prior to installation.

c. The Contractor shall be responsible for determining and utilizing all measures required by the water utility Owner in tapping existing water mains. The Contractor shall also make appropriate arrangements with the water utility Owner based on the size and location of the tap indicated on the drawings.

d. If the proposed water extension does not begin at an existing valve, a new tapping sleeve and valve of the size specified shall be installed at the required location as specified. All tapping sleeves and valves shall be installed in accordance with MSS SP-60. Alternately, if water service interruption is acceptable to the Owner, a valve may be installed at the appropriate location in the existing water piping.

e. The Contractor shall be responsible for installing all backflow prevention devices or other "jumpers" as may be required by the Plans or the water utility Owner at the point of connection with the existing water system. For extensions of the existing system, the valve isolating the new system from the existing system will not be opened until all other water system construction has been completed and satisfactorily passed all testing in compliance with these specifications unless specifically authorized by the water utility Owner.

8. Thrust Block Installation

a. All turns, fittings, etc., that induce pressure which would cause separation of pipe, break-age, etc., shall be provided with adequate thrust blocks, unless otherwise shown on the drawings. Thrust blocks shall be constructed to the minimum dimensions shown on the drawings or as directed by the Engineer.

b. Thrust blocks shall be made of ready mix concrete with a minimum compressive strength at 28 days of not less than 3,000 PSI when tested in accordance with ASTM C39. Sakrete or any similar material will not be permitted under any circumstances.

c. Blocking shall be formed and placed in such a manner that the pressure to be exerted at the point of blocking shall be transferred to firm, undisturbed earth. Where possible, the concrete shall be placed so that the fitting joints will be accessible for repair.

d. All bolts and pipe joints shall be protected against contact with thrust block concrete by the installation of a 20 mil polyethylene film placed between the fittings and the concrete. Where any section of a main is provided with concrete thrust blocks, the hydrostatic pressure test shall not be made until seven days after installation of the concrete thrust blocks unless otherwise approved by the Engineer. Where trench conditions are, in the opinion of the Engineer, unsuitable for thrust blocks, the Contractor shall provide steel tie rods and socket clamps to adequately anchor the piping. All tie rods and clamps shall be given a bituminous protective coating or shall be galvanized.

e. The Contractor shall also be responsible for any damage or repairs caused by blow-outs of any insufficiently blocked pipe.

9. Joint Construction

a. All pipe joints shall be constructed in strict accordance with the pipe manufacturer's specifications and materials and any deviation must have prior approval of the Engineer.
b. The maximum deflection per joint of flexible joint pipe shall be that deflection recommended by the manufacturer. However, at no time will a deflection greater than 3 degrees (11 inches in an 18'-0" pipe section) be allowed.
c. Mechanical Joints
    1) Clean last 8-inches outside the spigot, and the inside of the bell of mechanical joint pipe to remove oil, grit, tar (other than standard coating) and other foreign matter from the joint and then paint area clean with an approved soap solution. The ductile iron gland shall then be slipped on the spigot end of the pipe with the extension of the gland toward the socket or bell end. The rubber gasket shall be painted with the soap solution and placed on the spigot end with thick edge toward the gland.
    2) Push entire section of pipe forward to seat spigot end in the bell. Press gasket into place within the bell, being careful to have the gasket evenly located around the entire joint. Move ductile iron gland along the pipe into position for bolting, insert all bolts and screw nuts up tightly with fingers. Tighten all nuts with a suitable (preferably torque-limiting) wrench. Tighten nuts that are spaced 180 degrees apart alternately in order to produce equal pressure on all parts of the gland. If effective sealing is not obtained by tightening the bolts to the specified torques, the joint shall be disassembled and reassembled after thorough cleaning.
    3) An adapter having a fitting bell and a mechanical joint socket may be used by the Contractor when joining an existing bell and spigot to a new mechanical joint.
d. Push-on Joints
    1) Clean gasket and spigot and inside of bell thoroughly to remove all direct and other foreign matter.
    2) Insert gasket furnished by the pipe manufacturer into the gasket groove in the bell. Gasket shall be properly seated in the grooves provided in the pipe bell.
    3) Using a non-toxic vegetable soap, apply a film by hand to the inside surface of the gasket that comes into contact with the entering pipe and to the first 1" of the spigot end of the entering pipe. Use only lubricant specified by the pipe manufacturer.
    4) Align entering pipe with the bell to which it is to be joined. Enter the spigot end into the bell until it just makes contact with the gasket. Apply sufficient pressure to force the spigot end past the gasket up to solid contact with the bell.
    5) When it is necessary to field cut pipe with rubber gaskets, chamfer the cut end 1/8 inch x 30 degrees and check for roundness before inserting into a rubber gasket bell.
e. Copper Joints: Pressure-sealed joints for copper tubing shall be made using proprietary crimping tool and procedure recommended by copper, pressure-seal-fitting manufacturer.

10. Ductile-Iron Piping and Fittings: Comply with AWWA C600.
11. Grooved and Shouldered Pipe Joints: Comply with AWWA C606.
12. Field Welding Materials: Comply with AWWA C206.
13. Exposed Piping

a. All exposed piping to be installed inside tanks, wetwells, vaults and buildings shall be installed as shown on the Drawings. All exposed pipe shall be ductile iron utilizing flanged joints unless otherwise noted.
b. All exposed ductile iron pipe, fittings and valves shall be field painted with two (2) coats of epoxy paint as recommended by the paint manufacturer. Color of paint shall be as selected by the Owner.

14. No pipe shall be laid except in the presence of the Engineer or his Representative or with special permission from the Engineer.
15. Route pipe in straight line, and re-lay pipe that is out of alignment or grade.
16. Pipe shall be removed at any time if broken, injured or displaced in the process of laying same, or of backfilling the trench.
17. High Points:
    a. Pipe shall be installed in a manner that minimizes localized high points in the piping.
    b. If unforeseen field conditions arise that necessitate high points, install air-release valves as specified, as indicated on Drawings, or as directed by the Engineer.
18. Bearing:
    a. Maintain bearing along entire length of pipe.
    b. Excavate bell holes to permit proper joint installation.
    c. Do not lay pipe in wet or frozen trench.
19. Prevent foreign material from entering pipe during placement.
20. Allow for expansion and contraction without stressing pipe or joints.
21. Close pipe openings with watertight plugs during Work stoppages.
22. Establish elevations of buried piping with not less than 3 feet of cover.
    a. Measure depth of cover from final surface grade to top of pipe barrel.

D. PE Encasement:
    a. Encase piping in PE where indicated to prevent contact with surrounding backfill material.
    b. Comply with AWWA C105.
    c. Terminate encasement 3 to 6 inches above ground where pipe is exposed.

E. Backfilling: Backfill around sides and to top of pipe as specified.

3.4 FIELD QUALITY CONTROL

A. Testing: Pressure test and disinfect as specified.

END OF SECTION 331413

SECTION 331417.10 MONOCLOR® RESIDUAL CONTROL SYSTEM (BULK)

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope of Work

1. This Section covers the work necessary by the Contractor, Residual Control System (RCS) Supplier, Owner, and Engineer, to furnish, install, test, and make ready for operation, a Residual Control System.

2. The RCS includes, but is not limited to the system control cabinet with PLC, water sampling cabinet, tank mixer, piping, valves, ancillary equipment as specified herein, installation, related testing, start-up, and training services.

3. The RCS Supplier shall furnish an entire Residual Control System consisting of the following major components:

   a. Compatible Tank mixing system as manufactured and supplied by PSI Water Technologies, Inc.
   b. Smart Control Center (SCC) – Integrated control panel with Human Machine Interface and data acquisition system.
   c. Water Quality Station (WQS) – Reagentless, amperometric probe type analyzer to be used in continuous measurement of Total Chlorine, pH, Temperature, and ORP simultaneously.
   d. Chemical Feed Skids (CFS) – Skid mounted system for injecting ammonia (liquid ammonium sulfate with typical concentration of 38%-40%) and chlorine (liquid sodium hypochlorite with typical concentration of 12.5%) in potable water.

B. System Description

1. The Monoclor® RCS is an automated system designed to continuously monitor the disinfectant level and precisely dose chemicals in order to control and maintain a disinfectant concentration target.

2. The Monoclor® RCS shall improve water quality through multiple processes:
   a. The reservoir shall have high energy, active mixing that ensures instantaneous reaction of introduced chemicals and ensure a homogenous water body that will not stratify.
   b. The Monoclor® RCS shall allow for optimization of the chloramine residual curve by continuous monitoring of water quality parameters and controlled dosing of ammonia and chlorine.

3. The system shall be designed for the following operating conditions
   a. Ambient Temperature: 0 to 35 °C (33 to 90 °F).

b. Relative humidity: 0 to 95%, non-condensing.

4. The system must maintain the incoming disinfectant residual within ± 0.2 ppm of the desired set-point within 48 hours after initial system start-up.

1.02 RELATED SECTIONS

A. All electrical, mechanical, metal, painting and instrumentation work included herein shall conform to the applicable Sections or Divisions of this project except as otherwise shown or specified.

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. American National Standards Institute (ANSI).
B. Underwriter Laboratory (UL): UL 508A- Industrial Control Panel
C. Occupational Safety and Health Administration (OSHA)
D. National Electrical Manufacturers Association (NEMA)
E. National Electrical Code (NEC)

1.04 QUALITY ASSURANCE

A. RCS Supplier Requirements

1. All equipment provided under this section shall be obtained from a single manufacturer, who shall:

a. Assume full responsibility for the completeness and proper operation of the RCS.
b. Have experience, be reputable, and be qualified in designing and manufacturing Residual Control equipment.
c. Have at least five years with Residual Control equipment for storage tanks ranging in capacity from 0.5 MG to 49 MG.
d. Supply units containing all necessary appurtenances and components for a complete and operating system conforming to this specification. The tank mixer shall be pre-assembled, piped, and factory-inspected to assure compliance with all operational requirements. Loose tank mixer components shall not be acceptable. No field assembly or wiring will be permitted with the exception of external conduits. Equipment footprint as shown on the drawings shall not be exceeded.

2. To ensure quality and complete unit responsibility, components of the RCS must be assembled to the furthest extent possible and inspected by the RCS Supplier at its facility. The complete RCS must be a regularly-marketed product of that manufacturer. The RCS Supplier must have physical plant, technical and design staff, and fabricating personnel to complete the work specified.

3. The Owner reserves the right to be present at the fabricator’s facility for visual inspection of equipment to be supplied.

B. Specified Manufacturer

1. Residual Control System shall be Monoclor® RCS as manufactured and supplied by PSI Water Technologies, Inc., Campbell, California, (408) 370-6540.
2. No equal.

C. Warranty

1. Prior to acceptance of the Residual Control System, provide written warranty from the RCS Supplier that includes the following statements:

   a. RCS Supplier has inspected the installation during and after completion and the Residual Control system is free from faults and defects and is in conformance with the Contract Documents.

2. Equipment shall be warranted to be substantially free from defects in material and workmanship and conform to the specifications applicable to the product for 12 months from installation (with the completion of an Installation Activity Report completed by an authorized PSI representative) or 18 months from shipment, whichever occurs first.

D. Product Submittals

1. The following product data shall be electronically submitted by the RCS Supplier for review and approval by the Engineer that the product provided conforms to the site-specific requirements prior to the fabrication of the systems:
   a. A certificate demonstrating that the mixer is tested and certified to meet NSF Standard 61 for Drinking Water System Components and NSF-Annex G for California Low-Lead Standards.
   b. General equipment specifications and data sheets for both the tank mixer.
   c. Product data sheets.
   d. Installation, start-up, operation and maintenance instructions.
   e. Factory-recommended maintenance schedule and list of recommended spare parts.
   f. Diagram indicating the electrical wiring to be installed onsite by which responsible party prior to and during the Monoclor® Residual Control System installation.
   g. Site specific information.

E. Operation and Maintenance Manuals

1. Detailed operation and maintenance (O&M) manuals for the RCS shall be provided by the Supplier to the Engineer for review and approval. At a minimum, the following shall be included:

a. Required Operation Data.
   1. Complete, detailed operating instructions for each piece of equipment.
   2. Explanations for all safety considerations relating to operations.
   3. Recommended spare parts lists.

b. Required Maintenance Data.
   1. All information and instructions required by plant personnel to keep equipment properly cleaned, lubricated, and adjusted so that it functions economically throughout its full design life.
   2. Maintenance summary forms.
   3. Explanation with illustrations as necessary for each maintenance task
   4. Recommended schedule of maintenance tasks.
   5. Lubrication charts and table of alternate lubricants
   6. Troubleshooting instructions.
   7. List of maintenance tools and equipment.
   8. Name, address, and phone number of manufacturer and manufacturer's local service representative for major system components.

F. Manufacturer Services

1. Prior to scheduling services by the RCS Supplier, the Contractor shall verify the equipment installation and provide the completed installation checklist with photo documentation. Upon receipt of the completed installation checklist with photo documentation, the RCS Supplier shall schedule start-up and training to take place no sooner than two (2) weeks. The Contractor shall coordinate testing requirements and scheduling with the Engineer.

2. The RCS Supplier shall be present at each jobsite for the following after the system is installed:

   a. Certification of proper installation, system startup, and functional testing.
      1. Installation inspection shall include supervising the correction of any defective or faulty work before acceptance by Owner.
      2. System startup shall include testing, calibrating, and adjustment of all components for optimum performance.
      3. Functional testing shall include inspection of integration of the provided equipment’s controls to the Owner’s SCADA system, etc.
   b. Training Owner’s personnel and providing detailed instructions in the operation, maintenance, and troubleshooting for the system including calibration procedures, alarm and fault conditions, monitoring and operational procedures.
      1. Upon request, a training manual will be provided with an outline of the training procedures.
      2. If requested, in addition to the initial training during startup, PSI will provide operator training at a per diem rate, with topic of instruction based on RCS operation and personnel needs.

c. Provide one trip for each jobsite for two days, travel time excluded, for tasks a and b above.

3. Services shall be provided by a technician that is factory-trained by the RCS Supplier and has demonstrated ability and experience in the installation and operation of the equipment.

PART 2 – PRODUCTS

2.01 RESIDUAL CONTROL SYSTEM

A. A PLC-based control panel containing system controls, water quality analyzer, tank mixer, chemical storage tanks, chemical feed skids, and all other necessary interconnecting wiring and hardware shall form a complete Residual Control System. Components of the RCS shall comply with this specification. All components of the Residual Control system shall be pre-assembled, piped, and factory-inspected prior to shipping. The installation contractor shall provide all interconnecting piping and conduit, which shall be PVC.

2.02 WATER QUALITY STATION

A. Water Quality Station consists of a reagentless amperometric probe type analyzer able to read at least residual chlorine or chloramine, pH, ORP, and temperature simultaneously.

B. At a minimum, the Water Quality Station shall have the following features, components, and functionality:

1. Materials
   a. Housing: Powder coated steel
   b. Enclosure Rating: NEMA 3R
2. Power Requirements: 115 VAC, 60 Hz
2. Sampling and discharge flow rate: 10 GPH
3. Maximum inlet pressure of flow cell: 30 PSI
4. HMI: 3.8“ LCD Touch Screen
5. SCC Communication: Modbus RS-485
6. SCADA Communication: 8 analog outputs
7. Real-time data acquisition on USB Flash Drive.
8. Sensors
   a. Total Chlorine Sensors
      i. Dual probe configuration
      ii. Type: 3-electrode amperometric
      iii. Measuring Range: 0 - 20 mg/L
      iv. Resolution: 0.01 mg/L
   b. pH Sensor
      i. Type: Combined 2-electrode type pH probe
      ii. Measuring Range: 0 – 14
      iii. Resolution: 0.01
   b. ORP Sensor
      i. Type: Single Junction
      ii. Measuring Range: +/-2000mV or range of ORP meter

iii. Measuring surface: Platinum Extended Tip

2.03 SMART CONTROL CENTER

B. The Smart Control Center (SCC) shall continuously monitor the water quality data from the WQS and issue dosing commands to the Chemical Feed Skids (CFS) to maintain residual levels at a predetermined set-point. The control panel shall house the operator interface terminal (OIT), PLC, and terminal strips to fully support the functions of water quality monitoring, and chemical feed skid dosing to precisely add disinfectant chemicals.

C. The control panel shall display all relevant operating parameters and/or alarm conditions. The OIT will serve as the operator interface, data input screen, and alarm log.

D. At a minimum, the Smart Control Center shall have the following features, components, and functionality:

1. Materials
   a. Housing: Powder coated steel
   b. Enclosure Rating: NEMA 4
2. Power Requirements: 115 VAC, 60 Hz
3. Allen Bradley MicroLogix 1400 programmable logic controller (PLC) with Ethernet communication protocol.
4. Human-machine interface (HMI): Magelis DT351 7.4” LCD touch screen
5. Ethernet based access to HMI software from computer or smartphone within same network
6. SCADA Communication:
   a. Modbus TCP/IP
7. Chemical feed skid controls.
8. Alarm Management System will produce an automated alert on the HMI if monitored parameters fall out of range of set-point values.
9. Real-time data acquisition on USB Flash Drive.
10. Three different levels of access: Viewer, Operator or Administrator.
11. Three operating modes: Off, Manual and Auto.

2.04 CHEMICAL STORAGE TANK

A. High density linear polyethylene (HDLPE) chemical storage tank(s) shall be provided for the following operating conditions:

CHEMICAL STORED	DIAMETER	WALL HEIGHT	CAPACITY (GALLONS)
Sodium Hypochlorite (12.5%)	33”	47”	120
Liquid Ammonium Sulfate (40%)	27”	47”	65

Under no circumstances will HDLPE tanks greater than 72” high be acceptable.

B. The chemical storage tank shall be upright, cylindrical, flat bottom, double wall tanks molded in a one-piece seamless construction by the rotational molding process (laminated or fabricated tanks will not be accepted. The material used shall be virgin polyethylene resin as compounded and certified by the manufacturer. All polyethylene resin material shall contain a minimum of a U.V. 15 stabilizer as compounded by the resin manufacturer.

C. The standard design specific gravity shall be 1.9. The minimum required wall thickness for the cylinder straight shell must be sufficient to support its own weight in an upright position without any external support. The top head must be integrally molded with the cylinder shell. The minimum thickness of the top head shall be equal to the top of the straight wall.

D. The chemical storage tank shall be properly vented and have a minimum of three inches clearance on all sides to allow for expansion and contraction.

E. The RCS Supplier shall provide one (1) submersible level transmitter per chemical storage tank according to the following specifications:
1. Operating pressure: 0-13 ft. w.c. (+/- 0.5% Accuracy)
2. 4-20mA output to chemical dosing controller
3. Materials: PVC housing and cable. Ceramic sensor diaphragm.
4. Model 59P as manufactured by Viatran or equal.

F. Unless otherwise specified, all pipe and fittings shall be Sch 80 PVC and all fasteners stainless steel.

2.05 CHEMICAL FEED SKIDS

E. Chemical Feed Skids contain chemical dosing controllers which provide feedback to and receives commands from the Smart Control Center and transmits signals to the chemical dosing pumps. One (1) chlorine feed skid and one (1) ammonia feed skid will be provided per Monoclor® Residual Control System.

F. Chemical Dosing Controller
1. Pump Control Options: Digital relay, analog (4-20mA), or power switch
2. Power Requirements: 115 VAC, 60 Hz
3. SCC Communication: Modbus RS-485
4. Housing: Black Polycarbonate
5. Enclosure Rating: NEMA 3R
6. Dimensions: 10.0” x 8.0” x 6.0”

G. Chemical Feed Skid:

1. Containment:
   a. Chemical resistant, UV protected black polypropylene
   b. 9 Gallons secondary containment

2. Peristaltic Pump:
   a. Metering pump is a positive displacement, peristaltic type tubing pump with a brushless variable speed motor, non-spring loaded roller assembly

located in the pump head, integral leak detection system, and flexible tubing with attached connection fittings.

b. Pump head is a single, unbroken track which requires no-tools maintenance and can be mounted on the left or right of the pump.
c. Pump provides front panel user touchpad controls for stop/start and configuration menu access and navigation, operating mode selection, and priming.
d. Pump is equipped with a 3.5" TFT color display for menu driven configuration settings, pump output value, service alerts, leak detection system alarms status, and remote input signal values.
e. Pump provides the manual control of pump output volume via flowrate setpoint.
f. Pump is used to remote control of pump output volume via 4-20mA signal.
g. Enclosure Rating: NEMA 4X (IP66)
h. Metering pumps shall be a Watson-Marlow Qdos CWT Peristaltic Pump or equal.

3. Piping/Unions: PVC Schedule 80

4. Seals: Viton or EPDM

5. Tubing:
   a. Sodium Hypochlorite: 1/4” I.D. reinforced PVC tubing.
   b. Ammonia: 3/8” O.D. flexible polyethylene tubing.
   c. NSF-61 Approved.

6. Pump skid accessories:
   a. PVC calibration column.
   b. PVC backpressure relief valve.
   c. PVC pressure relief valve.
   d. Wye strainer.
   e. Pressure transmitter
      i. Operating pressure: 0-100 PSI (+/- 0.5% Accuracy)
      ii. 4-20mA output
      iii. Digital display

7. Mounting:
   a. Mounting Clips: Chemical resistant, UV protected black polypropylene
   b. Pump Mounting Brackets: 316 Stainless Steel
   c. Mounting Hardware: 316 Stainless Steel

2.06 SCOPE FOR A SUBMERSIBLE PAX MIXER

A. This section covers submersible tank mixing systems up to 2.0 HP in size intended for continuous use while submersed in potable water storage tanks. Each mixer shall have the ability to function continuously on a year-round basis, regardless of drain and fill cycles. Each mixer shall consist of a water-filled submersible motor, an impeller and a non-submersible control center that houses all control electronics.

THE REQUIREMENT

A. CONTRACTOR shall furnish a PWM400V3 PAX Water Mixer with a PCC405V3 PAX Control Center and install submersible mixing system together with controls and accessories necessary for a complete and operable system.

B. UTILITY shall furnish electrical conduit with either 115VAC or 230VAC Single Phase voltage based on System configuration, a Safety disconnect switch and a 20 Amp non-GFCI circuit breaker up to the point of installation of the mixing system control center.

C. UTILITY shall also provide conduit from control center to tank penetration for submersible motor cable and penetration through tank for same cable.

REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Comply with the applicable reference specifications as specified in the General Requirements

B. Occupational Safety and Health Administration, OSHA

C. NSF/ ANSI Standard 61

D. Underwriters Laboratories Inc., UL 508

2.07 CONTRACTOR SUBMITTALS

A. NSF Certification
   1. Copies of the NSF-61 certified listing for all submersible mixer material being placed inside the tank and headspace, including the motor and power cable.

B. Installation, Operations, and Maintenance Manuals shall be obtained from the equipment manufacturer and submitted. The following sections shall be included:
   1. General equipment specifications and data sheets
   2. Installation, start-up, operation, and maintenance instructions
   3. Factory-recommended maintenance schedule
   4. Wiring diagrams specifying what electrical wiring needs to be done onsite during and prior to the installation, and by which responsible party
   5. List of equipment or tooling necessary for diagnostics, trouble-shooting, repair or general maintenance

2.08 QUALITY ASSURANCE

A. Each mixing system shall be tested prior to deployment according to standard engineering practices at the factory testing facilities.

B. Complete mixing system is NSF/ANSI Standard 61 certified by NSF

2.09 WARRANTY

A. For the period beginning with shipment to Buyer and ending on the time periods listed below, the Product is warranted to be substantially free from defects in material and workmanship and to conform to Seller's specifications applicable to the Product –
   1. Two (2) years on all supplied parts

2. One hundred twenty (120) days labor

2.10 PERFORMANCE

A. Mixing system shall completely mix reservoir according to the following minimum performance requirements. These requirements can be measured and validated after installation by operators with readily-available tools such as temperature probes and total chlorine grab samplers.

1. Temperature Uniformity

For tanks up to 2,000,000 gallons in volume: All temperatures shall converge to within 0.50°C (0.9°F) within 24 hours after mixer is installed and activated.

2. Disinfectant Residual Uniformity

For tanks up to 2,000,000 gallons in volume: Disinfectant residual within top five feet of tank and bottom five feet of tank will converge to within 0.20 ppm within 24 hours after mixer is installed and activated. During continuous operation of the mixer, under normal disinfectant dosing parameters, disinfectant residual will converge to within 0.20 ppm at least once every 24 hours.

2.2 GENERAL

A. Mixing system consists of an impeller mounted on a submersible motor and supported approximately three feet in height from the tank floor in order for it to launch a jet of water from the bottom of the tank up toward the surface of the water. Mixer control and operation shall be independent of tank drain and fill cycles to ensure constant mixing. Wet-side of Mixer shall weigh less than 60 pounds (~27 kg) and dry-side shall weigh less than 70 pounds (~32 kg). Both wet-side and dry-side shall be able to be hoisted, installed, and/or removed by on-site personnel without additional equipment needed, and so that there is no crush hazard or entanglement hazard present, and so that weight of mixer on tank floor does not cause damage to interior coating.

B. Mixing system active components shall be elevated at a minimum of 18 inches above tank floor to avoid disturbing accumulated tank sediment or entraining particles and causing accelerated wear of moving parts.

C. Mixers using submersible pump with slit or “water sheet” or horizontal motor mounting designs are not acceptable.

D. Mixers shall include a buoyancy mechanism to keep nozzle pointing upright no matter the angle of the tank floor

E. Mixers shall include integrated power cable as a lowering mechanism for simplicity

F. Mixer provider must have more than 1000 installation of similar equipment in potable water tank

G. Mixers shall have no oil-filled parts

H. All wet-side mixer components shall be certified by NSF to the NSF/ANSI Standard 61

I. Dry-side mixer components shall include sine filter to prolong motor life and reduce noise level.

J. Power source for mixer shall be 230VAC single phase grid power to allow unit to continue 24/7 operation where necessary.

K. No maintenance required on the wet-side components in typical potable water application

L. No passive mixing system allowed.

2.3 CONSTRUCTION

A. Components – wet-side: shall be NSF/ANSI Standard 61 certified.

Equipment entering tank shall not adhere to, scratch or otherwise cause damage to internal tank coating or put undue stress on the materials of the tank construction. Equipment shall fit through a standard hatch of size 18-inch x 18-inch or larger. UTILITY may prefer to puncture side-wall or ceiling of tank (in place of puncturing the hatch-way) to allow motor cable entry into the tank for ease of installation and protection against freezing/ice damage.

Each submersible mixer shall consist of the following components, regardless of the power source selected:

1. Nozzle
   AISI Type 316 Stainless Steel

2. Nozzle housing
   AISI Type 316 Stainless Steel

   Brush finish to minimize surface corrosion

   Buoyancy mechanism to keep nozzle pointing upright no matter the angle of the tank floor

   Chlorine/chloramine resistant rubber foot pad to avoid scratching tank floor

   Integrated power cable and lowering mechanism for simplicity

3. Motor
   AISI Type 304 Stainless Steel body

   Chlorine/Chloramine resistant rubber seals

   Fully submersible

B. Components – dry-side: 230VAC control center shall consist of the following components:

1. Enclosure
   Type 4 (NEMA 4) Lockable

   Weather Resistant

Overall weight of control center not to exceed 50 lbs.

Green and Red LED Indicator lights show motor status

White Power Indicator Led

Cooling Fan

2. Motor Controller/VFD
   Rated to 3.0 HP

   Operating temperature range -4 ºF to 131 ºF (-20 ºC to 55 ºC)

   HOA Switch

   Manual speed control

   Thermal shut-off protection built-in

   Current overload protection built-in
   SCADA outputs included:

      Digital Output signal indicating motor running

      Digital Output signal indicating fault

      Digital Input/output signal allowing remote motor on/off

      RS-485 or Dry Contact connections

      4-20mA Signal

3. Branch Circuit Protection
   Panel equipped with a 230VAC 20-Amp main breaker

4. Sine Filter

2.4 CONTROLS

A. Each unit shall be equipped with all necessary controls, inter-wired, to provide the following minimum functions:

1. On/Off switch to control power to mixer.
2. Automatically-activated motor shut-off if water level drops below motor height in tank.
3. Sine filter
4. Any other controls shown on electrical and instrumentation drawings.

2.5 ACCEPTABLE MANUFACTURERS:

A. PAX Water Technologies (Richmond, California)

PART 3 – EXECUTION

3.1 INSTALLATION

A. The CONTRACTOR shall furnish services of a factory-trained installation contractor or crew having experience with installation procedures and operation and maintenance requirements for the type of equipment installed under these specifications. Mixer must be able to be installed through a 18”x18” hatch. Mixer must be able to be installed without draining tank or taking tank out of service. Wet-side of Mixer shall weigh less than 60 pounds (~27 kg) and dry-side shall weigh less than 70 pounds (~32 kg). Both wet-side and dry-side shall able to be hoisted, installed, and/or removed by on-site personnel without additional equipment needed, and so that there is no crush hazard or entanglement hazard present, and so that weight of mixer on tank floor does not cause damage to interior coating.

B. Tank penetration is recommended to be above tank water line, typically through the hatch side-wall.

1. Fitting will prevent moisture intrusion into tank and ideally be horizontally oriented.
2. Fitting shall be 1” diameter fitting to allow cable to pass through.
3. Strain relief for power cable shall be part of the contractor-supplied fitting for tanks more than 30’ in depth.
4. For tanks more than 70’ in depth, or at customer’s discretion, a water-tight penetration may be installed under the water-line.

C. Installation of the in-tank (“wet-side”) components may be performed in any of the following ways:

1. Installation by a factory-trained and drinking-water-certified potable water tank diver.
2. Installation by personnel with confined space training while the tank is drained and empty.
3. Installation by tank manufacturer personnel during tank manufacture.
4. Installation below a hatch opening in a full tank utilizing a chain.

D. Installation of the outside-of-tank (“dry-side”) components may be performed by:

1. Third party representatives or CONTRACTORS according to the manual provided.
2. UTILITY personnel according to the manual provided

E. The mixer and control center shall be installed in accordance with approved procedures submitted and as shown, unless otherwise approved in writing from the Factory.

3.01 TRAINING

A. PAX Water Technologies staff (or their representatives) will instruct designated UTILITY personnel in the safe and proper operation of the PAX Water Mixer. This training will reference the operations manual provided with equipment and show how to check for proper functioning of the equipment.

3.02 FACTORY ASSEMBLY AND TESTING

A. The RCS shall be pre-assembled at the manufacturing location.

B. Factory testing shall include visual inspection of all equipment, complete assembly, and functional testing of equipment including leak testing, piping and instrumentation check, verification of control panel wiring and operation, and confirmation of proper operating parameters.

C. Engineer and/or Owner reserve the right to be present at the RCS Supplier's manufacturing facility to witness factory inspection. Engineer and/or Owner shall provide intent to witness factory inspection at the time of the design submittal review and approval, and RCS Supplier shall provide notice to Engineer and/or Owner regarding the scheduled time of the factory inspection at least five business days in advance of the proposed factory inspection.

D. The RCS Supplier shall maintain Quality Control documentation that includes system test settings and measured performance.

3.03 DELIVERY, STORAGE, AND HANDLING

A. The RCS shall be packaged and shipped so as not to incur damage to any portion of the equipment through handling and installation of the system itself.

B. The Contractor shall be responsible for the delivery, storage, and handling of products in accordance with the RCS Supplier's recommendations.

C. The Owner shall inspect all equipment and materials against approved Shop Drawings at time of delivery. Equipment and materials damaged or not meeting requirements of the approved Shop Drawings shall be immediately returned to the RCS Supplier for replacement or repair.

D. Equipment and materials shall be stored in a dry, chemical-free location and protected from the elements according to the RCS Supplier's instructions.

E. Equipment and materials shall be handled in an approved manner according to the RCS Supplier's instructions.

3.04 INSTALLATION

A. Manufacturer trained installation contractor, specific to the equipment under these specifications need to be provided.

B. The installation and startup is performed in accordance with manufacturer Operation and Maintenance Manual and instructions by personnel experienced in the operation of this equipment.

C. The PSI Service Team or an authorized contractor will complete the Installation Activity Report, which certifies the equipment installation it has been completed in accordance with Manufacturer's specification.

D. Qualified personnel will be provided by the equipment manufacturer to survey the equipment installation.

3.05 MANUFACTURER'S SERVICE AND START-UP

A. A factory technician from the RCS Supplier shall be present at the jobsite for initial system start-up and commission of equipment as specified in section 1.04.F. Factory technician will insure that the system is properly installed, start-up the system, and train the Owner's personnel.

B. Contractor and RCS Supplier shall make equipment adjustments required to place system in proper operating condition.

3.06 IDENTIFICATION AND MARKING:

A. The RCS, along with all applicable components, shall be marked and identified for all health, flammability, and reactivity of hazardous materials as required by all applicable jurisdictional building codes, statues, standards, regulations, and laws.

END OF SECTION

APPENDIX A
VENDOR EQUIPMENT LIST

MONOCLOR® RESIDUAL CONTROL SYSTEM
PSI Water Technologies, Inc. Project No. 425007

1MG KE TANK
CITY OF ELIZABETH, NC

PSI WATER TECHNOLOGIES
A cleanwater1 Company

Equipment Submittal

Submitted To:
City of Elizabeth
Eizabeth, NC 27909
Attn: Randy Lassiter

Prepared By:
PSI Water Technologies, Inc.
550 Sycamore Drive
Milpitas, California 95035
Telephone: (619) 578-9977
Project Manager: Craig Laque
April 24, 2025

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SECTION 1.0

STATEMENT OF CONFIDENTIALITY

This document and all information contained herein are the property of the PSI Water Technologies, Inc. and/or its affiliates ("PSI"). The design concepts and information contained herein are proprietary to PSI and are submitted in confidence. They are not transferable and must be used only for the purpose for which the document is expressly loaned. They must not be disclosed, reproduced, loaned, or used in any other manner without the express written consent of PSI. In no event shall they be used in any manner detrimental to the interest of PSI. All patent rights are reserved. Upon the demand of PSI, this document, along with all copies and extracts, and all related notes and analyses, must be returned to PSI or destroyed, as instructed by PSI. Acceptance of the delivery of this document constitutes agreement to these terms and conditions.

SECTION 2.0

FORWARDING LETTER

PSI WATER TECHNOLOGIES

A cleanwater1 Company

April 24, 2025

PSI File No. P24-6325 (Firm)
PSI Project Number 425007

Mr. Randy Lassiter
Elizabeth Water Department
Elizabeth, NC 27909

Re: 1MG KE Tank Monoclor® Residual Control System
Elizabeth, NC
Design Submittal

Dear Mr. Lassiter,

Enclosed please find our design submittal for the 1MG KE Tank Monoclor® Residual Control System to be installed in Elizabeth, NC. The design submittal has been prepared in accordance with PSI proposal P24-6325 (Firm).

We would be pleased to provide any additional information, clarifications, or meet with the Engineer, if so desired, to answer any questions. Please refer to Section 5.0 for our list of Clarifications, Notes.

Regards,

Craig Laque
Project Manager

SECTION 3.0

PROCESS DESCRIPTION

3.1 Residual Control Process Description
3.2 Major System Components
3.3 System Features/Advantages

3.1 PROCESS DESCRIPTION

The Monoclor® RCS Residual Control System developed by PSI Water Technologies, Inc. is an automated system for controlling disinfectant residual in drinking water storage tanks, reservoirs, distribution systems. The system can work for both chlorinated and chloraminated water systems. The PSI Monoclor® RCS system is designed to continuously monitor the disinfectant level and precisely dose chemicals (such as chlorine and ammonia) into the tank to achieve a process objective, such as to control and maintain a disinfectant concentration target.

The PSI Monoclor® RCS delivers increased stability and control of residual disinfectant by combining the powerful mixing energy at the point of injection and an advanced control algorithm to monitor and automatically dose an appropriate amount of disinfectant. The combination of a powerful mixing energy at point of injection, the proprietary control algorithm developed and extensively validated in a laboratory environment, and results from full scale installations ensure reliable and consistent performance of the disinfectant control system.

The powerful mixing energy at the point of injection ensures injected chemicals are rapidly dispersed throughout the distribution pipeline. The true genius in the Monoclor® RCS Residual Control System is the PLC-based control algorithm that allows for optimization of the chloramine breakpoint curve. The algorithm acts in two different modes and can shift automatically to adjust to the system conditions.

In the first mode, free Ammonia is present. A decrease in total Chlorine residual is detected by the algorithm and PLC and activates the Hypochlorite feed pump. The chemical is injected by a variable speed pump directly into the tank . By introducing the chemical directly into the distribution pipeline, it undergoes instantaneous reaction and is then evenly diluted, distributed, and completely mixed throughout the distribution system. As shown in Figure 2, the system detects an increase in Chloramine concentration as the chlorine level is increased.

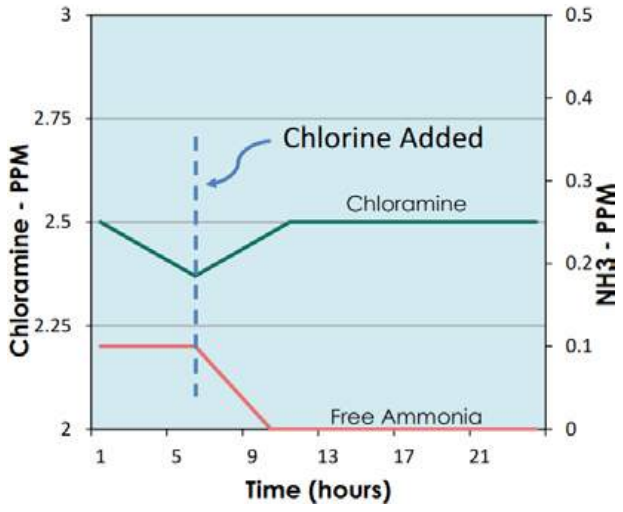


Figure 2. In the presence of free Ammonia, the Monoclor® RCS system injects Chlorine to raise the total chlorine residual back to the desired set point.

In the second mode, there is no free ammonia present. The Monoclor® RCS system detects this by tracking the chloramine concentration as hypochlorite is introduced to the system. Depicted the Figure 3, the Monoclor® RCS system recognizes that the chloramine concentration continues to drop even with the increase in chlorine levels, an indication that *di-* and *tri-*chloramine are being produced. The ammonia feed pump is initiated in addition to the chlorine already being added to the system until the set point is achieved.

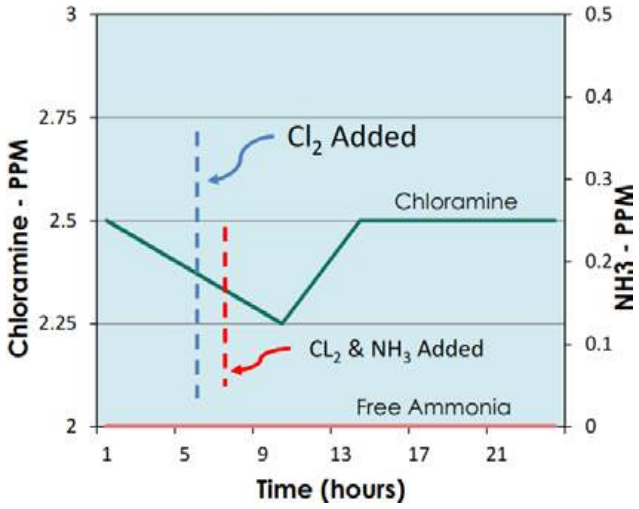


Figure 3. After detecting a continual decline in chloramine concentration while injecting chlorine, the Monoclor® RCS system introduces ammonia to the system. This allows for the chloramine concentration to return to the set point.

Under all circumstances, chemical feed can only be initiated upon confirmation of analyzer flow.

3.2 MAJOR SYSTEM COMPONENTS

Water Quality Station™ Water Sampling System

The Water Quality Station™ Water Sampling System (WQS) is an advanced water chemistry measurement system that precisely and continuously samples and measures the disinfectant chemistry inside a water tank or pipe. The WQS utilizes a set of sensors that measure the temperature, pH, Oxidation-Reduction Potential (ORP), and free chlorine. These measurements are displayed in real time on the Human-Machine Interface (HMI) display and are continuously logged onto a USB flash drive for analysis. Two WQS are used for this system. The first WQS will connect directly to the site PLC and the sample will be taken prior to the chemical injection point. The second WQS will connect to the Smart Control Center and the sample will be taken after the injection point.

Chemical Storage Tanks

The HDLPE Sodium Hypochlorite and Liquid Ammonia Sulfate storage tanks are sized to optimize storage capacity. A submersible level transmitter continuously monitors the liquid level in each tank. Fill, supply, return, and vent bulkhead connections are included in the tanks scope of supply. Top access is provided to facilitate the inspection of the tanks.

Chemical Feed Systems

Reliable chemical feed is required for precise control of Chloramine residual. The chemical feed system is designed with the necessary components to safely and precisely inject each chemical, Chlorine and Ammonia, into potable water. The system provides power and signal connections directly to the chemical dosing pumps via analog and digital signals activated by the electrical control panel. The chemical feed system also monitors the pump and provides feedback to the control panel. Based on this feedback, the control panel can activate any alarms and system response that are included in the extensive Alarm Management System. Accessories for each pump include a wye strainer, calibration column, diaphragm check valve, pressure relief valve, pressure transmitter with isolator, back pressure valve, and ball check valve. Each chemical feed pump and its accessories are factory-mounted on a polyethylene skid that includes secondary containment and an optical leak detector.

TANK MIXING SYSTEM

The upward rotational flow characteristics produced by the PAX Water Mixing System improve several water attributes. Complete mixing of the tank removes any isolation sections that could be subject to freezing. Moving cold water from the bottom of the tank upward to blend with the warm water at the top eliminates thermal stratification. Deploying the mixing system can easily be done in a few hours. The simple construction minimizes the amount of on-site assembly required. After the chemical feed connection is made, the unit is lowered into the tank through the hatch without the use of boats, divers, or confined space entry. By running the hose up the hatch, the need for making a penetration in the tank wall is eliminated.

Smart Control Center Electrical Control Panel

The Monoclor® RCS System includes a complete, pre-wired, electrical control panel consisting of a PLC and touchscreen human-machine interface (HMI). The touchscreen HMI provides access to the PLC which controls all functions of the residual control system.

The Smart Control Center (SCC) is the "brain" of the Monoclor® RCS. The control panel is a controller, monitor and data acquisition system all in one. By having an intuitive and user-friendly interface, the control panel menu allows the operator to program a set point for the disinfection level and continuously monitors the water quality data from the WQS. When disinfectant levels fall below the set point, the control panel commands the chemical feed skid to precisely add disinfectant to maintain uniform and consistent water quality inside the tank.

As the WQS is continuously monitoring water quality and providing real-time feedback to control panel, the control panel is not only displaying the feedback for anyone to observe but also logging data from up to 24 operator-chosen outputs to an internal memory card inside the controller. This allows water system operators and managers to collect data on the quality of the water within the system for any duration of time from minutes to years. These data sets will allow utilities to evaluate day to day operations, react to unexpected changes in water chemistry and observe the effects of treatment plant changes on distribution system water quality. The system also has an extensive Alarm Management System built into the software that will alert the user of irregularities within the system and produce an automated response, from an alert on the screen to system shut down, in order to ensure safe operating conditions.

3.3 SYSTEM FEATURES/ADVANTAGES

The Monoclor® RCS Residual Control System offers maximum value measured by performance and reliability as well as capital, installation, maintenance, and operating costs. This is illustrated by the following system advantages:

a. **Real-Time Sampling and Analysis Maintains Constant Residual:**
The water in the distribution system is perpetually monitored by the Monoclor® RCS Residual Control System, which paces chemical dosing based on water flow. The powerful mixing energy at the point of injection ensures that the injected chemicals will rapidly react, dilute, and disperse throughout the distribution pipe.

b. **Minimum Installation Cost and Time:**
Most parts for the Monoclor® RCS Residual Control System are inventoried at the factory or can be quickly shipped by vendors, reducing lead times. Hypochlorite, ammonia, and sampling connections are all predetermined and are clearly indicated.

SECTION 4.0

SCOPE OF SUPPLY

4.1 Scope of Supply by PSI Water Technologies, Inc.
4.2 Scope of Supply by Others

4.1 SCOPE OF SUPPLY BY PSI

No	Item Description	Qty.
1.	**PWM250 Mixer Wet Assembly,** including: ▪ Stainless steel Ballast and Housing ▪ EPDM Molded Foot ▪ Integrated Power Cable ▪ 230V three phase 2 horsepower water-cooled motor powered by the PAX Control Center (PCC255) ▪ Chemical Injection Stems (Qty.1)- Shipped Loose for install ▪ Tank Penetration Strain relief – Shipped Loose for install	1
2.	**Control Center Dry Assembly with SCADA Compatibility**, including: **NEMA 4 Enclosure:** ▪ Lockable and weather resistant, 55 lbs. ▪ Green and Red LED Indicator lights to display motor status ▪ White LED Indicator light to display power ▪ Cooling fan **Motor Controller/VFD:** ▪ Allen Bradley, 230VAC single phase input, rated to 3.0 HP ▪ HOA Switches ▪ Thermal shut-off/Current Overload protection built-in ▪ Sine filter, Branch-circuit protection **SCADA outputs included**: ▪ Digital Output signal indicating motor running ▪ Digital Output signal indicating fault ▪ Digital Input/Output signal for remote motor on/off ▪ RS-485 or Dry Contact connections, 4-20mA signal	
3.	**Cable 130 ft.**, including: • Flat-jacketed 4 conductor, includes strain relief for tank penetration (Relief Shipped loose)	1
4.	**Smart Control Center, SCC1000** ▪ Allen-Bradley MicroLogix 1400 Programmable Logic Controller (PLC), Magelis DT351 7.4” HMI: Color LCD touch screen ▪ Communication: Ethernet based access to HMI software from computer or smartphone within same network ▪ Remote Monitoring Telemetry ▪ Water Quality Station Communication: Two wire twisted cable ▪ Chemical Dosing Controller: RS-485 port for chemical feed system communications ▪ SCADA: Modbus TCP/IP standard, analog output available ▪ Enclosure: Equal to or greater than Type NEMA 4	1

No	Item Description	Qty.
5.	**Hypochlorite Storage Tank,** including; ▪ 120 Gallon, Double Wall, HDLPE Construction ▪ Submersible Level Transmitter ▪ Tank Fittings ▪ Dimensions 34”D x 51”H	1
6.	**Chemical Feed System – Chlorine,** including; ▪ Skid: Black polypropylene, Piping : PVC Schedule 80 ▪ Pump: Watson Marlow CWT Pump, 7.93 GPH @ 110 PSI ▪ Secondary Containment: 12 gallons secondary containment ▪ Controller - Input/Output: 4 digital inputs, 2 digital outputs, 2 analog inputs, 1 analog output ▪ Controller - Communication: Modbus RS-485 with Smart Control Center ▪ Controller - Pump Control Option: Digital relay, analog (4-20 mA), power switch ▪ Accessories: o Calibration Column, wye strainer o Pressure Relief Valve, Back Pressure Regulator o Pressure Transmitter	1
7.	**Hypochlorite Storage Tank,** including; ▪ 120 Gallon, Double Wall, HDLPE Construction ▪ Submersible Level Transmitter ▪ Tank Fittings ▪ Dimensions 26”D x 41”H	1
8.	**Chemical Feed System – Ammonia (ASP),** including; ▪ Skid: Black polypropylene, Piping : PVC Schedule 80 ▪ Pump: Watson Marlow CWT Pump, 7.93 GPH @ 110 PSI ▪ Secondary Containment: 12 gallons secondary containment ▪ Controller - Input/Output: 4 digital inputs, 2 digital outputs, 2 analog inputs, 1 analog output ▪ Controller - Communication: Modbus RS-485 with Smart Control Center ▪ Controller - Pump Control Option: Digital relay, analog (4-20 mA), power switch ▪ Accessories: o Calibration Column, wye strainer o Pressure Relief Valve, Back Pressure Regulator o Pressure Transmitter	

PSI WATER TECHNOLOGIES

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No	Item Description	Qty.
9.	**Water Quality Station, WQS1000** ▪ Water Connection: 3/8" Push-connect ▪ Sampling Flow Rate: 10 GPH ▪ Connectivity: Modbus RS485 Connection ▪ Data Logging: Real-time DAQ on USB flash drive ▪ Measurement - Total Chlorine: Dual Amperometric reagent less online sensor, 0-10 PPM measuring range, 0.01 PPM resolution ▪ Measurement – ORP Sensor (Platinum Extended Tip) ▪ Measurement - Temperature: 32-212° F measuring range, 0.1° F resolution ▪ Measurement - pH: 0-14 measuring range, 0.01 resolution ▪ Measurement - Water Level (optional): pressure transducer, resolution of 1% maximum scale ▪ Enclosure: Equal to or greater than Type NEMA 4X Stainless Steel rating	1
10.	**Submersible Sample Pump** ▪ STA – Rite JP Signature 2000, .5 HP, 120V, 7 GPM ▪ Pressure Reducing Valve, Globe Valve, pressure gauges , shipped loose for install	1
11.	**Tank Penetration Accessory** ▪ Stainless steel strain relief for 4 wire flat-jacketed cable	1
12.	**Manufacturer's Services for Installation Inspection, System Start-Up, and Operator Training (2 Days at the Jobsite)**	Included
13.	**Submittal and Operation & Maintenance Manual as Follows** ▪ Submittal: Sent Electronically ▪ O&M Manual: Sent Electronically	Included
14.	**FOB Factory, Milpitas, CA with Full Freight Allowed to Jobsite, Elizabeth, NC**	Included

4.2. SCOPE OF WORK BY OTHERS

1. PAX Mixers and Chemical Injection Stems.
2. Integration of Pax Mixer Control Center into Smart Control Center
3. Chemical Injection equipment and installation point.
4. Equipment unloading and installation.
5. Secondary containment of all equipment and piping.
6. Ammonia and Chlorine chemical supply.
7. Each chemical storage tank must be labeled appropriately according to local regulations. Check with your local regulating agency for requirements.
8. Proper distance between chemical storage tanks must be maintained according to local regulations.
9. All civil works and concrete pad for equipment.
10. Any underground or structural work.
11. Water piping from booster pump outlet to tank/reservoir hatch.
12. Tank mounted fitting boxes for chemical and sample lines.
13. All interconnecting piping, including between chemical storage tanks, metering pumps and accessories motive water supply, water sampling cabinet/station, and connections at hatch.
14. Electrical power to the following.
    A. Water Quality Station (100-240VAC/1Ph/60Hz for 10A).
    B. Smart Control Center (100-120VAC/1PH/60Hz for 10A).
    C. Chemical Feed Skid(s) (100-120VAC/1Ph/60Hz for 15A).
15. Any electrical conduit runs.
16. Any tank recoating services, labor, or parts.
17. All hose, pipe and tubing supports, strut, and clamps.
18. Freeze protection for all tubing and piping external to the reservoir, if required.
19. All electrical conduit, wiring, electrical material (including disconnect switches), etc. between control panel, metering pumps, SCADA, etc.
20. Hatch penetrations or modifications.
21. Room ventilation, air conditioning, or lighting.
22. Videotaping.
23. All taxes, fees, lien waivers, bonds and licenses.
24. Permitting or regulatory approval.
25. Valves, fittings, appurtenances not specifically listed under Scope of Supply by PSI
26. Any items not explicitly listed under Scope of Supply by PSI.

SECTION 5.0

CLARIFICATIONS, NOTES AND EXCEPTIONS

5.1 Clarifications and Notes

5.1 CLARIFICATIONS

1. This document applies to the equipment for the 1MG KE Tank. There is no written Engineering Spec to adhere to. As a result, there are no exceptions, only clarifications.

2. The Water Quality Station sample line must be installed in order to meet key criteria to operate as designed.

   A. The WQS needs 8-12 GPH of constant, consistent flow less than 30 PSI.
   B. The sample line must originate in a well-mixed area of the tank below the low water level.
   C. The Sample line must not originate in the chemical injection stream to avoid incorrect Residual levels.
   D. Unless otherwise noted it is assumed the analyzed water is routed to a drain.

2. The PAX mixer is designed to with internal buoyancy features that keeps the mixer upright while submersed. The mixer water inlet in close to the base of the mixer. As result, when the PWM250 is installed, any additional slack from the lifting chain and cable should be taught. This will help the mixer stay stationary and not drift in the tank to an area where it will be less effective.

4. Drawing 5.2025.04.04_KE_White_Water_Tower from Withers Ravenel Engineering was reviewed with following comment. Details can be found in the Water Sampling Section 7.

   A. Drawing C2.00 Elevated tank Plan details shows the Water Quality Station Submersible Sample Pump Configuration. The Submersible sump pump applied to his job has a flow rate of 5 Gallons per Minute. As result ancillary equipment and piping arrangements needed to accommodate derating the flow before it gets to the Water Quality Station is necessary.
   B. With the above point A, PSI Water Technologies recommends adding a globe or throttle valve with a water return loop from pump discharge. This loop is fab with a simple PVC T and a globe or throttle valve. This loop should be inside the tank, above the high-water line. This will help relief the initial high-water flow and pressure. The additional components of the pressure gauges and pressure relief valve can be installed at the base of the tank. PSI will include the recommended valve, a pressure regulator and two pressure gauges. The installation of these including any additional hose, piping and reducers are by others. PSI will include a design drawing detailing this arrangement.
   C. The drawing shows Schedule 90 PVC piping connected to the Water Quality Station. The WQS Station inlet and discharge are ¼” ID hose barb. Please see Section 6 for details.

5.2 Exceptions 11 25 80:

1. 1.01.A.3.a states the supplier shall furnish an entire chemical disinfection system including a tank mixing system. PSI is of understanding the exiting PAX tank mixing system and chemical injection equipment is to be incorporated int the new Monoclor® System.

2. 1.01.A.5 states there is existing disinfection equipment to be installed as a back up to the new disinfection system. The existing Evoqua Depolox Analyzer will remain an interdependent piece of equipment. It will no be connected to the PSI RCS system in any way.

3. 2.02.B.1.2 identifies the Water Quality Station to have a power source rated at 240VAC, 50 Hertz. The WQS is designed to utilize a 120VAC/ 60 Hertz power input.

4. 2.03.D.2 identifies the Smart Control Center to have a power source rated at 240VAC, 50 Hertz. The SCC is designed to utilize a 120VAC/ 60 Hertz power input.

5. 2.04 Identifies the storage tanks fabrication characteristics. PSI is proposing Chlorine Tanks that are 250 Gallons, 32"W x 83"H. The ammonia tank is 90 gallons, 30"W x 41"H. Tank Fittings will be shipped loose for installation by the contractor. This will allow easier fitting configuration to match piping. Details can be found in Section 8.3. Please review dimensions to ensure they will fit in the designed containment areas.

6. 2.04.E specifies the storage tank level sensor. Since the origin of this proposal PSI has transitioned to the use of the Level Pro Controller as its standard. PSI is submitting Level Pro Model 200C as an equal to the Viatran. Please see Section 8.3 for details.

7. 2.05.B.2 identifies the Chemical pump power requirements. The Chemical Feed Skids will be rated at 115VAC/ 60 Hertz.

8. Section 2.05.C.1.b states the Chemical Feed Skid has 9 Gallons of secondary containment. The updated Chemical Feed Skids are slightly larger with a 12 Gallon secondary containment capability. Please see Section 8.2 for details.

9. City of Thousand Oaks Drawing 24-17A (P001), the process flow diagram, shows the Water Quality Station (WQS) connecting to the Smart Control Center (SCC) thru a Skid Modbus Controller. The most robust and reliable method of connection is to install a 18AWG shielded twisted pair from the RS-45 terminals on the WQS to the SCC PLC adapters. Please see Section 8 for details.

SECTION 6.0

SCHEDULE

Please keep in mind that fabrication and shipment of the equipment typically takes between ten and twelve (10 and 12) weeks following design confirmation. The major components have been ordered. PSI is targeting the middle of June 2025 for delivery. PSI will provide updated equipment delivery estimates as we confirm delivery of all long lead time items. Note that mixers have already been delivered to the site.

The commissioning of the equipment will require the attention of PSI personnel. Please keep us posted as to the expected installation schedule so that we may schedule service personnel in advance.

PSI requires a minimum of three (3) weeks notification prior to performing onsite system start-up and operator training. PSI will work with you to attempt to accommodate your scheduling needs.

We look forward to working with you and are ready to offer whatever assistance possible to assure successful and timely completion of the project.

SECTION 7.0

TECHNICAL INFORMATION

7.1 UL Listing/ NSF Certification

CERTIFICATE OF COMPLIANCE

Certificate Number	MH66053
Report Reference	MH66053-2023-04-11
Date	2023-April-11
Issued to:	PSI Water Technologies, Inc. 550 Sycamore Dr Milpitas CA, 95035-7412 US
This is to certify that representative samples of	DRINKING WATER SYSTEM COMPONENTS See Addendum Page for Product Designation(s). Have been evaluated by UL in accordance with the Standard(s) indicated on this Certificate.
Standard(s) for Safety:	NSF/ANSI/CAN 61- 2022, Drinking Water System Components - Health Effects and NSF/ANSI/CAN 372 – 2022, Drinking Water System Components - Lead Content
Additional Information:	See the UL Online Certifications Directory at https://iq.ulprospector.com for additional information

This Certificate of Compliance indicates that representative samples of the product described in the certification report have met the requirements for UL certification. It does not provide authorization to apply the UL Mark. Only the Authorization Page that references the Follow-Up Services Procedure for ongoing surveillance provides authorization to apply the UL Mark.

Only those products bearing the UL Mark should be considered as being UL Certified and covered under UL's Follow-Up Services.

Look for the UL Certification Mark on the product.

Deborah Jennings-Conner

Deborah Jennings-Conner, VP Regulatory Services

UL LLC

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL. For questions, please contact a local UL Customer Service Representative at http://ul.com/aboutul/locations/

Statement of Certification to NSF/ANSI 61



UL provides testing and certification of water systems and components to ensure their safety for use in drinking water systems. Certification to the health effects requirements of NSF/ANSI 61 has been completed for these products which include all wetted components – including the entire frame, feet, motor, impeller, and motor cables shipped with all UWM50, PWM100, PWM150, PWM200, PWM250, PWM300, PWM400, PWM500, and PWM600 PAX Mixers.

PAX WATER TECHNOLOGIES

A cleanwater1 Company

550 Sycamore Drive
Milpitas, CA 95035
(866) 729-6493

SECTION 8.0

EQUIPMENT

8.1 Water Sampling System
8.2 Chemical Feed Systems
8.3 Reservoir Mixing System

PSI WATER TECHNOLOGIES

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SECTION 8.1

WATER SAMPLING SYSTEM

8.1.1 Water Sampling System Product Specification

8.1.2 Water Sampling System Drawings

8.1.3 Water Sampling System Product Data Sheets

8.1.3 Water Sampling Pump

WATER QUALITY STATION

The Water Quality Station (WQS) is a panel containing advanced water chemistry sensors for managing residual levels in the distribution system. The WQS continuously samples and monitors residual, pH and temperature inside storage tanks (as a minimum) and provides real-time alerts when there are unexpected changes in water quality.

The WQS is a panel of advanced sensors that analyze the water chemistry inside your tank to provide:

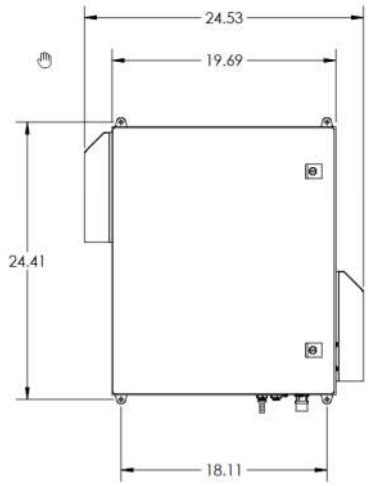
- Real-time data on water temperature, pH and chlorine (as a minimum)
- Alarm notifications when there are unexpected changes in water chemistry
- Remote monitoring of water quality in the distribution system (SCADA compatible)



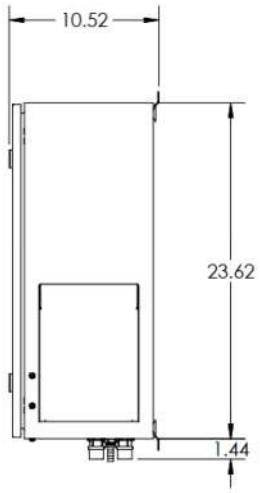


WATER QUALITY STATION™ SPECIFICATIONS		
Parameters	Total/ Free Chlorine Sensor(s)	Amperometric reagentless online sensor Measuring range: 0-20 PPM Resolution: 0.01 PPM 1-point calibration Automatic temperature compensation
	Temperature	Measuring range: 0-45°C (33-113°F) Resolution: 0.1°
	pH	Automatic temperature compensation Measuring range: 0-14 Resolution: 0.01 3-point calibration
	ORP	Measuring range: 0-1000 mV Resolution: 0.1 mV 2-point calibration
Operating Temperature		0-45°C (33-113°F)
Storage Temperature		Panel without Cl Sensor: 0 to 45°C (33 to 113°F) Chlorine Sensor: 5-40°C (41 to 104°F) dry and without electrolyte Electrolyte Gel: 5-25°C (41 to 77°F)
Max Operating Pressure		30 psi (with retaining ring)
Sampling and Discharge Flow Rate		Preferred value is 10 GPH (0.17 GPM or 0.63 LPM) Continuous

FRONT VIEW



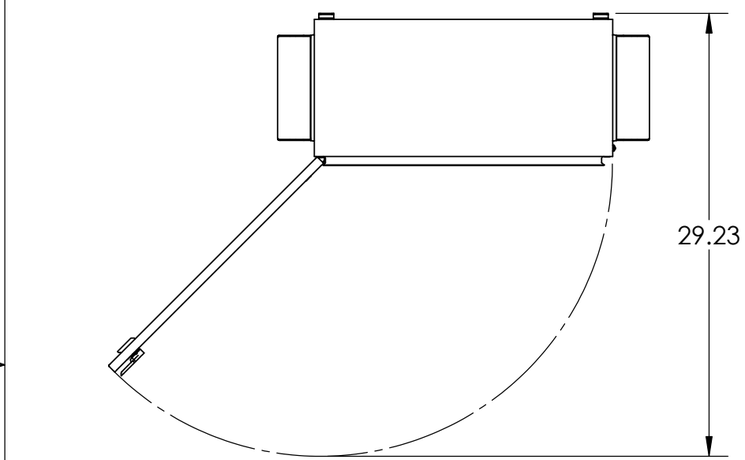
SIDE VIEW

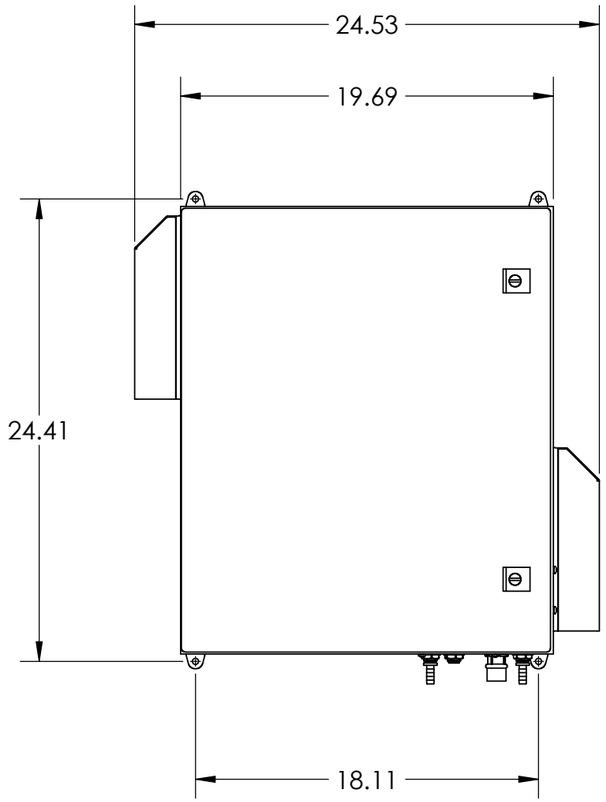


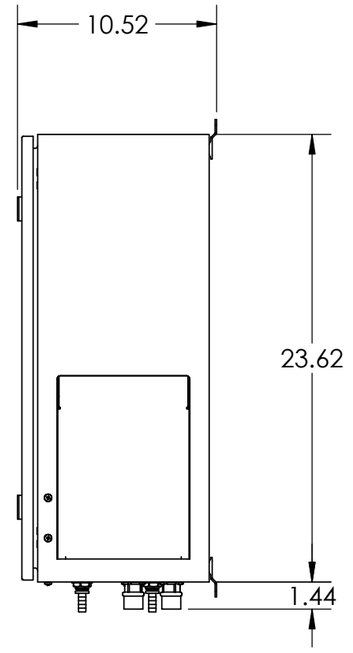
WATER QUALITY STATION SPECIFICATIONS	
HMI	3.8“ LCD Touch Screen
Flow Control	Adjustable regulator valve
Flow Verification	Flowmeter
Power Requirements	100-240 VAC, 50/60 Hz, 15 Watts
Water Connection	3/8” Push-connect
Connectivity	Ethernet connection with Smart Control Center RS-485 connection with Smart Control Center
Weight	Approximately 45 lbs (20kg)
Enclosure	18”H x 16” W x 8” D, powder-coated carbon steel Equal to or greater than NEMA Type 3R
Data Logging	Real-time data acquisition on USB Flash Drive of process variables every 30 seconds and alarms on occurrence
SCADA	8 Analog Outputs (4-20 mA or 0-10 V)

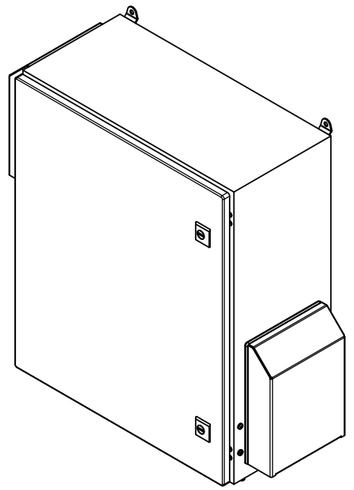
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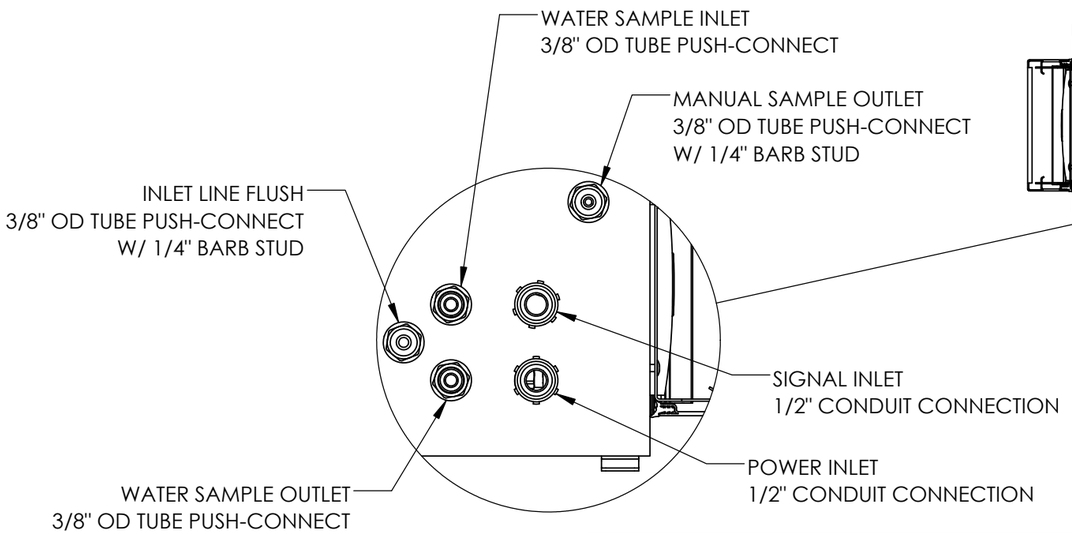
1. WEIGHT: 60 LB
2. INLETS AND OUTLETS: 3/8" COMPRESSION
3. MATERIALS OF CONSTRUCTION:
   - ENCLOSURE: MILD STEEL, NEMA 4, POWDER COATED GREY
   - TUBING: PU, NSF-61
   - FITTINGS: PP, PVC
   - GASKETS/SEALS: VITON/EPDM
4. DIMENSIONS: 2'-0"W x 0'-11"D x 2'-0"H
5. WQS POWER REQUIREMENTS: 120VAC, 1Ø, 15A SERVICE

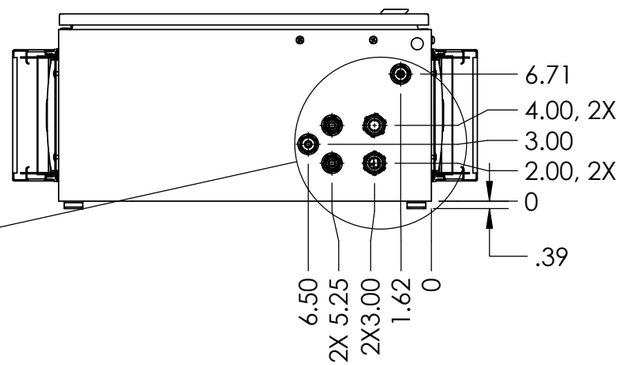












REV.	DATE	APPROVED	DESCRIPTION
A	11/3/2023	CL	PRODUCTION RELEASE
B	2/6/2024	CL	ADDED MANUAL SAMPLE OUTLET

DIMENSIONS ARE IN INCHES [MILLIMETERS] UNLESS OTHERWISE NOTED

TOLERANCES UNLESS OTHERWISE NOTED

INCHES	MILLIMETERS
.XX ±.03	.X ±.50
.XXX ±.005	.XX ±.13
DIAMETERS CONCENTRIC WITHIN Ø.005	DIAMETERS CONCENTRIC WITHIN Ø.13
HOLES ±.005	HOLES ±.13
ANGLES ± 1°	ANGLES ± 1°

MACHINED SURFACES TO BE 63 RMS EXCEPT AS NOTED

INTERPRET DIMS/TOLERANCES PER ANSI/ASME Y14.5-1994
DO NOT SCALE DRAWING

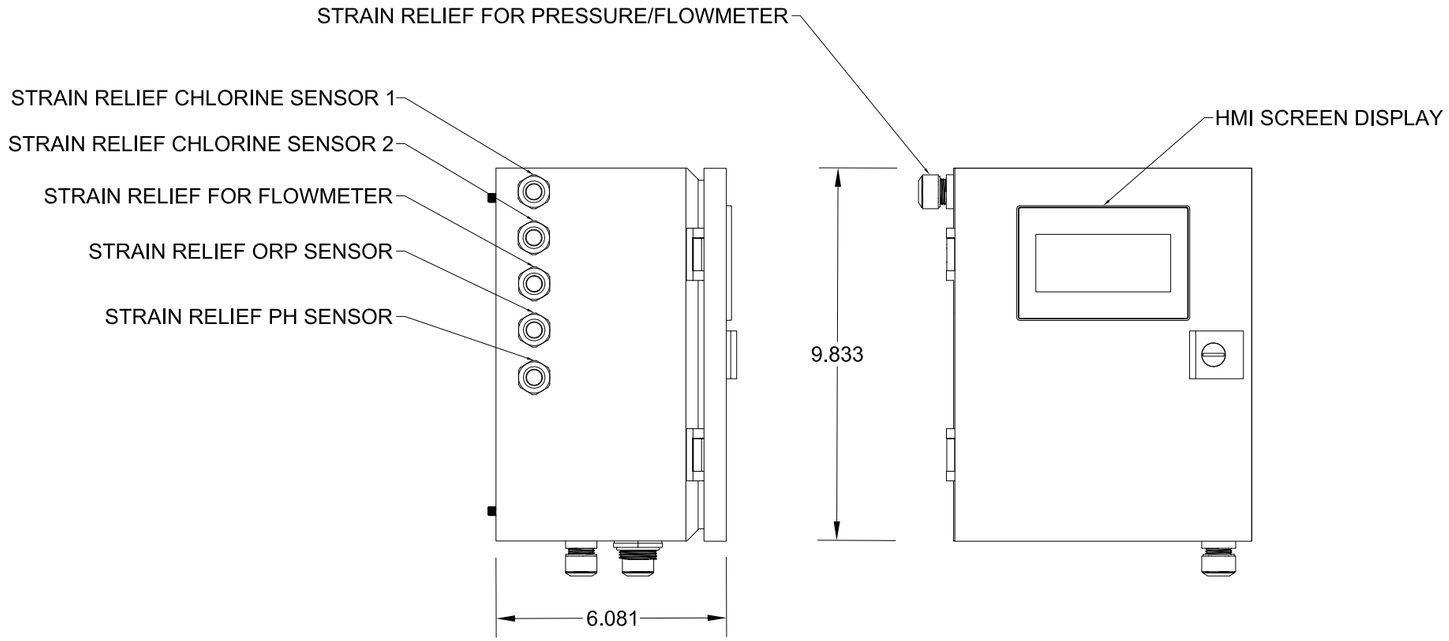
	NAME	DATE
DRAWN BY	C.LEVASH	11/3/2023
CHECKED BY	C.LEVASH	11/3/2023

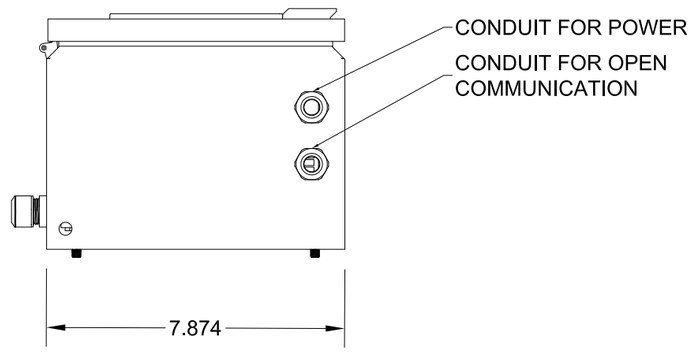
This drawing represents an investment by PSI WATER TECHNOLOGIES, INC. of substantial sums, including our engineering skills and experience. It is, therefore, loaned without consideration other than the agreement and condition that it is not to be used in whole or in part to assist in making or to furnish any information to others for the making of drawings, print apparatus, or parts thereof. The acceptance of this drawing will be construed as an acceptance of the forgoing conditions and as an admission of the exclusive ownership in and to the drawings of PSI WATER TECHNOLOGIES, INC.

PSI WATER TECHNOLOGIES
A cleanwater1 Company

TITLE:
WATER QUALITY STATION OUTLINE AND UTILITY DRAWING

SIZE	DWG. NO.	REV
B	000000-MN3000-OU	B
SCALE 1:8		SHEET 1 OF 1





REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
A	10/19/2023	TY	RELEASED				

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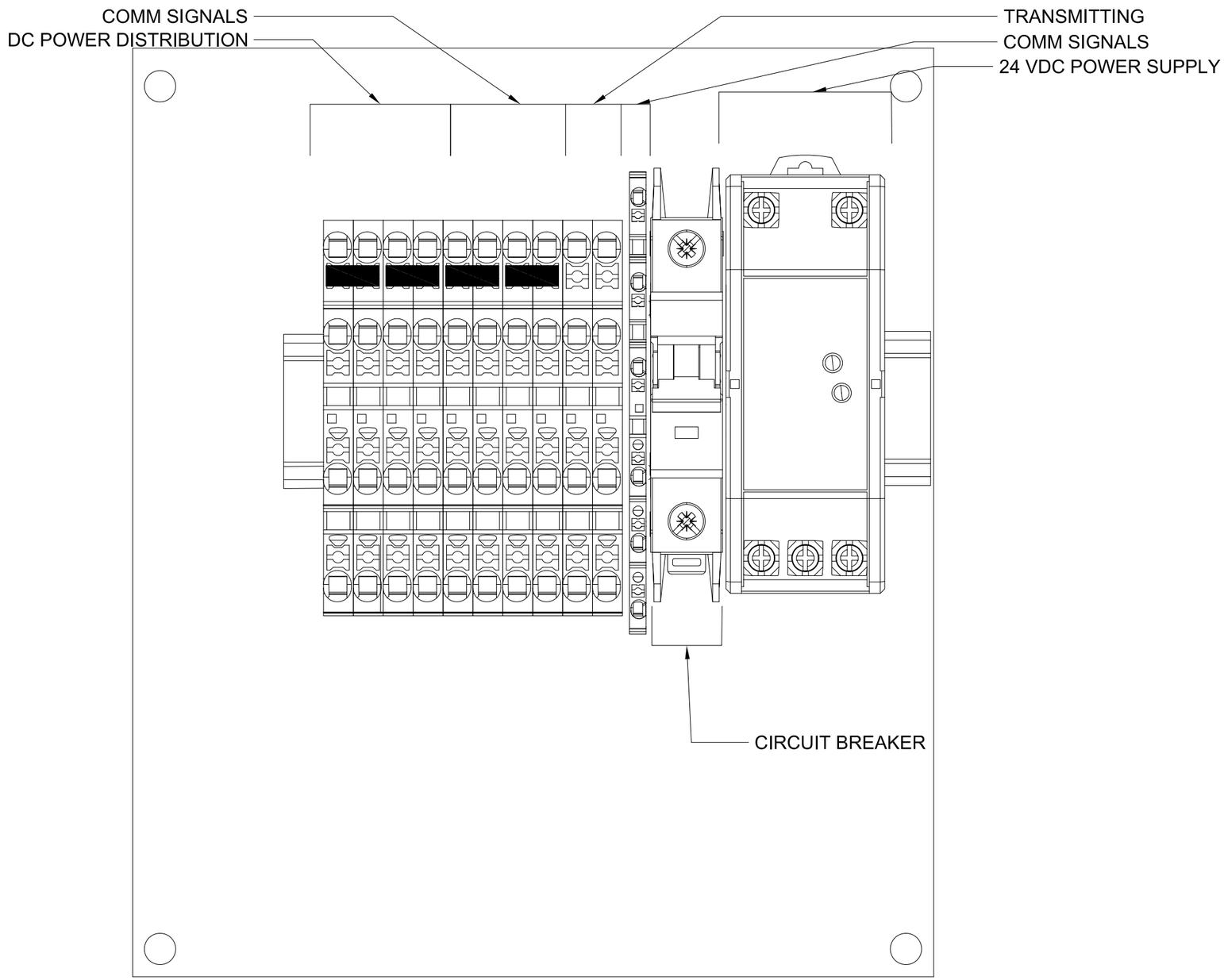
PAX Water Technologies
A UGSI SOLUTIONS COMPANY

DRAWN BY: T. YOUNG	DATE: 10/19/2023	
CHECKED BY: B. FRITZ	DATE: 10/19/2023	
SCALE: NONE	SIZE: D	

PROJECT: PAX WATER TECHNOLOGIES INC. STANDARD DRAWING

SUBJECT: WATER QUALITY STATION WQS ELECTRONIC ENCLOSURE ENCLOSURE LAYOUT

DWG #: 1101-XXXX-01 | SHEET 1 OF 5 | REV. A



REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
A	10/19/2023	TY	RELEASED	△			
△				△			
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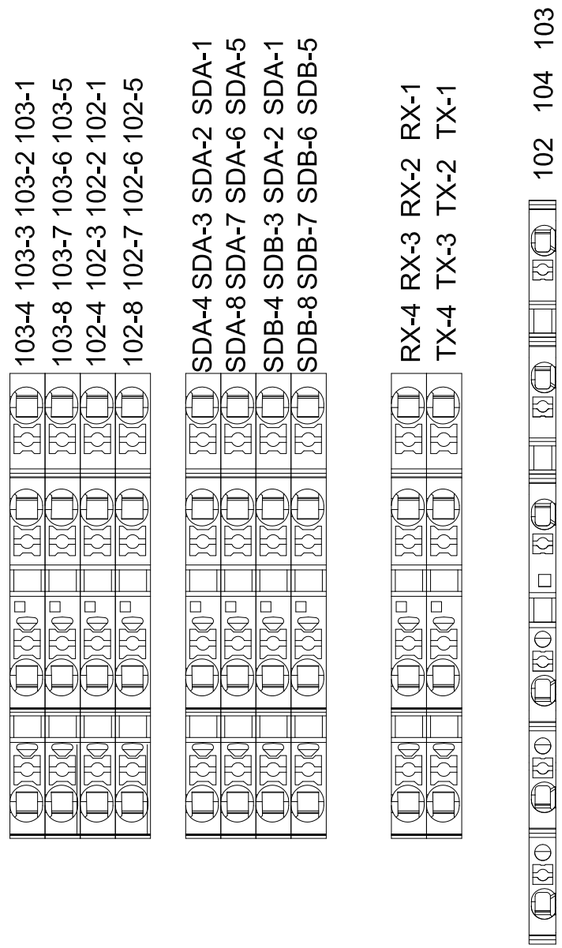
PAX Water Technologies
A UGSI SOLUTIONS COMPANY

DRAWN BY:	T. YOUNG	DATE: 10/19/2023
CHECKED BY:	B. FRITZ	DATE: 10/19/2023
SCALE:	NONE	SIZE: D

PROJECT:
PAX WATER TECHNOLOGIES INC.
STANDARD DRAWING

SUBJECT:
WATER QUALITY STATION
WQS ELECTRONIC ENCLOSURE
BACK PANEL LAYOUT

DWG #: 1101-XXXX-01 | SHEET 2 OF 5 | REV. A

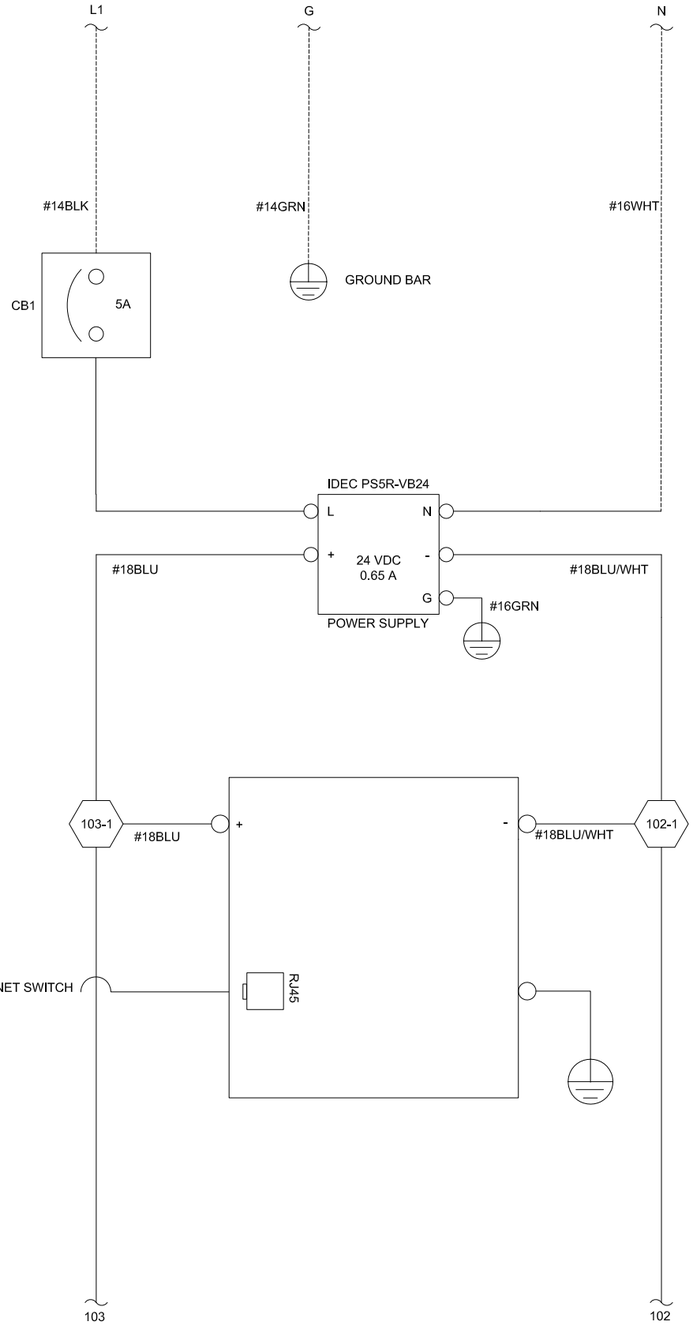


REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
A	10/19/2023	TY	RELEASED				

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PAX Water Technologies
A UGSI SOLUTIONS COMPANY

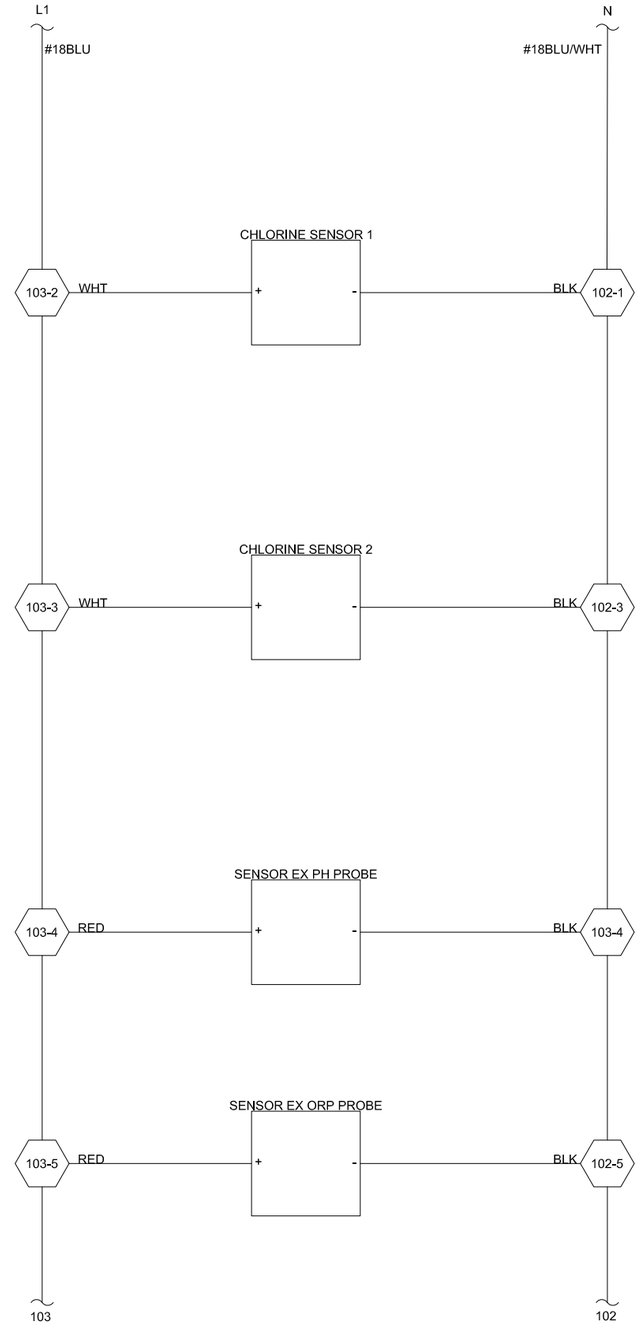
DRAWN BY: T. YOUNG	DATE: 10/19/2023	PROJECT: PAX WATER TECHNOLOGIES INC. STANDARD DRAWING
CHECKED BY: B. FRITZ	DATE: 10/19/2023	SUBJECT: WATER QUALITY STATION WQS ELECTRONIC ENCLOSURE TERMINAL BLOCK LAYOUT
SCALE: NONE	SIZE: D	DWG #: 1101-XXXX-01 | SHEET 3 OF 5 | REV. A



CB1
1 POLE DIN RAIL MOUNT 10 KAIC
5A@277VAC/48VDC
EATON FAZ-C5-1-NA-SP

PS1
24VDC 0.65A POWER SUPPLY
0.35A@120VAC, UL508
IDEC PS5R-VB24

PLC
SMART AXIS
12 DI/DO, 2AI/AO POINTS WITH ETHERNET
IDEC FT1A-C12RA-B

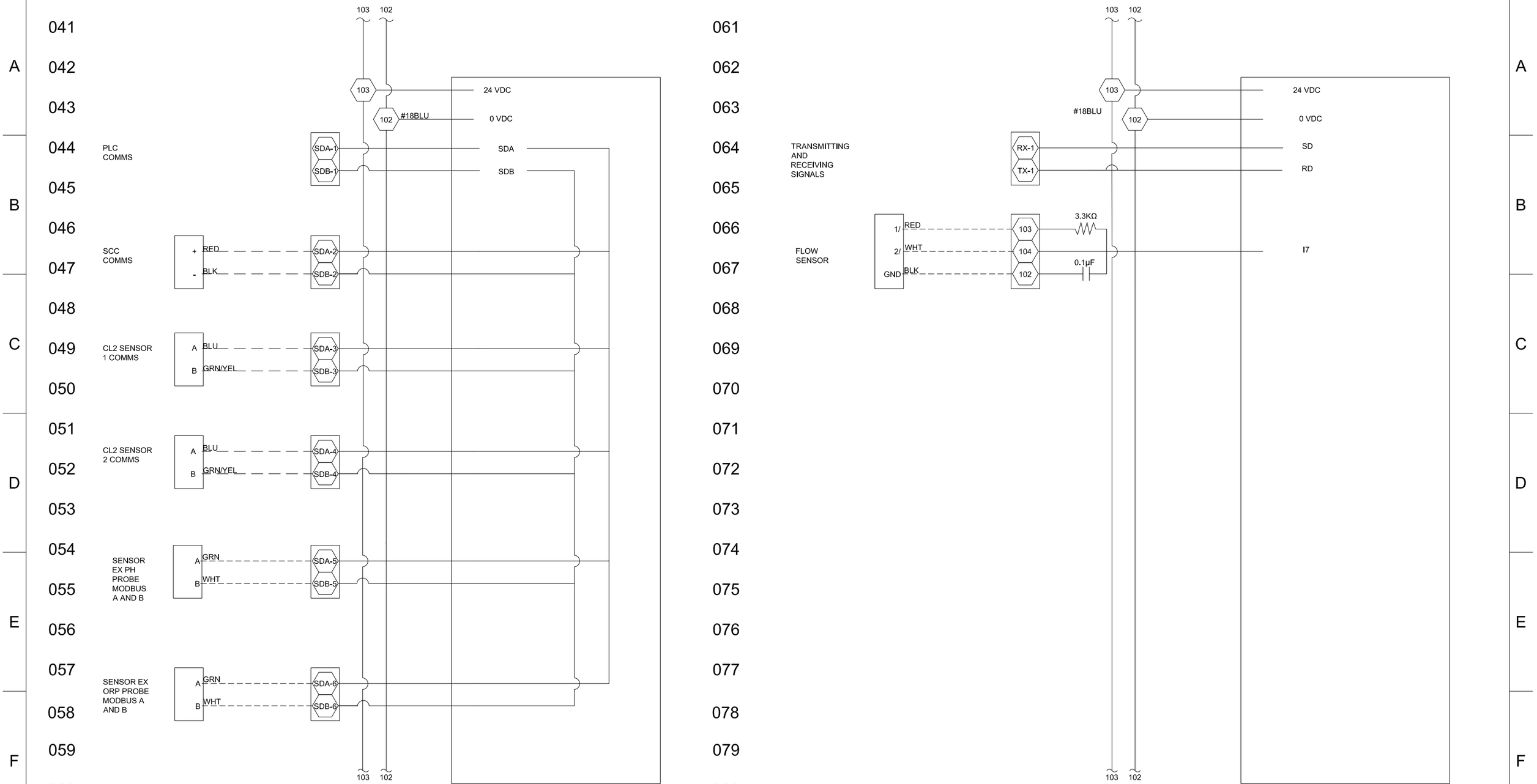


REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
A	10/19/2023	TY	RELEASED				

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PAX Water Technologies
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DRAWN BY: T. YOUNG	DATE: 10/19/2023	PROJECT: PAX WATER TECHNOLOGIES INC. STANDARD DRAWING
CHECKED BY: B. FRITZ	DATE: 10/19/2023	SUBJECT: WATER QUALITY STATION WQS ELECTRONIC ENCLOSURE WIRING LAYOUT
SCALE: NONE	SIZE: D	DWG #: 1101-XXXX-01 | SHEET 4 OF 5 | REV. A



REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
A	10/19/2023	TY	RELEASED				

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PAX Water Technologies
A UGSI SOLUTIONS COMPANY

DRAWN BY:	T. YOUNG	DATE:	10/19/2023
CHECKED BY:	B. FRITZ	DATE:	10/19/2023
SCALE:	NONE	SIZE:	D

PROJECT:
PAX WATER TECHNOLOGIES INC.
STANDARD DRAWING

SUBJECT:
WATER QUALITY STATION
WQS ELECTRONIC ENCLOSURE
WIRING LAYOUT

DWG #: 1101-XXXX-01 | SHEET 5 OF 5 | REV. A

Wallmounted enclosure – WM 8017.561 - WM242010NC

: 12.02.2019 build on www.rittal.com/ca-en



Product description

Material:	Door: Carbon steel, all-round foamed-in PU seal Housing: Carbon steel
Surface finish:	Housing and door: Dipcoat primed, powder-coated on the outside, textured paint Mounting plate: Zinc-plated
Color:	RAL 7035
Protection category IP to IEC 60 529:	IP 66
Protection category NEMA:	NEMA 4
Supply includes:	Housing with door(s) Door hinged on left Mounting plate Rear wall mounting holes Quarter turn latch with slotted head insert

Product features

Dimensions:	Height: 600 mm (24 ″) Width: 500 mm (20 ″) Depth: 250 mm (9.8 ″)
Material thickness::	Housing: 1.5 mm (0.06 ″) Door: 1.5 mm (0.06 ″) Mounting plate: 2.5 mm (0.1 ″)
Mounting plate:	Height: 570 mm (22 ″) Width: 449 mm (18 ″)

© Rittal 2019

Packaging unit:	1 pc(s).
Weight/packaging unit:	22 kg (48.5 lb.)
EAN:	83140

Approvals

Approvals:	UL

© Rittal 2019

Outlet filter Standard – SK 3238.200

created: 11.02.2019 on www.rittal.com/com-en



Product description

Description:	For ventilation by convection, an outlet filter can be installed in the upper and lower sections of the enclosure.
Material:	ABS Material resistance to UL 94-5VA
Colour:	RAL 7035
Protection category IP to IEC 60 529:	IP 54 including filter mat
Protection category NEMA:	with standard filter: NEMA 12
Supply includes:	Outlet filter Filter mat

Product features

Dimensions:	Width: 148.5 mm Height: 148.5 mm Depth: 24 mm
Required mounting cut-out:	Width: 124 mm Height: 124 mm
Packs of:	1 pc(s).
Weight/pack:	0.18 kg

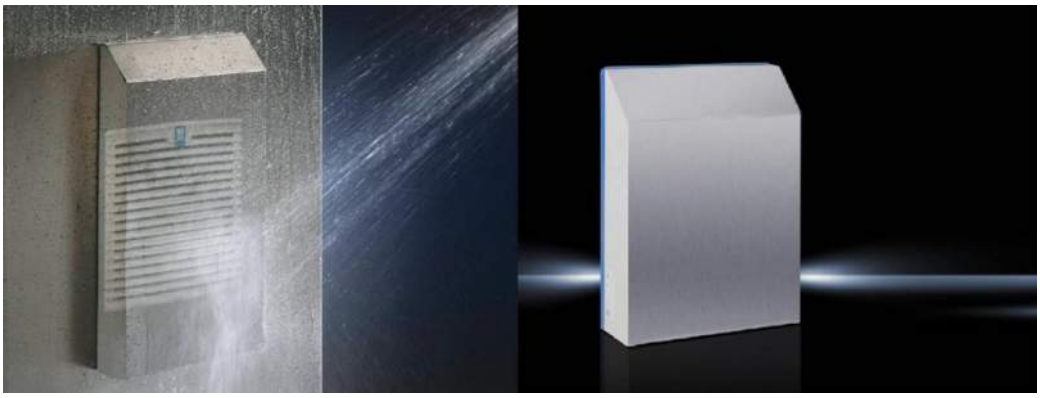
Customs tariff number:	39269097
ETIM 6.0:	EC002513
ETIM 5.0:	EC002513
eCl@ss 8.0/8.1:	27180706
eCl@ss 7.0/7.1:	27180706
eCl@ss 6.0/6.1:	27180706
eCl@ss 5.1/5.1.4:	27180706
Product description:	SK outlet filter, Standard, WHD: 148.5 x 148.5 x 24 mm

Approvals

Approvals:	CSA UL + C-UL - FTTA UR + C-UR

Hose-proof hood to increase the protection category – SK 3238.080

created: 11.02.2019 on www.rittal.com/com-en



Product description

Description:	For fan-and-filter units/outlet filters. Easy cleaning thanks to exterior silicone coating approved for use with foodstuffs.
Material:	Stainless steel Silicone
Protection category IP to IEC 60 529:	IP 56 when fitted over fan-and-filter unit/outlet filter with filter mat
Protection category NEMA:	with standard filter: NEMA 1 with standard filter: NEMA 12 with standard filter: NEMA 3 with standard filter: NEMA 4 with standard filter: NEMA 4X
To fit Model No.:	3238....

Product features

Dimensions:	Width: 176 mm Height: 245 mm Depth: 55 mm
Packs of:	1 pc(s).
Weight/pack:	1.52 kg
EAN:	4028177651685

Customs tariff number:	73269098
ETIM 6.0:	EC000744
ETIM 5.0:	EC000744
eCl@ss 8.0/8.1:	27182405
eCl@ss 7.0/7.1:	27189269
eCl@ss 6.0/6.1:	27189269
eCl@ss 5.1/5.1.4:	27180792
Product description:	SK hose-proof hood, for SK 3238…,, WHD: 176 x 245 x 55 mm

Approvals

Approvals:	CSA UL + C-UL - FTTA UR + C-UR

New Generation PLC

IDEC

FT1A Series SmartAXIS - Touch

Key Features

- 3.8" (3.7" monochrome) HMI with embedded 12 I/O PLC
- Available in Monochrome or 65K TFT color
- 740 cd/m² monochrome, 400 cd/m² color
- 8 inputs, 4 relay outputs
- Embedded 2pt 0-10V analog input
- 10 Amp Relay contacts
- Vertical or horizontal orientation
- Embedded Ethernet port
- USB Mini-B Programming Port
- USB Type A port for data logging and recipe functions
- RS232C/RS485 interface
- IP66f (water and oiltight)



c UL us LISTED

CE

General Specifications

Part Numbers	FT1A-C12RA-W	FT1A-C12RA-B	FT1A-C12RA-S	FT1A-M12RA-W	FT1A-M12RA-B	FT1A-M12RA-S
Appearance						
LCD Screen	TFT Color			STN Monochrome		
Bezel Color	Light Gray	Dark Gray	Silver	Light Gray	Dark Gray	Silver
Operating Temperature	0 to +50°C					
Storage Temperature	–20 to +60°C (no freezing)					
Rated Power Voltage	24V DC					
Allowable Voltage Range	20.4 to 28.8V DC (including ripple)					
Maximum Power Consumption	9.2W maximum (when USB2 is not used: 5.8W max.)					
Weight	Approx. 300g					

Display Specifications

Part Number	FT1A-C12RA-*	FT1A-M12RA-*
Display Element	TFT color LCD	STN monochrome LCD
Colors/Shades	65,536 colors	Monochrome 8 shades
Effective Display Area	88.92 W x 37.05 H mm	87.59 W x 35.49 H mm
Display Resolution	240 W x 100 H pixels	
View Angle	Left/right 40°, top 20°, bottom 60°	Left/right/top/bottom: 45°
Contrast Adjustment	Not possible	32 levels
Backlight	LED	LED (white, red, pink)
Backlight Life	50,000 hours Note 1	
Brightness Note 2	400 cd/m²	740 cd/m²
Brightness Adjustment	32 levels	
Backlight Control	Auto off function	
Backlight Replacement	Not possible	
Graphics	Line, polyline, polygon, rectangle, circle, ellipse, arc, pie, equilateral polygons (3, 4, 5, 6, 8), fill, picture	
Window Display	3 popup screens + 1 system screen	

1. The backlight life refers to the time until the brightness reduces by half after use at 25°C.
2. Brightness of LCD only (monochrome LCD: when lit white).

Specifications con't on next page

Function Specifications

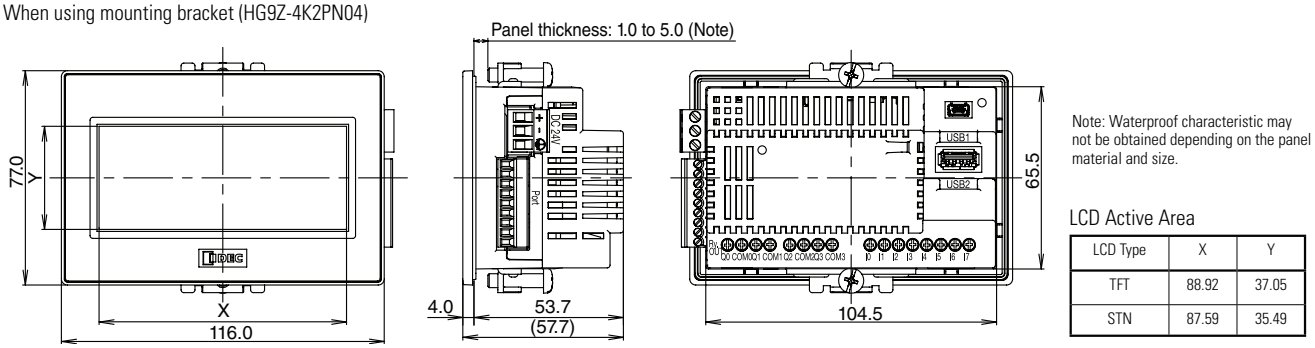
Part Numbers		FT1A-C12RA-*, M12RA-*
Program Capacity		Program size: 48 KB, Configuration memory capacity: 5 MB
Input	Points	8
	Output Points	4
User Program Storage		Flash ROM (100,000 times)
Backup Function	RAM	Backup data: Internal relay, shift register, counter current value, data register [Note 1], clock data (year, month, and day)
	Backup Data	128KB
	Buzzer Output	Single tone (tone length is adjustable)
	Backup Duration	Approx. 30 days (typical) at 25°C after backup battery fully charge
	Battery	Lithium
	Charging Time	Approx. 15 hours for charging from 0% to 90% of full charge
	Battery Life	5 years
	Replaceability	Not possible
Clock Function [Note 2]		Clock accuracy: ±30 sec/month (typical) at 25°C
Control System		Stored program system
Instruction Words	Basic Instructions	42
	Advanced Instructions	97
Processing Time	Basic Instruction	1850μs/1000 steps
	END Processing	5 msec minimum
Internal Relay		1024
Shift Register		128
Data Register		2000
Counter (adding, reversible)		200
Timer (1-sec, 100ms,10ms, 1ms)		200
Input Filter		Without filter, 3 to 15ms (selectable in increments of 1ms)
Catch Input/Interrupt Input	Input Points	4
Self-diagnostic Function		Keep data, Power failure, Clock error, Watchdog timer, Timer/counter preset value change error, User program syntax, User program execution, System error, Memory cartridge transfer error
High-speed Counter	Points	
	Maximum Counter Frequency	Single/two-phase selectable: 1 (5 kHz, multiple 2/4, single-phase cannot be used) Single-phase: 4 (x 10 kHz)
	Counting Range	0 to 4,294,967,295 (32 bits)
	Operation Mode	Rotary encoder mode and adding counter mode
Analog Voltage Input	Points (Terminal No.)	2
	Input voltage Range	0 to 10V DC
	Digital Resolution	10-bit(0 to 1000)
USB Port	USB Standard	USB 2.0
	Connector	Mini-B type
Ethernet Port		1

1. Among data registers D0 to D1999, only D0 to D999 are backed up.
2. Set the calendar/clock using the clock function in WindLDR.

Dimensions on next page

Dimensions (mm)

When using mounting bracket (HG9Z-4K2PN04)

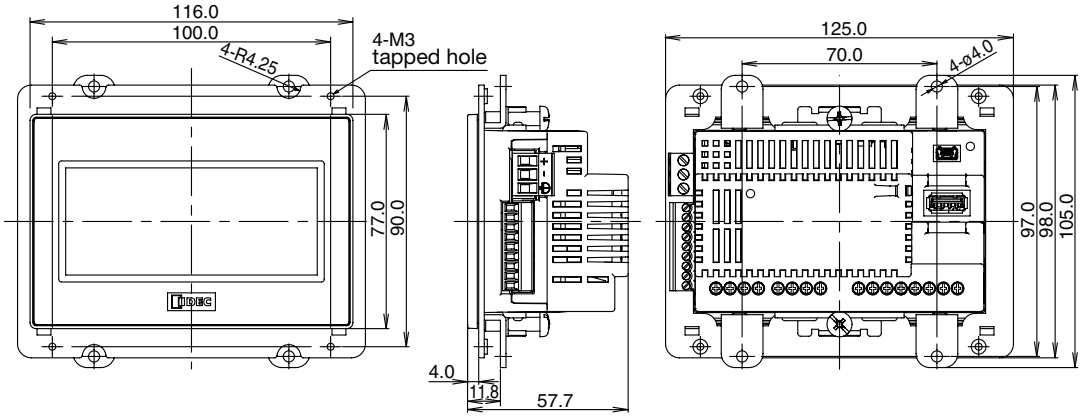


Note: Waterproof characteristic may not be obtained depending on the panel material and size.

LCD Active Area

LCD Type	X	Y
TFT	88.92	37.05
STN	87.59	35.49

When using rear mount adapter (FT9Z-1A01)



IDEC Corporation • 1175 Elko Drive • Sunnyvale, CA 94089 • 800-262-IDEC (4332) • Fax: 408-745-5258 • www.IDEC.com/usa

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~~8GB~~, ~~16GB~~, 32GB and ~~64GB~~*

Cruzer Fit™ USB Flash Drive

Whether it's your favorite music or your most important work documents, the Cruzer Fit™ USB flash drive gives you the storage you need in a compact and portable device.

Highlights

- Low-profile design
- Store, protect and transfer your videos, music, photos or other files
- Password protect and encrypt your private files with SanDisk SecureAccess™ software[1]

With its low-profile design, the Cruzer Fit USB flash drive easily fits USB ports and blends in with your notebooks, tablets, TVs and car audio systems. Whether it's your favorite music, pictures, music collection, video collection or your work documents, the Cruzer Fit USB flash drive gives you the ever-present storage you need in a compact and portable device. Protect access to your private data with the included SanDisk SecureAccess™ software[1].

When your data matters, you can trust SanDisk®.

SanDisk SecureAccess™



SanDisk®
a Western Digital brand

Cruzer Fit™ USB flash drive Specifications	
Capacities	8GB, 16GB, 32GB and 64GB*
Dimensions	7.37 x 12.70 x 17.53 mm or 0.26 x 0.50 x 0.69 in. (L x W x H)
Operating temperature	32° – 95°F (0° – 35°C)
Storage temperature	14° – 158°F (–10° – 70°C)
Software	SanDisk SecureAccess™ software[1]
Compatibility	USB 2.0 port
Warranty	United States: 2-year limited warranty All other regions: 5-year warranty

For more information, please visit www.sandisk.com

SanDisk®
a Western Digital brand

At SanDisk®, we're expanding the possibilities of data storage. For more than 25 years, SanDisk's ideas have helped transform the industry, delivering next generation storage solutions for consumers and businesses around the globe.

Western Digital Technologies, Inc.
951 SanDisk Drive | Milpitas | CA 95035 | USA

Western Digital Technologies, Inc. is the seller of record and licensee in the Americas of SanDisk® products.

[1] Password protection uses 128-bit AES encryption and is supported by Windows® Vista, Windows® 7, Windows 8, Windows 10 and Mac OS X v10.7+ (software download required for Mac, see www.SanDisk.com/SecureAccess)

* 1GB = 1,000,000,000 bytes. Actual user storage less.

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TARAline CP4MA*-AT

indicator	Total chlorine = free chlorine + bound chlorine (TRO = total residual oxidants) Reduced dependence on pH
Application	Sea water, ballast water of vessels Surfactants (tensides) are partially tolerated.
Chlorination agents	inorganic chlorine compounds: NaOCl (=sodium hypochlorite), $Ca(OCl)_2$, chlorine gas, electrolytically generated chlorine
Measuring system	Membrane covered, amperometric potentiostatic 3-electrode system with electronic inside
Electrical connection	Only allowed to be connected to a suitable and authorised zener barrier, (see manual „TARAline CP4MA-AT“)
Electronic	mA-version: - current output; analog - not galvanically isolated electronics - output signal: analog (analog-out/analog)
Information about the measuring range	The actual slope of a sensor can vary production-related between 65% and 150% of the nominal slope Note: With a slope > 100% the measuring range is reduced accordingly. (Ex.: 150% slope → 67% of the specified measuring range)
Slope drift At repeatability conditions (25 °C, pH 7,2 in drinking water)	approx. <-1% per month
Working temperature	Measuring water temperature: 0 … +45 °C (no ice crystals in the measuring water)
	ambient temperature: 0 °C < Ta < +55°C
Temperature compensation	Automatically, by an integrated temperature sensor Sudden temperature changes must be avoided
Norminal pressure	Nominal pressure : 0.3 bar, no pressure impulses and/or vibrations
	Max. allowable working pressure: Operation without retaining ring: 0.5 bar, no pressure impulses and/or vibrations
	Max. allowable working pressure: Operation with retaining ring: 0.5 bar, no pressure impulses and/or vibrations



TARAline CP4MA*-AT

Flow rate (Incoming flow velocity)	approx. 15-30 l/h (33 – 66 cm/s) in TARAflow FLC, small flow rate dependence is given	
pH-range	pH 4 – pH 12, highly reduced dependence on pH-value (see diagram “Slope of TARAline CP4 versus pH”)	
Run-in time	First start-up approx. 2 h	
Response time	T_{90}: approx. 2 min.	
Zero point adjustment	Not necessary	
Slope calibration	At the device, by analytical determination, DPD-4-Method (DPD-1 + DPD-3)	
interferences	Only for the measurement of total chlorine: ClO_2: factor 1 O_3: factor 1.3	
Absence of the disinfectant	Max. 24 h	
Connection	4-20 mA version: 2-pole terminal	
max. length of sensor cable (depending on internal signal processing)	analog	< 30 m
	digital	> 30 m are permissible Maximum cable length depends on application
material	Microporous hydrophilic Membrane, PVC-U, PEEK, stainless steel 1.4571	
Size	diameter: approx. 25 mm Length: 4-20 mA version approx. 220 mm	
Transport	+5 … +50 °C (Sensor, electrolyte, membrane cap)	
storage	Sensor:	dry and without electrolyte no limit at +5 … +40 °C
	Electrolyte:	in original bottle protected from sunlight at +5 … +35 °C min. 1 year or until the specified EXP-Date
	Membrane cap:	in original packing no limit at +5 … +40 °C (used membrane caps can not be stored)
maintenance	Regularly control of the measuring signal, min. once a week The following data depend on the water quality: Change of the membrane cap: once a year Change of the electrolyte: every 6 months	

<table>
<tr><td>  </td><td colspan="2">TARAline
CP4MA*-AT</td></tr>
<tr><td rowspan="3">Ex-proof</td><td colspan="2">Certified according to ATEX and IECEx
Intrinsic safety "i"
(certificate, pages 6-12 of this data sheet)</td></tr>
<tr><td>Marking:</td><td>Ex II 2G Ex ib IIB T4 Gb</td></tr>
<tr><td>Zone:</td><td>EPL "Gb" corresponds to zone 1
EPL = Explosion Protection Level</td></tr>
<tr><td>CE</td><td colspan="2">EMC-Testing DIN EN 61326-1, 61326-2-3, 63000
RoHS compliant</td></tr>
</table>

Technical Data

1. CP4MA*-AT 4-20 mA (analog output, analog internal signal processing)

analog-out / analog

Only allowed to be connected to a suitable and authorised zener barrier, refer to operating instructions, section 3 „Ex-proof specifications“.

Electrical limits for the sensor electronics:
Input voltage: 12 ... 24 VDC
current: 4 ... 20 mA

	**Measuring range** **in ppm as Cl_2**	**resolution** **in ppm as Cl_2**	**Output** **Output resistance**	**Nominal slope** (at pH 7.2) **in mA/ppm as Cl_2**	**Voltage supply**	**Connection**
CP4MA2-AT	0.005…2.000 *	0.001	4…20 mA uncalibrated	4.8	12…24 VDC R_L 50Ω…R_L 900Ω	2-pole terminal (2 x 1 mm²) Recommended: Round cable ∅ 4 mm 2 x 0.34 mm²
CP4MA5-AT	0.05…5.00 *	0.01		1.92		
CP4MA10-AT	0.05…10.00 *	0.01		0.96		
CP4MA20-AT	0.05…20.00 *	0.01		0.48		

* tested and approved up to the concentration indicated

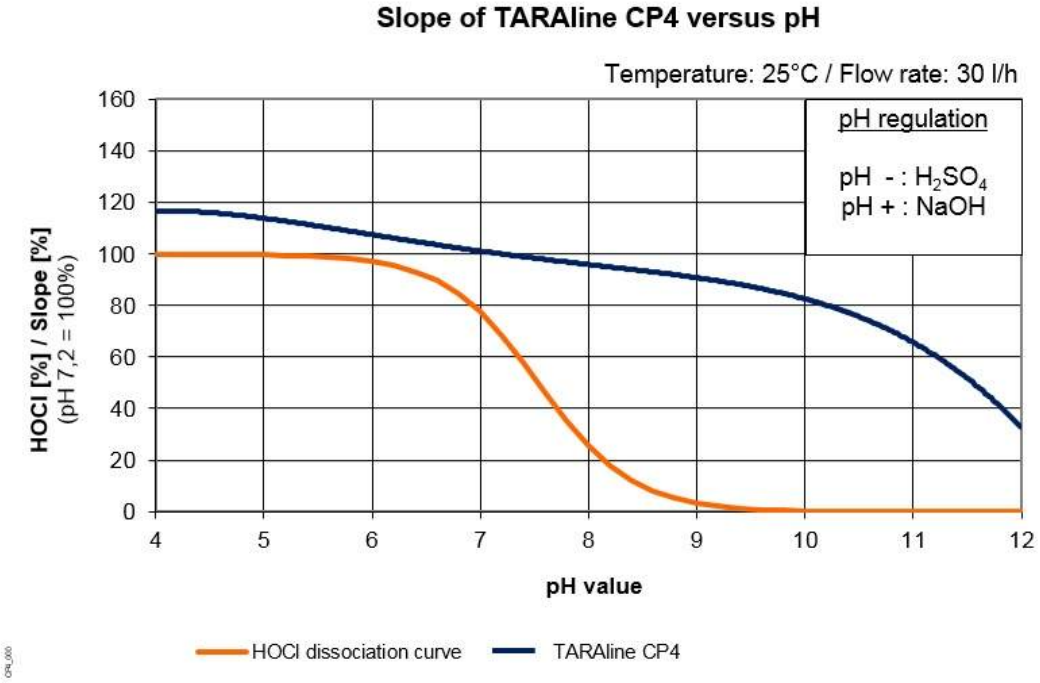
(Subject to technical changes.)

Spare Parts

Type	**Membrane cap**	**Electrolyte**	**Emery**	**O-ring**
For all CP4MA*-AT	M48.4S, Art. No. 11051-S	ECP1.4/GEL, 100 ml Art. No. 11006.1	S1 Art. No. 11908	14 x 1.8 NBR Art. Nr. 11806

(Subject to technical changes.)

Reiss GmbH
Eisleber Str. 5
D – 69469 Weinheim
Germany


Slope of TARAline CP4 versus pH
Temperature: 25°C / Flow rate: 30 l/h
pH regulation
pH - : H2SO4
pH + : NaOH
HOCl [%] / Slope [%]
(pH 7,2 = 100%)
160
140
120
100
80
60
40
20
0
4
5
6
7
8
9
10
11
12
pH value
HOCl dissociation curve
TARAline CP4

Sensorex

S272 Series pH & ORP Sensors

pH and ORP Electrodes for Online Process Monitoring





Digital Communication for More Process Visibility:

- Modbus and 4-20 mA output options now available
- Configuration and calibration can be done using web based software

Long Lasting Sensor Life

- Double junction prevents reference contamination
- Flat glass measurement surface reduces the threat of breakage

Versatile Sensor for a Variety of Applications

- Reliable performance in demanding applications
- Recommended applications include: chemical processing, industrial water treatment, potable water systems, boiler feedwater, and municipal wastewater plants

Specifications

pH Measurement Range	~~0-14 pH (Sodium ion error when 12.3 < pH)~~, Modbus (0-14pH) for -MB models
ORP Measurement Range	~~± 2000mV~~, Modbus (-2000 to + 2000mV) for -MB models
Body Material	Ryton® Polyphenylene Sulfide (PPS)
Temperature Range	0-100°C (32-212°F) 70˚C with Modbus models
Pressure Maximum	100 psig
Cable Length/	~~Connector 3m (10ft) Standard or Custom (by request) BNC or Tinned Leads Standard or Custom (by request)~~, Tinned leads standard for -MB models
Process Connection	3/4" NPT Threaded

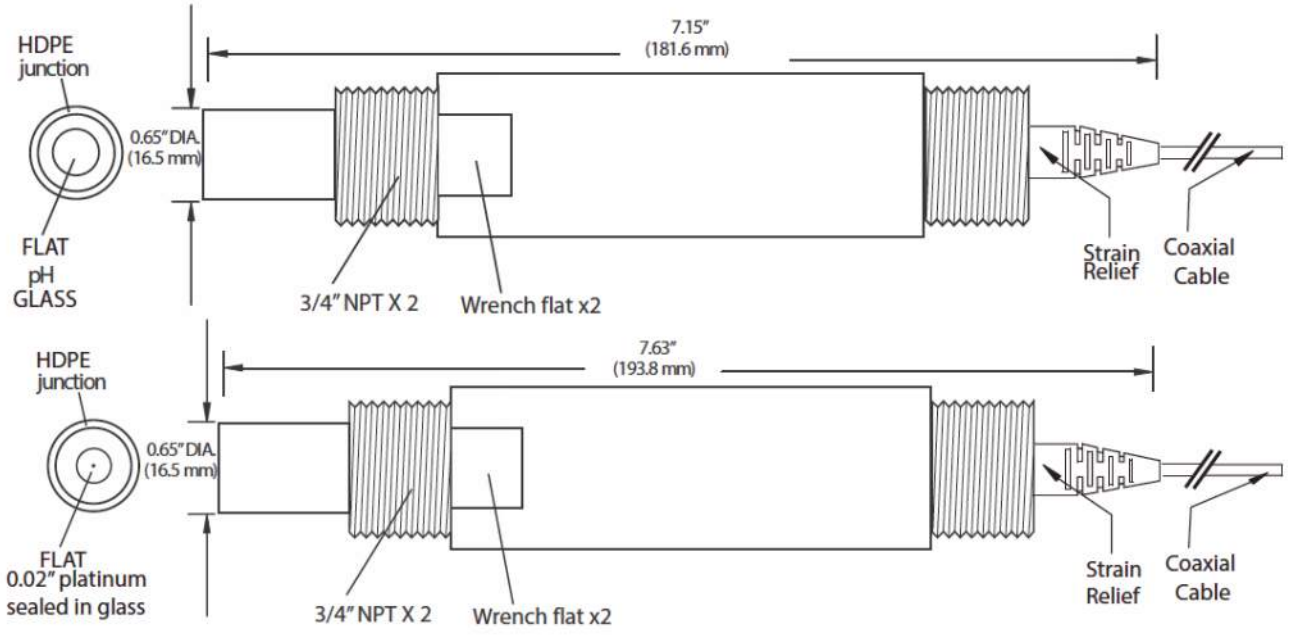
Parts covered in this data sheet include: S272CD, S272CDTC, S272CD-ORP, S272CDTC-MB2, S272CD-ORP-MB2

DESIGNED AND ASSEMBLED IN CALIFORNIA, USA
11751 MARKON DRIVE • GARDEN GROVE, CA 92841 • 714.895.4344 • WWW.SENSOREX.COM
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S272 Series pH & ORP Sensors

Dimensional Views

S272CD / S272CDTC
S272CD-ORP



Ordering Information

Part #	Description
S272CD	Ryton® body in-line pH electrode with 3 m cable, tinned tead or BNC connector
S272CDTC	Ryton® body in-line pH electrode with 3 m cable (built in ATC), tinned tead or BNC connector
S272CD-ORP	Ryton® body in-line ORP electrode with 3 m cable, tinned tead or BNC connector
S272CDTC-MA	Ryton® body in-line pH electrode with 3 m cable, tinned teads, 4-20mA = 0-14pH
S272CD-ORP-MA	Ryton® body in-line ORP electrode with 3 m cable, tinned teads, 4-20mA = 0-14pH
S272CDTC-MB2**	Ryton® body in-line pH electrode with 3 m cable, tinned leads, Modbus 485 output
S272CD-ORP-MB2**	Ryton® body in-line ORP electrode with 3 m cable, tinned leads, Modbus 485 output
CALBOX	Interface to calibrate, configure, and monitor sensor with a USB connection

*NOTE: ** Also available with 12V DC power option. Contact Sensorex for details.*

Doc. #450006 Revision A: Published 7/21/16

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FT-210 Series – TurboFlow®
Low Flow Turbine Sensor

- Low Flow Rates .1 to 2.5 LPM and High Accuracy ±3% of Reading
- Lightweight Turbine Ensures Fast Startup
- Mounts In Any Orientation



Gems FT-210 features proven turbine technology in a small package for low flow applications. The turbine technology provides a highly repeatable sensor ideally suited for measurement of either volume dispensing and/or flow rate applications. The small turbine reacts quickly to on/off dispensing applications. Each sensor is 100% tested, ensuring years of service life.

Specifications

Wetted Materials	
Body	Nylon 12 (Grilamid TR55)
Turbine	Nylon 12 Composite
Bearings	PTFE/15% Graphite
Operating Pressure	350 PSI (24 bar)
Burst Pressure	1400 PSI (97 bar)
Flow Range	.026-.65 gallons/minute 0.1-2.5 liters/minute 3.4-84.5 ounces/minute
Pulses	83,200 per gallon 22,000 per liter 650 per ounce
Frequency Output	36.6-917 Hz
Operating Temperature	-4°F to 212°F (-20°C to 100°C)
Viscosity	32 to 70 SSU (.8 to 16 Centistokes)
Filter	<50 Microns
Input Power	5 to 24 VDC
Output (Hz)	NPN Sinking Open Collector @ 20mA Maximum Leakage Current 10µA (3K-30K Pull up resistor required)
Accuracy	±3% of Reading
Repeatability	0.5% of Full Scale
Electrical Connection	9.4mm Spacing 3-pole DIN Connector (1˝ high)
Inlet/Outlet Ports	1/4˝ NPT (1/4˝ G Male also available)

How To Order

Specify a Part Number for the Port Connection AND a Part Number for the DIN Electrical Connection. Two Part Numbers are required for a complete part assembly.

FT-210 Sensor

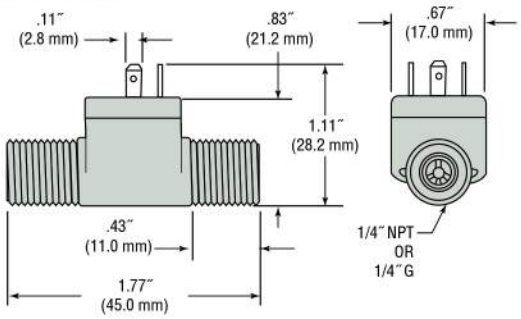
Body Material	Port Size	Part Number
Nylon 12	1/4˝ NPT	**212465** ⚡
	1/4˝ G	212460

⚡ – Stock Items.

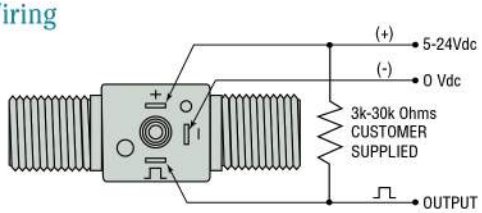
Electrical Connection

Description	Part Number
1 meter DIN PVC Cable Assembly with 10K pull-up resistor	**218572**
Mating DIN Connector	**212404**

Dimensions



Wiring

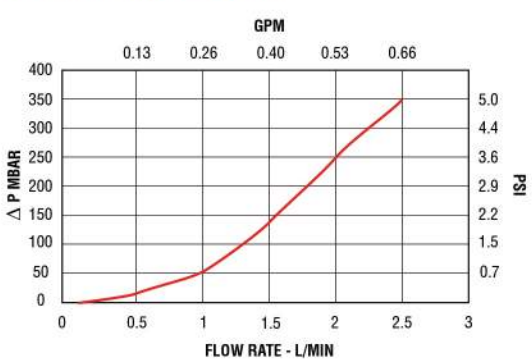


Pin Code: 1 = Output
2 = Supply
4 = Common

For Mating DIN Connector – P/N 212404

Function	DIN Termination
V+	1
–	⏚
Output	2

Pressure Drop—Typical



McMASTER·CARR®

In stock
$14.29 Each
8698T12

T-Strainer with Push-to-Connect Tube Connection

for **3/8" Tube OD**



For Use With	Water
For Reducing	Particles
Strainer Type	T
Connection Type	Tube
For Tube OD	*3/8"*
Tube Connection Type	Push-to-Connect
Gender	Female
Maximum Pressure	150 psi@ 70° F
Temperature Range	-40° to 125° F
Length	3"
Height	2 11/16"
Housing	
Material	Nylon Plastic
Color	Clear
Head	
Material	Polypropylene Plastic
Color	Black
Gasket Material	EPDM Rubber
Screen Material	304 Stainless Steel
Screen Construction	Mesh
Screen OD	15/16"
Screen Length	1 11/32"
Screen Mesh Size	50
Related Product	Replacement Screens

Clean out your strainer less often-these T-strainers have high debris-holding capacity. Install them prior to valves, pumps, and nozzles to protect sensitive equipment. Strainers have a nylon or polypropylene housing for excellent corrosion resistance.

Clear strainers allow you to monitor debris collecting in the screen without disconnecting your pipeline.

Strainers with push-to-connect tube connections make a tight seal around flexible tubing.

Use the optional fluoroelastomer gasket (sold separately) for oil applications.

STA-RITE® JP Series Signature 2000®

Composite



POWERED BY PENTEK®

C US

NSF/ANSI 61 Drinking Water

Precision-engineered, corrosion-resistant Signature 2000® Composite Pumps in 10, 15, 20 and 30 GPM deliver efficient, dependable performance even in rough, aggressive water. Heads to over 650 feet and capacities to 45 GPM. Built to deliver long-term, trouble-free service.

These pumps feature the proven SignaSeal™ staging system. Floating impeller design resists sand and reduces sand locking.

APPLICATIONS

Water systems...for residential, industrial, commercial, multiple housing and farm use.

SPECIFICATIONS

Shell: Stainless steel

Diameter: 3-7/8"

Discharge: Fiberglass-reinforced thermoplastic

Discharge Bearing: Nylatron®

Intermediate Bearing: (On larger units) polycarbonate, nitrile rubber and stainless steel

Impellers: Acetal

Diffusers: Polycarbonate

Suction Caps: Polycarbonate with stainless steel insert

Thrust Pads: Proprietary spec.

Shaft and Coupling: Stainless steel

Intake: Fiberglass-reinforced thermoplastic

Intake Screen: Polypropylene

Cable Guard: Stainless steel

Check Valve: Spring-loaded check valve

Agency Listings: CSA

FEATURES

Proven Staging System: Our proven SignaSeal staging system incorporates a harder-than-sand ceramic wear surface that when incorporated with our floating impeller design, greatly reduces problems with abrasives, sand lock-up and running dry.

Discharge: Corrosion-resistant fiberglass-reinforced thermoplastic for durability in aggressive water. Large octagon wrench area for ease of installation.

Discharge Bearing: Exclusive self-lubricating Nylatron bearing resists wear from sand.

Intake: Corrosion-resistant fiberglass-reinforced thermoplastic for durability in aggressive water.

Shaft: Positive drive from 7/16" hexagonal heavy-duty 300 grade stainless steel.

Coupling: Stainless steel press fit to pump shaft. Couples to all standard NEMA motors.

Shell: Crimped shell.

Hardware: All screws, washers and nuts are corrosion-resistant 300 grade stainless steel.

Check Valve: Spring-loaded check valve.

Cable Guard: Corrosion-resistant stainless steel guard protects motor leads. Tapered ends prevent pump from catching on well.

Intake Screen: Molded-in screen.

Pentek® XE Series™ Motor:
2 and 3 wire NEMA standard all stainless construction water-filled motors.

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STA-RITE® JP Series Signature 2000®

Composite

ORDERING INFORMATION

GPM	MOTOR TYPE	HP	STGS.	PH†	VOLT	ASSEMBLED PUMP			PUMP END			MOTOR		CONTROL BOX	
						CATALOG NUMBER	LENGTH INCHES*	WEIGHT POUNDS*	CATALOG NUMBER	LENGTH INCHES*	WEIGHT POUNDS*	CATALOG NUMBER	WEIGHT POUNDS*	CATALOG NUMBER	WEIGHT POUNDS*
10**	2 WIRE	1/2	8	1	115	S10P4JP05121	23	28	L10P4CJ	13	9	P42B0005A1	19		
		1/2	8	1	230	S10P4JP05221	23	28	L10P4CJ	13	9	P42B0005A2	19		
		3/4	11	1	230	S10P4JP07221	26	31	L10P4DJ	15	10	P42B0007A2	23		
		1	13	1	230	S10P4JP10221	29	35	L10P4EJ	17	11	P42B0010A2	25		
		1-1/2	17	1	230	S10P4JP15221	35	42	L10P4FJ	20	12	P42B0015A2	29		
	3 WIRE	1/2	7	1	115	S10P4JP05131	22-3/4	27-1/2	L10P4CJ	12-3/4	9	P43B0005A1	19	SMC-IR0511	4
		1/2	8	1	230	S10P4JP05231	23	28	L10P4CJ	13	9	P43B0005A2	19	SMC-CR0521	4
		3/4	11	1	230	S10P4JP07231	26	31	L10P4DJ	15	10	P43B0007A2	21	SMC-CR0721	4
		1	13	1	230	S10P4JP10231	29	35	L10P4EJ	17	11	P43B0010A2	23	SMC-CR1021	4
		1	13	3	230				L10P4EJ	15-1/2	10-1/4	P43B0010A3	23		
		1	13	3	460				L10P4EJ	15-1/2	10-1/4	P43B0010A4	23		
		1-1/2	17	1	230	S10P4JP15231	34	42	L10P4FJ	20	12	P43B0015A2	27	SMC-CR1521	7
		1-1/2	17	3	230				L10P4FJ	19-3/4	12-1/2	P43B0015A3	23		
		1-1/2	17	3	460				L10P4FJ	19-3/4	12-1/2	P43B0015A4	23		
15**	2 WIRE	1/2	6	1	115	S15P4JP05121	23	27	L15P4CJ	13	9	P42B0005A1	19		
		1/2	6	1	230	S15P4JP05221	23	27	L15P4CJ	13	9	P42B0005A2	19		
		3/4	8	1	230	S15P4JP07221	26	31	L15P4DJ	15	10	P42B0007A2	23		
		1	10	1	230	S15P4JP10221	30	35	L15P4EJ	17	11	P42B0010A2	25		
		1-1/2	12	1	230	S15P4JP15221	36	43	L15P4FJ	21	13	P42B0015A2	29		
	3 WIRE	1/2	5	1	115	S15P4JP05131	22-1/4	27	L15P4CJ	12-1/4	9	P43B0005A1	19	SMC-IR0511	4
		1/2	6	1	230	S15P4JP05231	23	27	L15P4CJ	13	9	P43B0005A2	19	SMC-CR0521	4
		3/4	8	1	230	S15P4JP07231	26	31	L15P4DJ	15	10	P43B0007A2	21	SMC-CR0721	4
		1	10	1	230	S15P4JP10231	30	35	L15P4EJ	17	11	P43B0010A2	23	SMC-CR1021	4
		1	9	3	230				L15P4EJ	15-1/2	10-1/4	P43B0010A3	23		
		1	9	3	460				L15P4EJ	15-1/2	10-1/4	P43B0010A4	23		
		1-1/2	12	1	230	S15P4JP15231	34	41	L15P4FJ	21	13	P43B0015A2	27	SMC-CR1521	7
		1-1/2	12	3	230				L15P4FJ	20-1/4	13	P43B0015A3	23		
		1-1/2	12	3	460				L15P4FJ	20-1/4	13	P43B0015A4	23		
20**	2 WIRE	3/4	6	1	230	S20P4JP07221	23-3/4	30	L20P4DJ	13	9	P42B0007A2	23		
		1	7	1	230	S20P4JP10221	27-1/4	34	L20P4EJ	15	10	P42B0010A2	25		
		1-1/2	10	1	230	S20P4JP15221	32	39	L20P4FJ	17	11	P42B0015A2	29		
	3 WIRE	3/4	6	1	230	S20P4JP07231	23-3/4	30	L20P4DJ	13	9	P43B0007A2	23	SMC-CR0721	4
		1	7	1	230	S20P4JP10231	27-1/4	34	L20P4EJ	15	10	P43B0010A2	25	SMC-CR1021	4
		1	7	3	230				L20P4EJ	15-1/2	10-1/4	P43B0010A3	23		
		1	7	3	460				L20P4EJ	15-1/2	10-1/4	P43B0010A4	23		
		1-1/2	10	1	230	S20P4JP15231	30-1/2	39	L20P4FJ	17	11	P43B0015A2	29	SMC-CR1521	7
		1-1/2	9	3	230				L20P4FJ	16-3/4	10-3/4	P43B0015A3	23		
		1-1/2	9	3	460				L20P4FJ	16-3/4	10-3/4	P43B0015A4	23		
		2	12	1	230				L20P4GJ	20-1/4	12-1/2	P43B0020A2	31	SMC-CR2021	7
		2	12	3	230				L20P4GJ	20-1/4	12-1/2	P43B0020A3	23		
		2	12	3	460				L20P4GJ	20-1/4	12-1/2	P43B0020A4	23		
30**	2 WIRE	1	5	1	230	S30P4JP10221	26-1/2	35	L30P4EJ	14	10	P42B0010A2	25		
		1-1/2	6	1	230	S30P4JP15221	30-1/2	39	L30P4FJ	15-1/4	11	P42B0015A2	29		
	3 WIRE	1	5	1	230	S30P4JP10231	26-1/2	35	L30P4EJ	14	10	P43B0010A2	23	SMC-CR1021	4
		1	5	3	230				L30P4EJ	15-1/2	10-1/4	P43B0010A3	23		
		1	5	3	460				L30P4EJ	15-1/2	10-1/4	P43B0010A4	23		
		1-1/2	6	1	230	S30P4JP15231	29	39	L30P4FJ	15-1/4	11	P43B0015A2	27	SMC-CR1521	7
		1-1/2	6	3	230				L30P4FJ	15-1/4	11	P43B0015A3	23		
		1-1/2	6	3	460				L30P4FJ	15-1/4	11	P43B0015A4	23		
		2	8	1	230				L30P4GJ	18-1/4	12	P43B0020A2	31	SMC-CR2021	7
		2	8	3	230				L30P4GJ	18-1/4	12	P43B0020A3	23		
		2	8	3	460				L30P4GJ	18-1/4	12	P43B0020A4	23		

†For all Pentek XE series three-phase motor options, see page 65.
*Length and Weight are approximate.

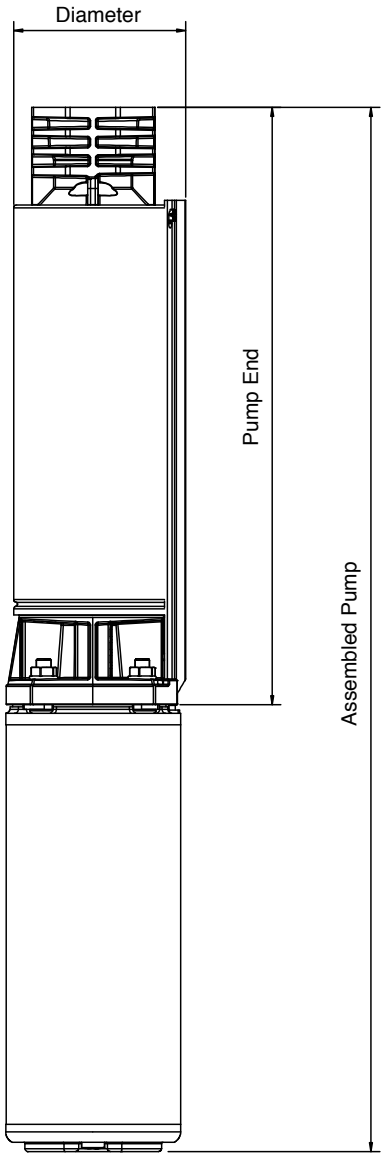
**For 10 GPM, 15 GPM, 20 GPM and 30 GPM discharge is 1-1/4" NPT.

NOTE: On 2 HP and larger pumps – Motor, Control Box or Magnetic Starter must be ordered separately.

STA-RITE® JP Series Signature 2000®

Composite

OUTLINE DIMENSIONS



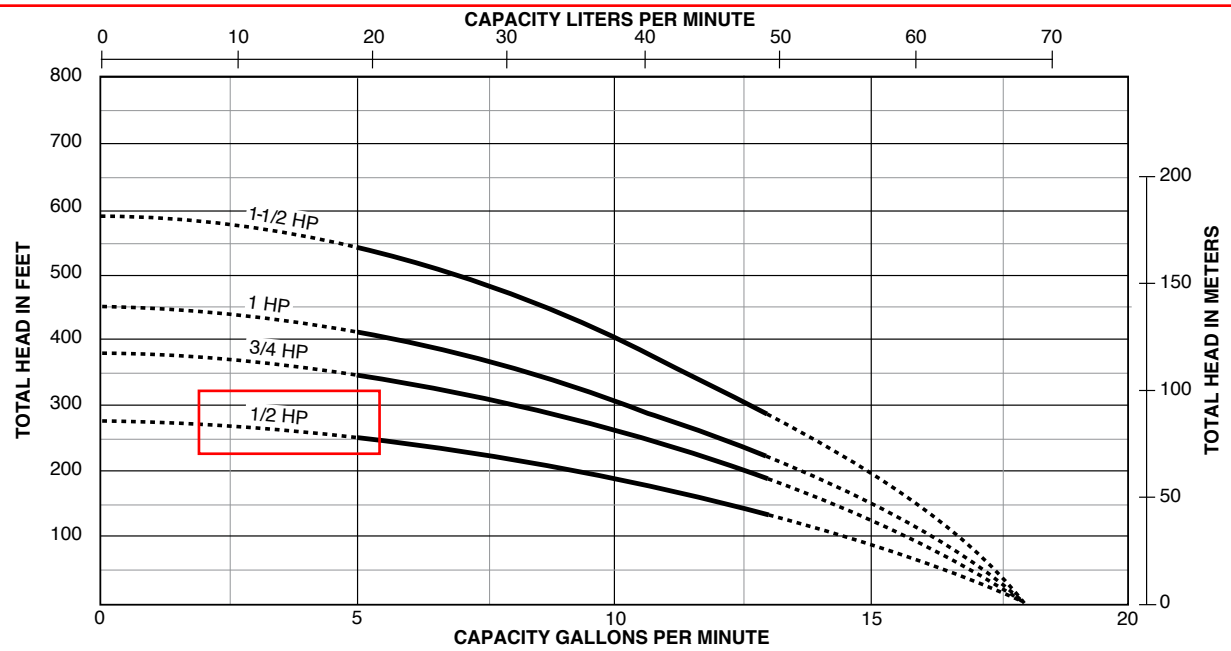
DISCHARGE	
10 GPM	1-1/4" NPT
15 GPM	1-1/4" NPT
20 GPM	1-1/4" NPT
30 GPM	1-1/4" NPT

For lengths, refer to Ordering Information tables.
Dimensions (in inches) are for estimating purposes only.

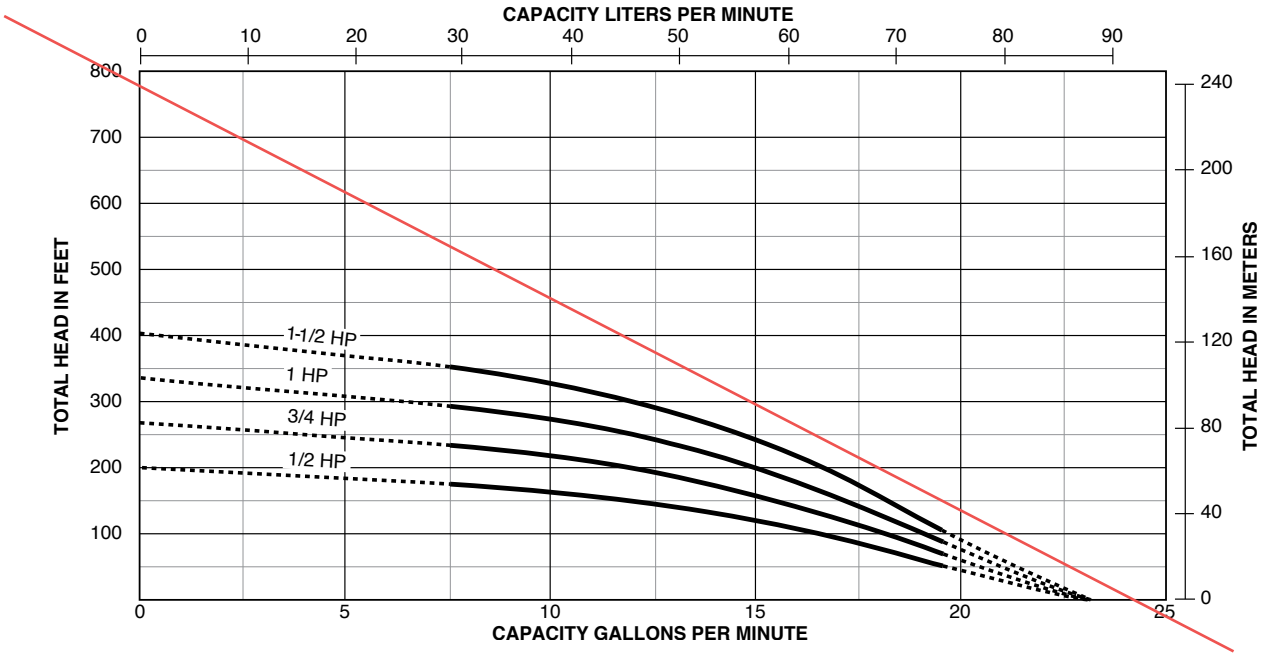
STA-RITE® JP Series Signature 2000®

Composite

PUMP PERFORMANCE: 10 GPM



PUMP PERFORMANCE: 15 GPM



Tested and rated in accordance with Water Systems Council Standards.

NOTE: Pumps installed with a Pro-Source® tank require a 100 PSI relief valve. Pumps installed with a conventional tank require a 75 PSI relief valve. Relief valve must be capable of relieving entire flow of pump at relief pressure.

STA-RITE® JP Series Signature 2000®

Composite

10 GALLONS PER MINUTE | **PUMP PERFORMANCE** (Capacity in gallons per minute)

HP	PSI	PUMPING DEPTH IN FEET																								SHUT-OFF HEAD	
		0	20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400	450	500	550	FEET	PSI
1/2	0	–	–	–	–	–	14.7	13.8	12.9	11.8	10.7	9.4	8.0	6.3	4.1											278	120
	20	–	–	–	14.4	13.5	12.5	11.5	10.3	9.0	7.5	5.7	3.2														
	30	–	–	14.3	13.4	12.4	11.3	10.1	8.8	7.3	5.4	2.7															
	40	–	14.2	13.2	12.2	11.1	9.9	8.6	7.0	5.1	2.0																
	50	14.0	13.1	12.1	11.0	9.7	8.4	6.8	4.7																		
	60	12.9	11.9	10.8	9.5	8.1	6.5	4.3																			
	70	11.7	10.6	9.3	7.9	6.2	3.9																				
	80	10.4	9.1	7.7	5.9	3.4																					
3/4	0	–	–	–	–	–	–	–	14.6	14.0	13.3	12.6	11.8	11.0	10.1	9.2	8.2	7.0	5.6	3.9						382	165
	20	–	–	–	–	–	14.4	13.8	13.1	12.3	11.6	10.7	9.9	8.9	7.8	6.6	5.1	3.2									
	30	–	–	–	15.0	14.3	13.7	13.0	12.2	11.5	10.6	9.7	8.7	7.6	6.4	4.9	2.8										
	40	–	–	14.9	14.2	13.6	12.9	12.1	11.3	10.5	9.6	8.6	7.5	6.2	4.6	2.4											
	50	15.4	14.8	14.1	13.5	12.7	12.0	11.2	10.3	9.4	8.4	7.3	6.0	4.3													
	60	14.7	14.0	13.3	12.6	11.9	11.1	10.2	9.3	8.2	7.1	5.7	4.0														
	70	13.9	13.2	12.5	11.8	10.9	10.1	9.1	8.1	6.9	5.5	3.7															
	80	13.1	12.4	11.6	10.8	9.9	9.0	7.9	6.7	5.3	3.4																
1	0	–	–	–	–	–	–	–	–	14.8	14.2	13.7	13.1	12.5	11.8	11.1	10.4	9.6	8.8	7.9	6.9	5.7				452	195
	20	–	–	–	–	–	–	14.6	14.1	13.5	12.9	12.3	11.6	10.9	10.2	9.4	8.5	7.6	6.6	5.3	3.8						
	30	–	–	–	–	–	14.5	14.0	13.4	12.8	12.2	11.5	10.8	10.1	9.3	8.4	7.5	6.4	5.1	3.5							
	40	–	–	–	15.0	14.5	13.9	13.3	12.7	12.1	11.4	10.7	9.9	9.1	8.3	7.3	6.2	4.9	3.2								
	50	–	–	14.9	14.4	13.8	13.2	12.6	12.0	11.3	10.6	9.8	9.0	8.1	7.1	6.0	4.7	2.9									
	60	–	14.8	14.3	13.7	13.1	12.5	11.9	11.2	10.5	9.7	8.9	8.0	7.0	5.8	4.4	2.6										
	70	14.7	14.2	13.6	13.0	12.4	11.8	11.1	10.4	9.6	8.7	7.8	6.8	5.6	4.2	2.2											
	80	14.1	13.5	12.9	12.3	11.7	11.0	10.2	9.5	8.6	7.7	6.6	5.4	3.9													
1-1/2	0	–	–	–	–	–	–	–	–	–	–	15.0	14.6	14.1	13.7	13.3	12.8	12.3	11.8	11.3	10.8	10.2	8.6	6.8	4.3	590	256
	20	–	–	–	–	–	–	–	–	14.9	14.4	14.0	13.6	13.1	12.6	12.2	11.7	11.1	10.6	10.0	9.4	8.8	6.9	4.5			
	30	–	–	–	–	–	–	–	14.8	14.4	13.9	13.5	13.0	12.6	12.1	11.6	11.1	10.5	9.9	9.3	8.7	8.0	5.9	2.9			
	40	–	–	–	–	–	–	14.7	14.3	13.9	13.4	13.0	12.5	12.0	11.5	11.0	10.4	9.8	9.2	8.6	7.9	7.1	4.7				
	50	–	–	–	–	–	14.7	14.2	13.8	13.4	12.9	12.4	11.9	11.4	10.9	10.3	9.7	9.1	8.5	7.7	7.0	6.1	3.2				
	60	–	–	–	15.0	14.6	14.2	13.7	13.3	12.8	12.4	11.9	11.3	10.8	10.2	9.6	9.0	8.3	7.6	6.8	6.0	4.9					
	70	–	–	14.9	14.5	14.1	13.7	13.2	12.8	12.3	11.8	11.3	10.7	10.1	9.5	8.9	8.2	7.5	6.7	5.8	4.8	3.5					
	80	–	14.9	14.5	14.0	13.6	13.2	12.7	12.2	11.7	11.2	10.6	10.1	9.5	8.8	8.1	7.4	6.6	5.7	4.6	3.3						

CAUTION: DO NOT use pump at flow rates indicated by the symbol '—'. To do so can cause premature failure of unit. Pump warranty void when failure occurs under these conditions. Tested and rated in accordance with Water Systems Council Standards.

NOTE: Pumps installed with a Pro-Source® tank require a 100 PSI relief valve. Pumps installed with a conventional tank require a 75 PSI relief valve. Relief valve must be capable of relieving entire flow of pump at relief pressure.

Bourdon Tube Pressure Gauge
Type 213.53DW, Stainless Steel Case
Drinking Water Series - Liquid Filled

Applications

- Intended for adverse service conditions where pulsating or vibration exists (with liquid filling).
- Safe for applications where water is anticipated to be used for human consumption.
- For applications in which products must comply with the 2014 US Safe Drinking Water Act and NSF 61/372.

Product Features

- Vibration and shock resistant (with liquid filling).
- Stainless steel case.
- Brass wetted parts with lead content ≤0.25%.
- NSF/ANSI 61 listed and certified to NSF/ANSI 372 and conforms with the lead content requirements for lead-free plumbing as defined by California, Vermont, Maryland, and Louisiana state laws and the U.S. Safe Drinking Water Act.



Bourdon Tube Pressure Gauge Model 213.53DW

Specifications

Design
ASME B40.100 & EN 837-1

Sizes
±2½" (63 mm)

Accuracy class
±2/1/2% of span (ASME B40.100 Grade A)

Ranges
Vacuum/Compound to 200 psi (16 bar)
Pressure from 15 psi (1 bar) to 600 psi (40 bar) or other equivalent units of pressure or vacuum

Working pressure

2½":	Steady:	¾ full-scale value
	Fluctuating:	⅔ full-scale value
	Short time:	full-scale value

Operating temperature
Ambient: -40°F to +140°F (-40°C to +60°C) - dry
-4°F to +140°F (-20°C to +60°C) - glycerine filled
-40°F to +140°F (-40°C to +60°C) - silicone filled
Medium: +140°F (+60°C) maximum

Temperature error
Additional error when temperature changes from reference temperature of 68°F (20°C) ±0.4% of span for every 18°F (10°K) rising or falling.

Weather protection
Weather tight (NEMA 4X / IP 66)

Pressure connection
Material: Lead-free copper alloy (lead content ≤0.25%)
Lower mount (LM) or center back mount (CBM) - 2" & 2½"
¼" NPT

WIKA®
Part of your business

Bourdon tube
Material: Lead-free copper alloy

Solder
No-lead solder

Movement
Copper alloy

Dial
White ABS

Pointer
Black aluminum

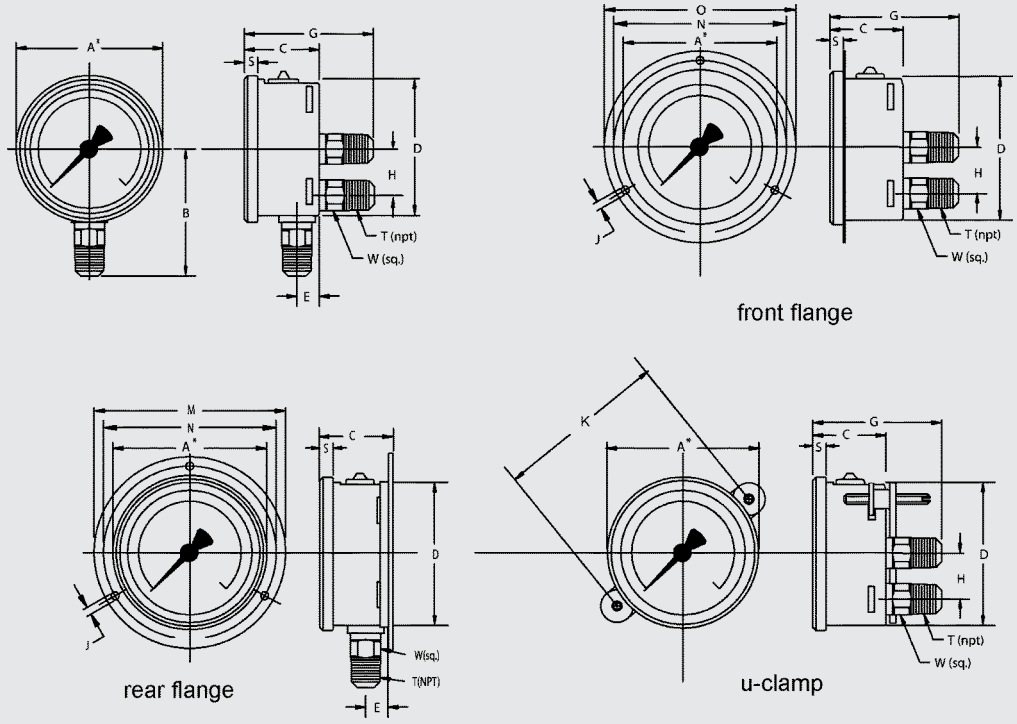
Case
304 stainless steel with vent plug and stainless steel crimp ring. Case connection sealed with O-ring, (O-ring material dependent on the case fill):

Window
Polycarbonate with Buna-N gasket

Case fill
Glycerine 99.7%

Optional extras
- Brass restrictor
- Stainless steel front or rear flange
- Zinc-plated steel or SS U-clamp bracket (field installable)
- Custom dial layout
- Other pressure scales available:
  bar, kPa, MPa, kg/cm² and dual scales

Dimensions



Size		(Standard Version)																
		A	B	C	D	E	G	H	J	K	M	N	O	S	T	W	Weight	
2½"	mm	69	54	32	62	13	54	-	3.6	72	88.1	75	85	6.5		14		
	in	2.69	2.13	1.26	2.45	0.51	2.13	-	0.14	2.83	3.47	2.95	3.35	0.26	¼"	0.55	0.44 lb.	filled

Recommended panel cut-out:
2½"- U-clamp: 63mm
front flange: 65mm

Ordering information
Pressure gauge model / Nominal size / Scale range / Size of connection / Optional extras required.
Specifications and dimensions given in this leaflet represent the state of engineering at the time of printing.
Modifications may take place and materials specified may be replaced by others without prior notice.

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E-Mail info@wika.com
www.wika.com

For Residential and Commercial Applications

Job Name _____ Contractor _____

Job Location _____ Approval _____

Engineer _____ Contractor's P.O. No. _____

Approval _____ Representative _____

LEAD FREE*

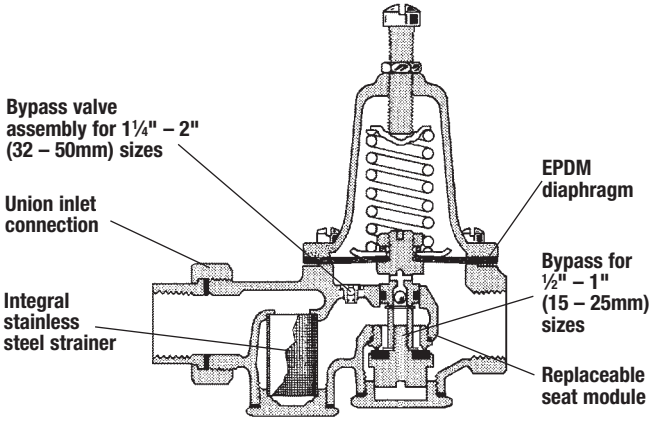
Series LF25AUB-Z3

Water Pressure Reducing Valves**

Sizes: ½" – 2" (15 – 50mm)

Series LF25AUB-Z3 Water Pressure Reducing Valves are designed to reduce incoming water pressure to a sensible level to protect plumbing system components and reduce water consumption. This series is suitable for water supply pressures up to 300psi (20.7 bar) and may be adjusted from 25 – 75psi (172 – 517 kPa). The LF25AUB-Z3 features Lead Free* construction to comply with Lead Free* installation requirements. The standard setting is 50psi (345 kPa). All parts are quickly and easily serviceable without removing the valve from the line. The standard bypass feature permits the flow of water back through the valve into the main when pressures, due to thermal expansion on the outlet side of the valve, exceed the pressure in the main supply.





Features

- Standard construction includes Z3 sealed spring cage and stainless steel corrosion resistant adjusting & cage screws for accessible outdoor or pit installations
- Union inlet connection
- Integral stainless steel strainer
- Replaceable seat module
- Lead Free* brass body construction
- Serviceable in line
- Bypass feature controls thermal expansion pressure***
- High temperature resistant reinforced diaphragm for hot water

Models

LF25AUB-Z3	NPT threaded female union inlet x NPT female outlet
LF25AUB-S-Z3	Solder union inlet x NPT female outlet
LF25AUB-DU-Z3	Double Union – NPT threaded union female inlet and outlet
LF25AUB-S-DU-Z3	Double Union – Solder union inlet and outlet
LF25AUB-DU-THDxPEX-Z3	Double Union – NPT threaded female inlet and PEX union outlet
LF25AUB-DU-LF-Z3	Double union body less fittings (¾", 1", 1¼")
LF25AUB-QC-Z3	Single Union – Quick-Connect union inlet (½", ¾", 1")
LF25AUB-DU-QC-Z3	Double Union – Quick-Connect inlet and outlet (½", ¾", 1")

Specifications

A Water Pressure Reducing Valve with integral strainer shall be installed in the water service pipe near its entrance to the building where supply main pressure exceeds 60psi (413 kPa) to reduce it to 50psi (345 kPa) or lower. The water pressure reducing valve shall be constructed using Lead Free* materials. Lead Free* regulators shall comply with state codes and standards, where applicable, requiring reduced lead content. The valve shall feature a Lead Free* brass body suitable for water supply pressures up to 300psi (20.7 bar). Provision shall be made to permit the bypass flow of water back through the valve into the main when pressures, due to thermal expansion on the outlet side of the valve, exceed the pressure in the main supply. Water Pressure Reducing Valve with built-in bypass check valves will be acceptable. Approved valve shall be listed to ASSE 1003 and IAPMO and certified to CSA B356. Valve shall be a Watts Series LF25AUB-Z3.**

*The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.

**A water saving test program concluded that reducing the supply pressure from 80-50psi (551-345 kPa) resulted in a water savings of 30%.

***The bypass feature will not prevent the pressure relief valve from opening on the hot water supply system with pressure above 150psi (10.3 bar).

Watts product specifications in U.S. customary units and metric are approximate and are provided for reference only. For precise measurements, please contact Watts Technical Service. Watts reserves the right to change or modify product design, construction, specifications, or materials without prior notice and without incurring any obligation to make such changes and modifications on Watts products previously or subsequently sold.

WATTS®

Materials

Body:	Lead Free* brass
Seat:	½"–1" (15–25mm) Replaceable engineered polymer (10% glass filled Noryl®)
	1¼"–2" (32–50mm) Replaceable stainless steel
Integral Strainer:	Stainless steel
Diaphragm:	Reinforced EPDM
Valve Disc:	EPDM

Note: for LP models where application temperatures exceed 160°F (71°C), but not over 180°F (82°C), a Teflon® protector should be added to sizes 1¼"–2" (32-50mm).

Pressure – Temperature

Temperature Range: 33°F – 160°F (0.5°C – 71°C)
Maximum Working Pressure: 300psi (20.7 bar)
Adjustable Reduced Pressure Range: 25–75psi (172 – 517 kPa)
Standard Reduced Pressure Setting: 50psi (345 kPa)

Options

Add Suffix	
G	Gauge tapping, ⅛" (3mm)
GG	Gauge tapping and 160psi (11 bar) gauge
HP	High pressure range 75–125psi (5.2 – 8.6 bar)
LP	Low pressure range 10–35psi (69 – 241 kPa)
Z7	400psi (27.6 bar) initial pressure, ½" (20mm) models only

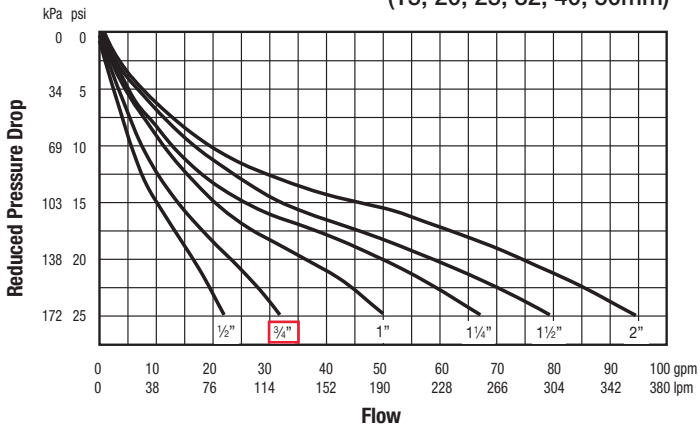
Noryl® is a registered trademark of SABIC Innovative Plastics™
Teflon® is a registered trademark of the E.I. du Pont de Nemours & Company.

Standards

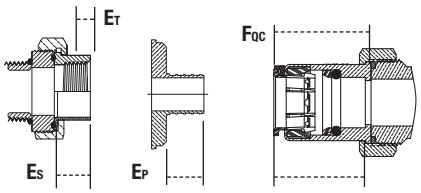
Meets requirements of ASSE Standard 1003: ANSI A112.26.2: CSA Standard B356; Southern Standard Plumbing Code and listed by IAPMO.
Military Standard MIL-V-18146B Type I.

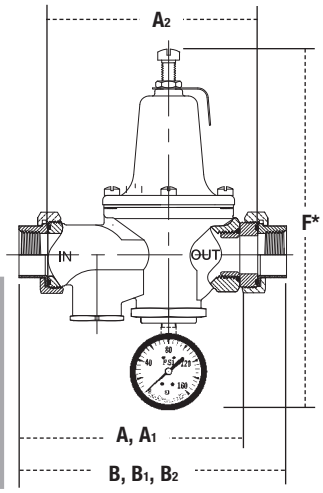
Capacity

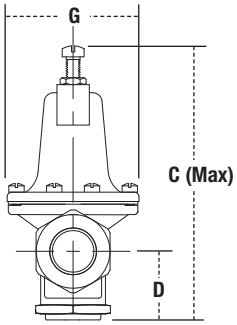
Sizes: ½", ¾", 1", 1¼", 1½", 2" (15, 20, 25, 32, 40, 50mm)



Dimensions — Weights







A - LF25AUB-Z3
A1 - LF25AUB-S-Z3
A2 - LF25AUB-DU-LF-Z3
B - LF25AUB-DU-Z3
B1 - LF25AUB-S-DU-Z3
B2 - LF25AUB-DU-THDxPEX-Z3
ET - NPT Engagement for tight joint
ES - Female sweat socket depth
EP - PEX end connection
FQC - Quick-Connect union

SIZE (DN)		DIMENSIONS													
		A		A1		A2		B		B1		B2		C	
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
½	15	5⅜	137	5⁵⁄₁₆	135	5³⁄₁₆	132	6⁷⁄₁₆	164	6⅜	162	–	–	7	178
¾	20	5⁵⁄₁₆	135	5½	140	5¼	133	6½	165	6⅞	175	6¾	171	7	178
1	25	6	152	6¼	159	5⅞	149	7⅜	187	7¹³⁄₁₆	198	7¹¹⁄₁₆	195	8	203
1¼	32	8¾	222	8¹⁵⁄₁₆	227	8¼	210	10¾	273	11	279	–	–	9	229
1½	40	8¾	222	9	229	8¼	210	10¾	273	11³⁄₁₆	284	–	–	9½	241
2	50	9¼	235	10	254	8¾	222	11⁵⁄₁₆	287	12¹¹⁄₁₆	322	–	–	11¼	286

SIZE (DN)		DIMENSIONS												WEIGHT	
D		F *		G		ET		ES		EP		FQC			
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	lbs.	kgs.
1½	38	9⁷⁄₁₆	240	3⅛	79	½	13	½	13	–	–	1½	38	3.5	1.6
1½	38	9⁷⁄₁₆	240	3⅛	79	½	13	¾	19	⅝	16	1¹¹⁄₁₆	42	3.5	1.6
1¾	44	10⁷⁄₁₆	266	3⅝	92	⅝	16	¹⁵⁄₁₆	23	¹³⁄₁₆	21	1¾	45	6.5	3.0
2⅛	54	11⁷⁄₁₆	291	3⅝	92	⅝	16	1	25	–	–	–	–	10	4.5
2⅜	60	11¹⁵⁄₁₆	304	4¹⁄₁₆	103	⅝	16	1¹⁄₁₆	28	–	–	–	–	10	4.5
3¼	83	13¹¹⁄₁₆	348	4¾	121	⅝	16	1⁵⁄₁₆	34	–	–	–	–	15	6.8

* Dimension includes optional gauge

WATTS®
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AV Series Angle Globe Valves

1/4" TO 2" PVC

KEY FEATURES

- PVC
- Space Saving 90° Body
- Panel Mount Lugs on 1/4" Size
- Fine Pitch Stem Threads for Precision Adjustment
- Reliable Globe Valve Design
- Perfect for Throttling and Changing Flow Direction

OPTIONS

- ~~Flanged Ends 1/2" to 2"~~

MATERIALS

- PVC Cell Class 12454 per ASTM D1784
- CPVC Cell Class 23447 per ASTM D1784
- FPM and EPDM O-Ring Seals

TECHNICAL INFORMATION

SELECTION CHART

SIZE	MATERIAL	END CONNECTION	SEALS	PRESSURE RATING
1/4" – 2" (DN8 – DN50)	PVC	Threaded or Flanged	FPM	150 PSI @ 70°F Non-Shock

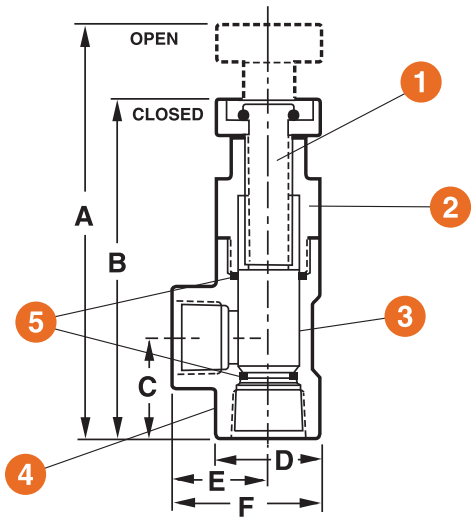
AV Series Angle Globe Valves

1/4" TO 2" PVC

TECHNICAL INFORMATION, *CONTINUED*

PARTS LIST

1. Stem
2. Bonnet
3. Piston
4. Body
5. O-Ring



DIMENSIONS

SIZE in / DN	A in / mm	B in / mm	C in / mm	D in / mm	E in / mm	F in / mm	WEIGHT lb / kg
1/4 / 8	3.63 / 92	3.19 / 81	1.06 / 27	1.00 / 25	.88 / 22	1.38 / 35	.13 / .06
1/2 / 15	5.88 / 149	4.94 / 125	1.50 / 38	1.38 / 35	1.44 / 37	2.06 / 52	.38 / .17
3/4 / 20	6.38 / 162	5.19 / 132	1.88 / 48	1.56 / 40	1.63 / 41	2.44 / 62	.50 / .23
1 / 25	7.44 / 189	6.19 / 157	2.06 / 52	1.94 / 49	1.94 / 49	2.75 / 70	.63 / .29
1-1/2 / 40	10.25 / 260	8.31 / 211	2.63 / 67	2.63 / 67	2.44 / 62	3.75 / 95	1.75 / .80
2 / 50	11.81 / 300	9.44 / 240	3.00 / 76	3.13 / 80	2.88 / 73	4.44 / 113	2.63 / 1.19

Dimensions are subject to change without notice – consult factory for installation information

Cv VALUES

SIZE in / DN	Cv VALUES GPM
1/4 / 8	1.0
1/2 / 15	5.0
3/4 / 20	10.0
1 / 25	16.0
1-1/2 / 40	45.0
2 / 50	70.0

PRESSURE LOSS CALCULATION FORMULA

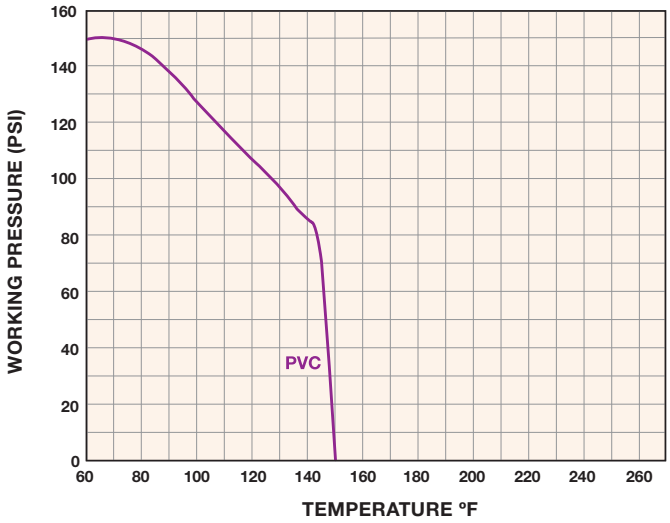
$$\Delta P = \left[\frac{Q}{Cv}\right]^2$$

ΔP = Pressure Drop

Q = Flow in GPM

Cv = Flow Coefficient

OPERATING TEMPERATURE / PRESSURE



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SECTION 8.2

CHEMICAL FEED SYSTEMS

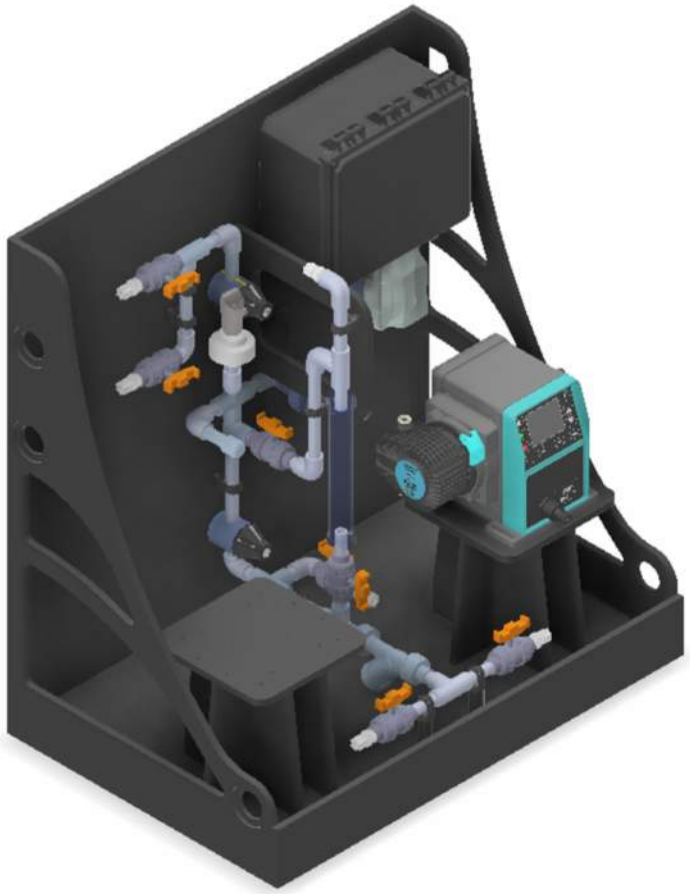
8.2.1 Chemical Feed Skid Product Specification
8.2.2 Chemical Feed Skid Outline and Utility Drawing
8.2.3 Chemical Feed Skid Pump Data Sheet
8.2.4 Chemical Feed Skid Component Data Sheet
8.2.5 Chemical Storage Tanks
8.2.6 Chemical Level Instrumentation
8.2.7 Chemical Injection Nozzles

CHEMICAL FEED SKID

The Chemical Feed Skid precisely and reliably delivers disinfectant chemicals (chlorine and/or ammonia) into a water tank or a distribution network.

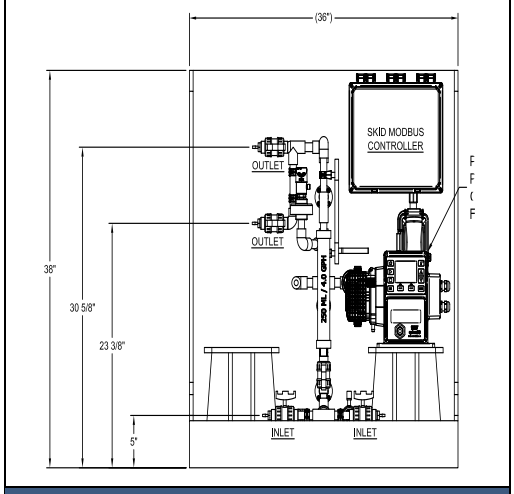
The Chemical Feed Skid features:

- Customizable pump skid to meet site specifications
- Monitoring of pump performance and chemical levels
- Leak detection and 12 gallons of secondary containment
- Integration with a Smart Control Center for precise chemical metering instructions

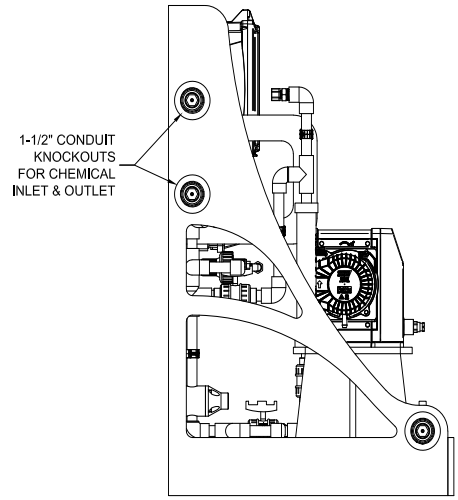


CHEMICAL FEED SKID SPECIFICATIONS	
Skid	Chemical resistant, UV protected black polypropylene 1/2" thick PP
Pump	QDOS CWT
Piping	PVC schedule 80
Tubing	Sodium Hypochlorite: 1/4" I.D. Reinforced PVC tubing 180 PSI max. Must meet NSF 51 & 61 standards. Connections for PVC tubing are PVDF Barb sitting with soft tubing hose clamps. Ammonia: 3/8" O.D. flexible polyethylene tubing, 500 PSI max. Must meet NSF 51 & 61 standards. Connections for PE tubing are slip fit with compression nuts for leak free operation.
Unions	PVC body, schedule 80, Viton (Hypo) or EPDM (LAS) seals
Ball Valves	True union, PVC body, Viton (Hypo) or EPDM (LAS) seals
Pressure Relief Valve	PVC body, Viton(Hypo)/EPDM(LAS) seals, adjustable pressure range 10-250 PSI, HDPE pressure adjusting screw
Back Pressure Valve	PVC body, Viton(Hypo)/EPDM(LAS) seals, adjustable pressure range 10-150 PSI, HDPE pressure adjusting screw
Calibration Cylinder	PVC body and end caps, chemical resistant, break resistant, colored graduations, 250ml (4 GPH) volume, ½" outlet
Pressure Transmitter	0-100 PSI, 316 stainless steel connection, 4-20mA output, +/- 0.5% Accuracy, with digital display
Pressure Guard	PVC body, Viton (Hypo) or EPDM (LAS) seals filled with FDA White mineral oil
Check Valve	PVC body, Viton(Hypo) or EPDM(LAS) seals, cracking pressure 1.5 PSI
Y-Strainer	PVC body, Viton(Hypo) or EPDM(LAS) seals
Mounting Clips	Gray Nylon Plastic, Snap-in
Pump Mounting Brackets	316 stainless steel
Mounting Hardware	316 stainless steel
Secondary Containment	12 gallons secondary containment
Leak Detection	Optical level switch, 4-20mA output

FRONT VIEW



SIDE VIEW



CHEMICAL DOSING CONTROLLER SPECIFICATIONS	
Input/Output	2 digital inputs 2 digital outputs 1 analog input 1 analog output
Communication	Modbus protocol (Standard) Hardwire (Option)
Connection	CAT 5 pass through cable
Power	120VAC 1PH 60HZ 4000W (600W Dual)
Enclosure	Dimensions: 12” x 10” x 6” NEMA Type 4X rating Black Polycarbonate
Pump Control Option	Digital relay Analog (4-20mA) Dual (Duty Standby) pumps
Sensor Inputs	Chemical Level Sensor and Pressure Transmitter

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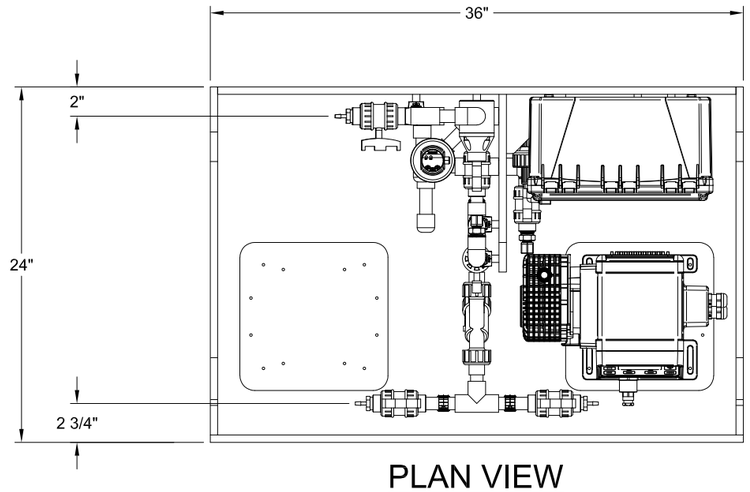
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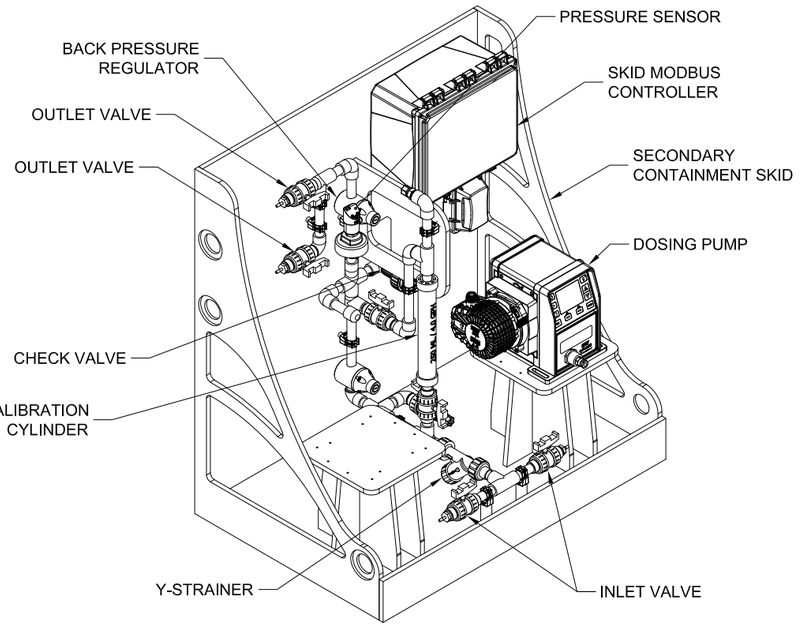
The information provided in this literature contains merely general descriptions or characteristics of performance which in actual case of use do not always apply as described or which may change as a result of further development of the products. An obligation to provide the respective characteristics shall only exist if expressly agreed in the terms of a written contract.

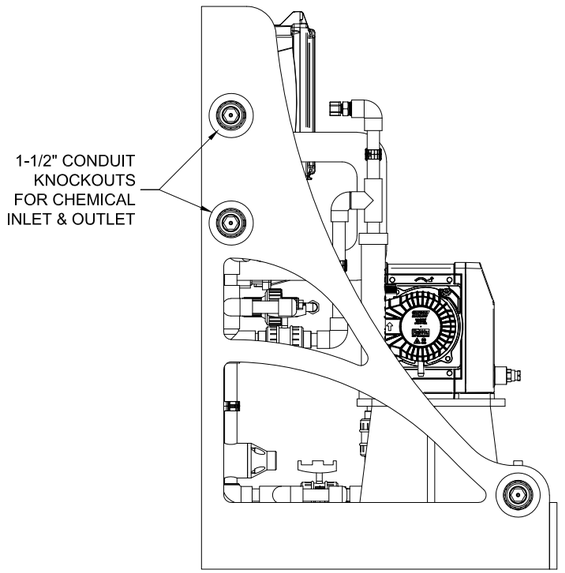
NOTES

1. WEIGHT:	150 LB
2. INLETS AND OUTLETS	
A. CHLORINE INLET CONNECTION:	3/8" COMPRESSION / 1/4" BARB
B. CHLORINE OUTLET CONNECTION:	3/8" COMPRESSION / 1/4" BARB
3. MATERIALS OF CONSTRUCTION:	
A. SKID:	PP (UV PROTECTED)
B. PIPING:	PVC (SCH 80)
C. HOSE/TUBING:	FEP
D. FITTINGS:	PVC / PVDF
E. GASKETS/SEALS:	FKM (VITON)
4. DIMENSIONS:	3'-0"W x 2'-0"D x 3'-2"H
5. CONTAINMENT VOLUME:	12 GALLONS
6. SKID ELECTRICAL REQUIREMENTS:	120VAC, 1Ø, 15A SERVICE

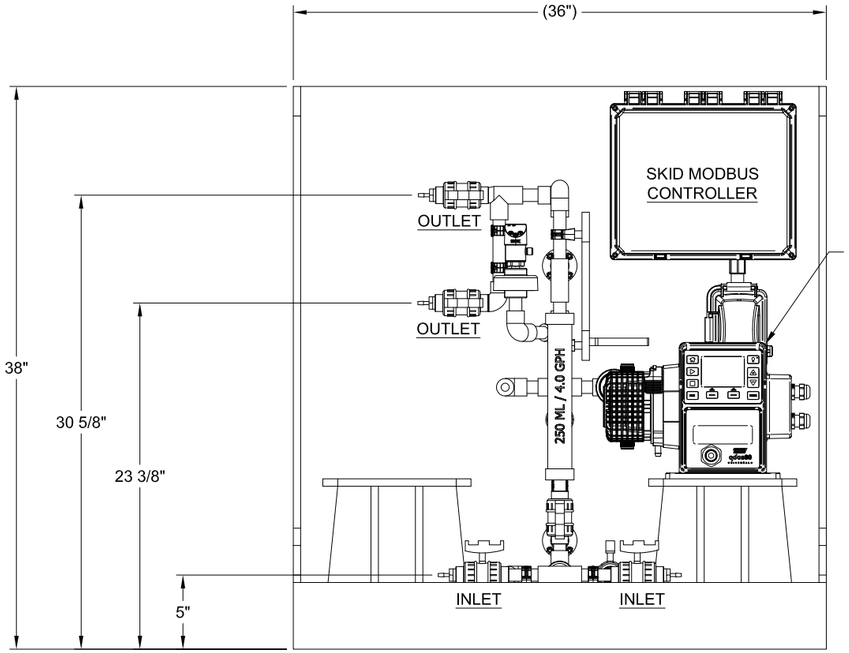


PLAN VIEW

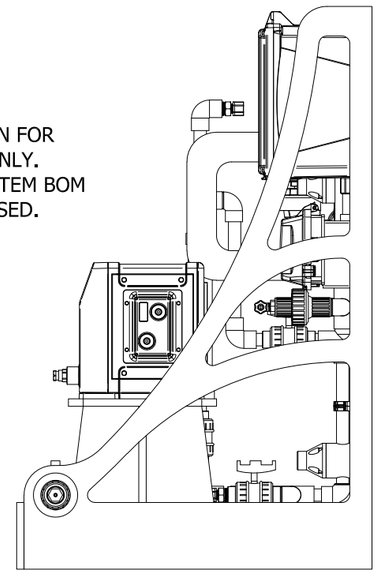




LEFT ELEVATION



FRONT ELEVATION



RIGHT ELEVATION

REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
A	12/22/2022	CL	INITIAL RELEASE				

This drawing represents an investment by PROCESS SOLUTIONS, INC of substantial sums, including our engineering skills and experience. It is, therefore, loaned without consideration other than the agreement and condition that it is not to be used in whole or in part to assist in making or to furnish any information to others for the making of drawings, print apparatus, or parts thereof. The acceptance of this drawing will be construed as an acceptance of the forgoing conditions and as an admission of the exclusive ownership in and to the drawings of PROCESS SOLUTIONS, INC.

PSI Water Technologies
A UGSI SOLUTIONS COMPANY

DRAWN BY: C. LEVASH	DATE: 12/22/2022
CHECKED BY: B. FRITZ	DATE: 12/22/2022
SCALE: NTS	SIZE: D

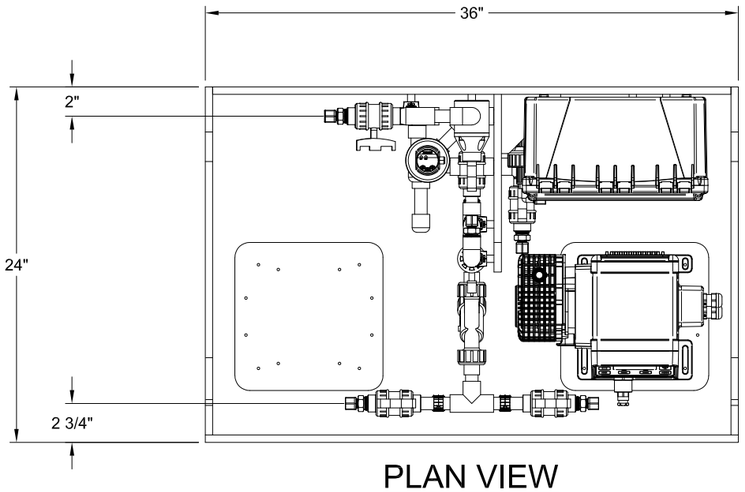
PROJECT:
PSI WATER TECHNOLOGIES, INC.
STANDARD DRAWING

SUBJECT:
DOSING SKID
SODIUM HYPOCHLORITE, SINGLE PUMP
OUTLINE & UTILITY DRAWING

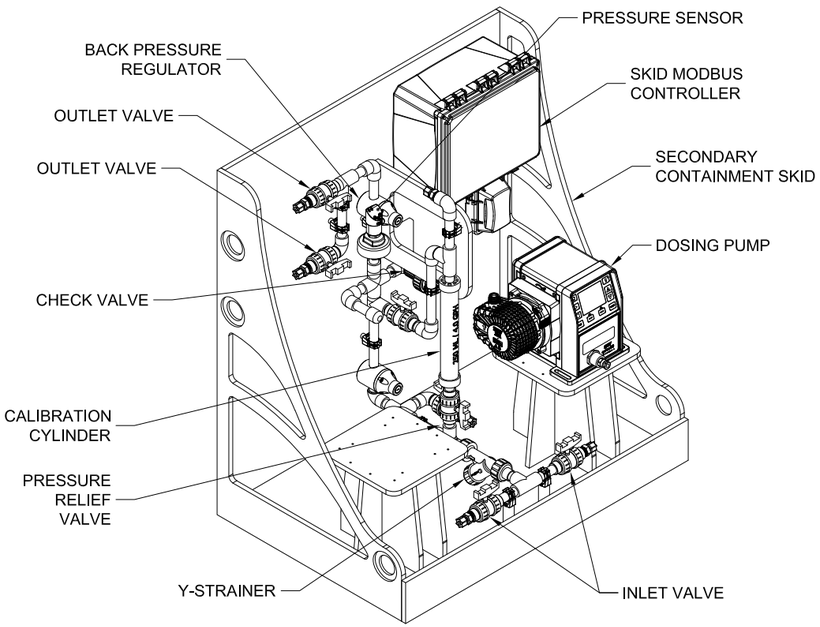
DWG #: 000000-PS1PC2-OU | SHEET 1 OF 1 | REV. A

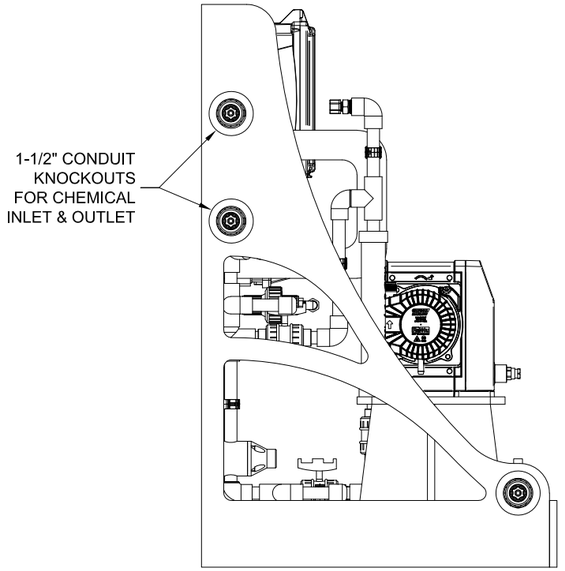
NOTES

1. WEIGHT: 150LB
2. INLETS AND OUTLETS
   - A. AMMONIA INLET CONNECTION: 3/8" COMPRESSION
   - B. AMMONIA OUTLET CONNECTION: 3/8" COMPRESSION
3. MATERIALS OF CONSTRUCTION:
   - A. SKID: PP (UV PROTECTED)
   - B. PIPING: PVC (SCH 80)
   - C. HOSE/TUBING: PE
   - D. FITTINGS: PVC
   - E. GASKETS/SEALS: EPDM
4. DIMENSIONS: 3'-0"W x 2'-0"D x 3'-2"H
5. CONTAINMENT VOLUME: 12 GALLONS
6. SKID ELECTRICAL REQUIREMENTS: 120VAC, 1Ø, 15A SERVICE

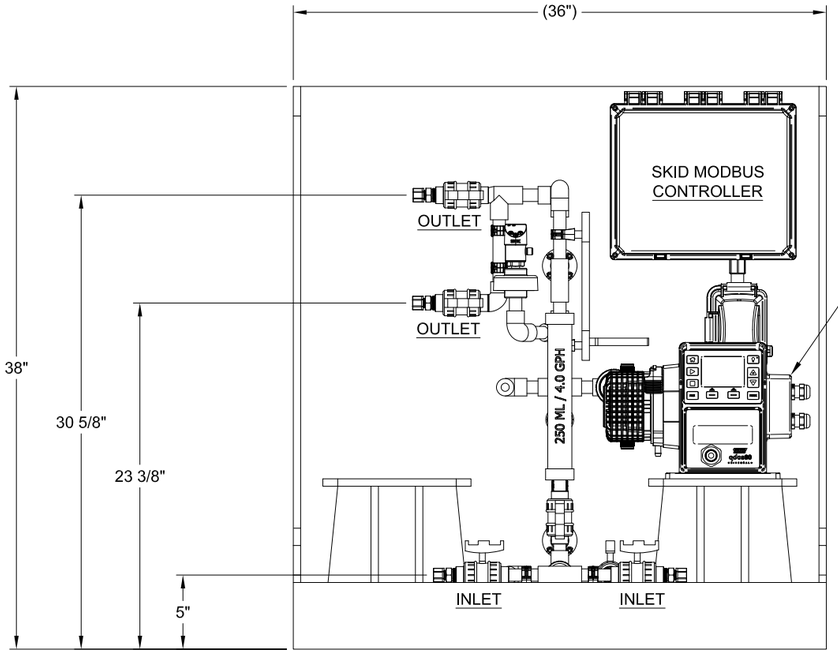


PLAN VIEW

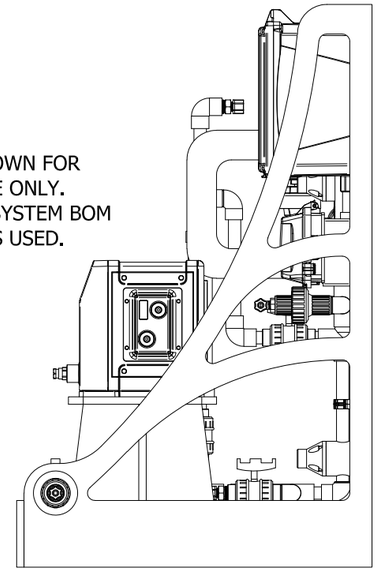




LEFT ELEVATION



FRONT ELEVATION



RIGHT ELEVATION

REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
A	12/22/22	CL	INITIAL RELEASE				

This drawing represents an investment by PROCESS SOLUTIONS, INC of substantial sums, including our engineering skills and experience. It is, therefore, loaned without consideration other than the agreement and condition that it is not to be used in whole or in part to assist in making or to furnish any information to others for the making of drawings, print apparatus, or parts thereof. The acceptance of this drawing will be construed as an acceptance of the forgoing conditions and as an admission of the exclusive ownership in and to the drawings of PROCESS SOLUTIONS, INC.

PSI Water Technologies
A UGSI SOLUTIONS COMPANY

DRAWN BY: C. LEVASH	DATE: 12/22/2022
CHECKED BY: B. FRITZ	DATE: 12/22/2022
SCALE: NTS	SIZE: D

PROJECT:
PSI WATER TECHNOLOGIES, INC.
STANDARD DRAWING

SUBJECT:
DOSING SKID
AMMONIA, SINGLE PUMP
OUTLINE & UTILITY DRAWING

DWG #: 000000-PS1PA2-OU | SHEET 1 OF 1 | REV. A

Qdos CWT

Qdos chemical metering and dosing pump

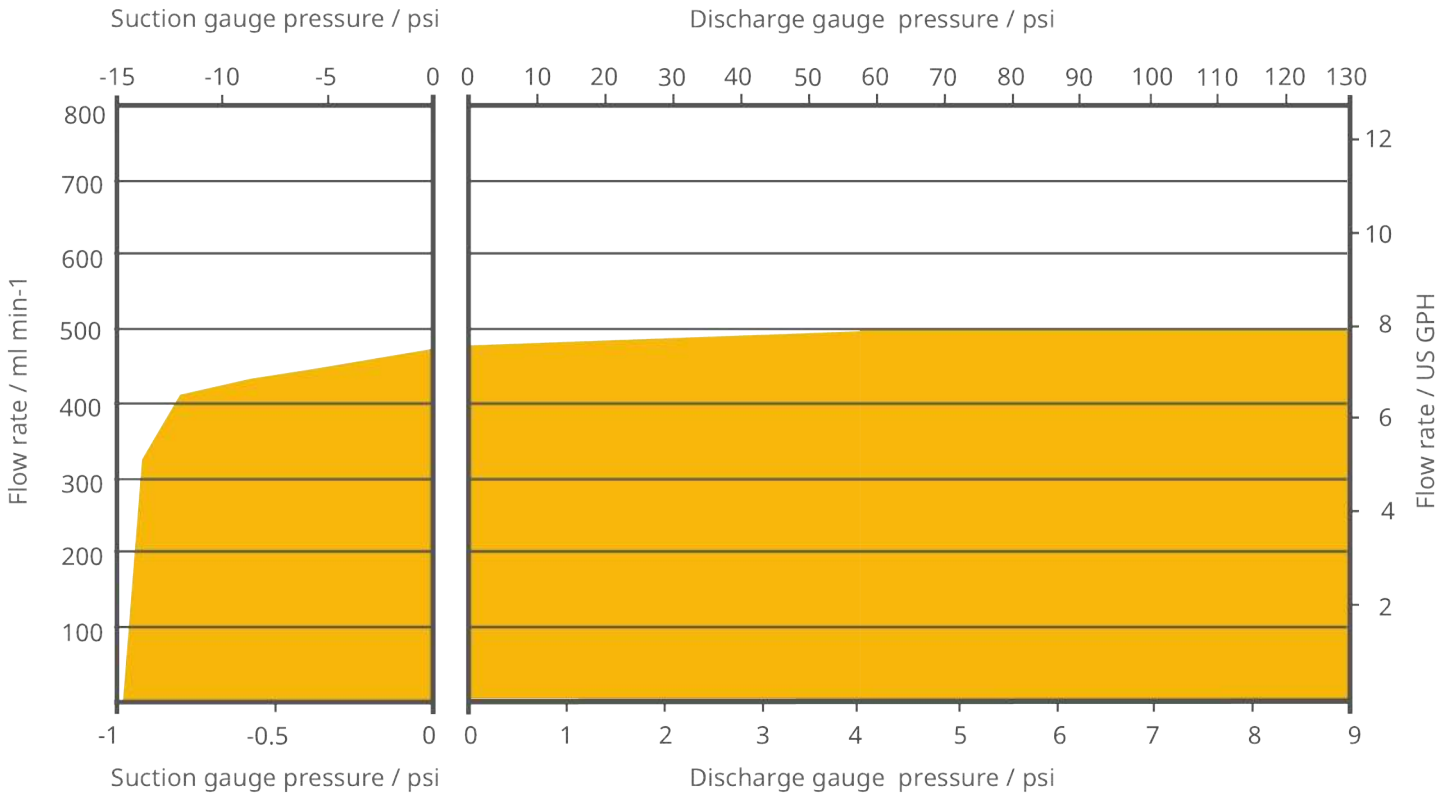
Features and benefits

- Flow rates from 0.1 to 500 ml/min at up to 9 bar
- Simple drop-in installation eliminates ancillary equipment
- Reduced maintenance with single, no-tools, component replacement
- Cost of ownership is less than that of a diaphragm pump
- Cut chemical cost through higher accuracy metering
- No backpressure valves, pulsation dampener, degassing valves, foot valves, strainers or float switches



Qdos CWT performance

Qdos® CWT™		Qdos® CWT™ remote	
Speed (rpm)	**Flow ml/min (USGPH)***	**Speed (rpm)**	**Flow ml/min(USGPH)***
0.025-125	0.1-500 (0.001-7.93)	0.078-125	0.3-500 (0.005-7.93)
*accuracy ±1%, repeatability ±0.5%			
*Flow rates can be affected by discharge pressure			



Technical specifications

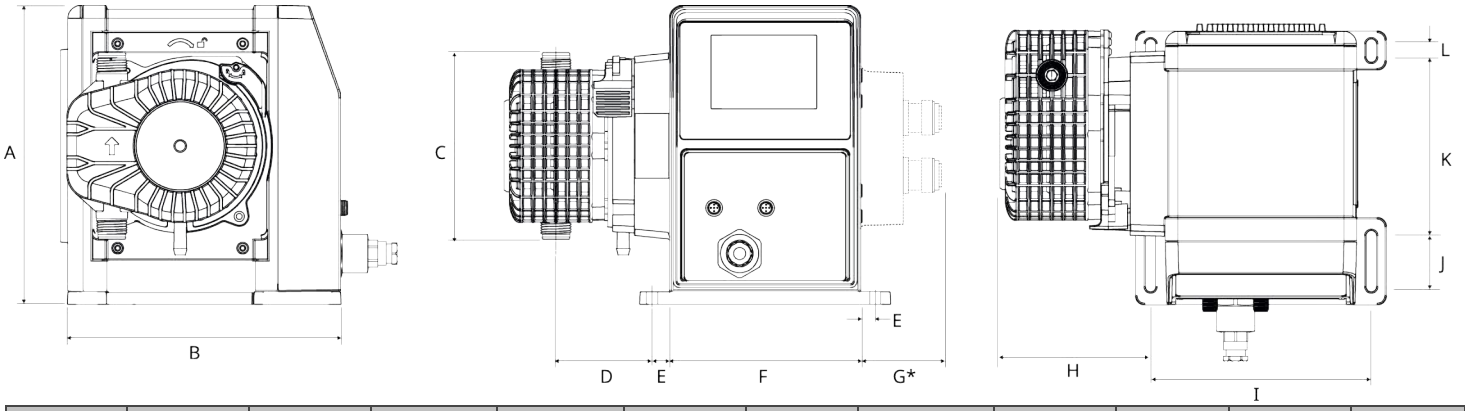
	Qdos CWT
Max. flow rate	500 ml/min
Min. flow rate	0.1 ml/min
Max. flow rate	7.93 USGPH
Min. flow rate	0.001 USGPH
Max. operating pressure	9 bar
Max. operating pressure	130 psi
Max. operating speed	125 rpm
Ambient Temperature Range	5 °C to 40 °C
Ambient Temperature Range	41 °F to 104 °F
Weight	6.8 kg
Weight	15 lbs
Control types	Manual, Profibus®, Remote, Universal, Universal relay, Universal+, Universal+ relay
Standards	CE, cETLus, CSA, C-Tick, IRAM S Mark, NSF 61
Drive standards	CE, cETLus, CSA, C-Tick, IRAM S Mark, NSF 61
Drive ingress protection	IP66, NEMA 4X
Drive humidity	80 % up to 31 °C, 88 °F, decreasing linearly to 50 % at 40 °C, 104 °F
Drive noise	< 70dB(A) at 1m
Max. altitude	2000 m
Power supply	100 V to 240 V AC 50 Hz to 60 Hz 190 VA, 12 V to 24 V DC
Drive power supply	100 V to 240 V AC 50 Hz to 60 Hz 190 VA, 12 V to 24 V DC

Minimum and maximum flow depends upon pumphead, flow unit and method of control. Pressure and speed depends on pumphead chosen.

Materials of construction

	Qdos CWT
Bearings	Steel
Driveshaft	Stainless steel 440C
Drive casework	20 % glass filled PPE/PS
Fluid connectors	Polypropylene, PVDF
Drive keypad/HMI	Polyester
Lubricant	PFPE based
Pumphead body assembly	40 % glass filled PPS
Pumphead rotor assembly	Stainless steel
Fluid contact element	EPDM, PEEK, PP
Fluid connection port	Polypropylene
Fluid connection seals	Santoprene
Pumphead enclosure seal	EPDM, NBR
Rotor	Stainless steel 303
Clamp ring	30% glass filled PP

Qdos CWT dimensions



A	B	C	D	E	F	G*	H	I	J	K	L
234 mm (9.2”)	214 mm (8.4”)	146 mm (5.8”)	77.4 mm (3.1”)	11.5 mm (0.5”)	150 mm (5.9”)	43 mm (1.7”)	117.9 mm (4.6”)	173 mm (6.8”)	40 mm (1.6”)	140 mm (5.5”)	10 mm (0.4”)
*Optional relay module											

Control options

Operational modes	Manual	Remote	PROFIBUS	Universal	Universal+
Manual	✓		✓	✓	✓
PROFIBUS—bus speed 9.6–1,500 kb/s			✓		
Contact				✓	✓
4-20mA		✓		✓	✓
Fault reporting	✓	✓	✓	✓	✓

Features	Manual	Remote	PROFIBUS	Universal	Universal+
Numerical flow display	✓		✓	✓	✓
Numerical speed display	✓		✓	✓	✓
Fluid level monitor	✓		✓	✓	✓
Max (prime)	✓		✓	✓	✓
Auto restart (after power restored)	✓	✓	✓	✓	✓
Fluid recovery	✓		✓	✓	✓
Leak detection	✓	✓	✓	✓	✓
3.5” (88.9mm) colour TFT display	✓		✓	✓	✓
LED Pump status icons		✓			

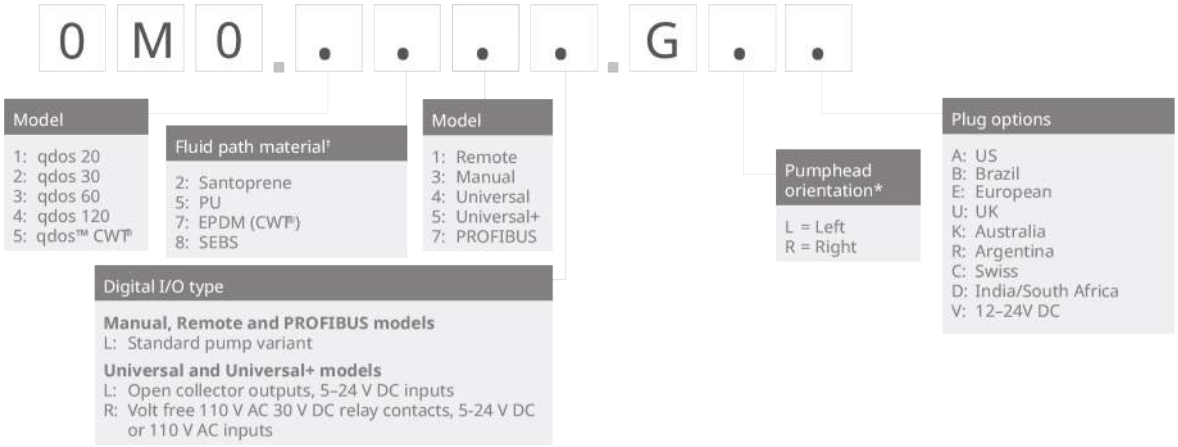
Control methods	Manual	Remote	PROFIBUS	Universal	Universal+
Input/Output Options		L	L	L or R	L or R
Manual control capability	✓		✓	✓	✓
4-20mA input		✓		✓	✓
4-20mA input two point calibration					✓
4-20mA output		✓			✓
Contact input (pulse/batch)				L or R	L or R
Manual speed adjustment range	3333:1 (Qdos 20) 5000:1 (Qdos 30) 10000:1 (Qdos 60) 20000:1 (Qdos 120)		3333:1 (Qdos 20) 5000:1 (Qdos 30) 10000:1 (Qdos 60) 20000:1 (Qdos 120)	3333:1 (Qdos 20) 5000:1 (Qdos 30) 10000:1 (Qdos 60) 20000:1 (Qdos 120)	3333:1 (Qdos 20) 5000:1 (Qdos 30) 10000:1 (Qdos 60) 20000:1 (Qdos 120)
Minimum motor adjustment speed increment (Dependent upon the operating mode and chosen flow unit)	0.006	0.078	0.100	0.003	0.003
4-20mA resolution		1600:1		1600:1	1600:1
Profibus speed resolution			550:1 (Qdos 20) 1250:1 (Qdos 30) 1250:1 Qdos 60 1400:1 (Qdos 120)		
Run stop input		✓		✓	✓
Run status output		✓		✓	L
Alarm output		✓		✓	L
Four configurable relay outputs					R
Remote fluid recovery		✓		L	L

PROFIBUS	Manual	Remote	PROFIBUS	Universal	Universal+
Speed set point			✓		
Speed feedback			✓		
Flow calibration function			✓		
Hours run			✓		
Revolution counter			✓		
Leak detection			✓		
Low fluid level alarm			✓		
Diagnostic feedback			✓		

Security	Manual	Remote	PROFIBUS	Universal	Universal+
Keypad lock	✓		✓	✓	✓
PIN lock to protect set up	✓		✓	✓	✓

*Control options - Universal and Universal+ models		
Variant	**Standard pump (L)**	**Relay Module (R)**
Input	5–24V DC	5-24V DC or 110V AC
Output	Open collector	Contact rating 110V AC, 4A 30V DC, 4A

Product codes



† For guidance on chemical compatibility see www.qdospumps.com

* The pumphead side location is required when ordering. The left/right perspective assumes the user is looking at the front of the pump. The pump in the dimensions diagram is considered a pumphead located to the left.

Description	Partcode
CWT 30 pumphead EPDM/PEEK/PFPE 9 bar (130 psi)	0M3.5700.PFP

Disclaimer: All flow rates shown were obtained pumping water at 20 °C (68 °F) with zero suction and delivery heads. The information contained in this document is believed to be correct but Watson-Marlow Limited accepts no liability for any errors it contains and reserves the right to alter specifications without notice. It is the user's responsibility to ensure product suitability for use within their application. Watson-Marlow, LoadSure, Pumpsil, PureWeld XL, Bioprene, Marprene are registered trademarks of Watson-Marlow Limited. Tri-Clamp is a registered trademark of Alfa Laval Corporate AB. GORE and STA-PURE are registered trademarks of W.L. Gore and Associates. Please state the product code when ordering pumps and tubing.

wmfts.com/global

11 June 2024



Sediment Strainers

Specifications

Sizes: 1/2" – 4"
Models: Socket, Threaded, Flanged (ANSI)
Body: PVC
Screens: Standard: 20 mesh PVC
Optional: PVC - 30 and 40 mesh
Stainless Steel - 20, 40 and 60 mesh
Seals: EPDM, FKM

Sizes 1/2" - 4" PVC/EPDM/FKM
Models NSF-61 Certified

Standard Features (Sizes 1/2" - 4")

- True union design facilitates installation or repair without expanding the pipeline
- Large filtration capacities and low pressure drops
- Transparent PVC strainer body permits easy evaluation of filter screen's condition
- Complete thermoplastic construction
- Pressure rating: 1/2" – 2", 150psi; 3" and 4", 85psi
- Sizes 1/2" – 2" supplied with two sets of end connectors (socket and threaded)

Options

- FKM seals for corrosive media
- Stainless steel 316 screens available in 20, 40 and 60 mesh
- In-line cleaning (clean out valve)

Tips on Sediment Strainers

- Clean screen regularly.
- Union nut of screening section can be removed for quick and easy maintenance (no need to remove body from pipeline).
- Sediment strainers protect pipeline's important and costly components, such as pumps and meters, by removing suspended particles and impurities.
- Filtering section must face downward when installed.
- You must identify flow direction, shown by molded arrow on the body, before installation.

Parts List (Sizes 1/2" – 4")

PARTS			
NO.	DESCRIPTION	PCS.	MATERIAL
1	Body	1	PVC
2	Filter Screen	1	PVC, Stainless Steel 316
3	Screen Support	1	PVC
4	End Connector	2	PVC
5	Union Nut	3	PVC
6	Retaining Ring	1	PVC
7	Split Ring	1	PVC
8	O-Ring (A)	1	EPDM, FKM, Others
9	O-Ring (B)	2	EPDM, FKM, Others
10	Stop Ring	2	PVDF * *

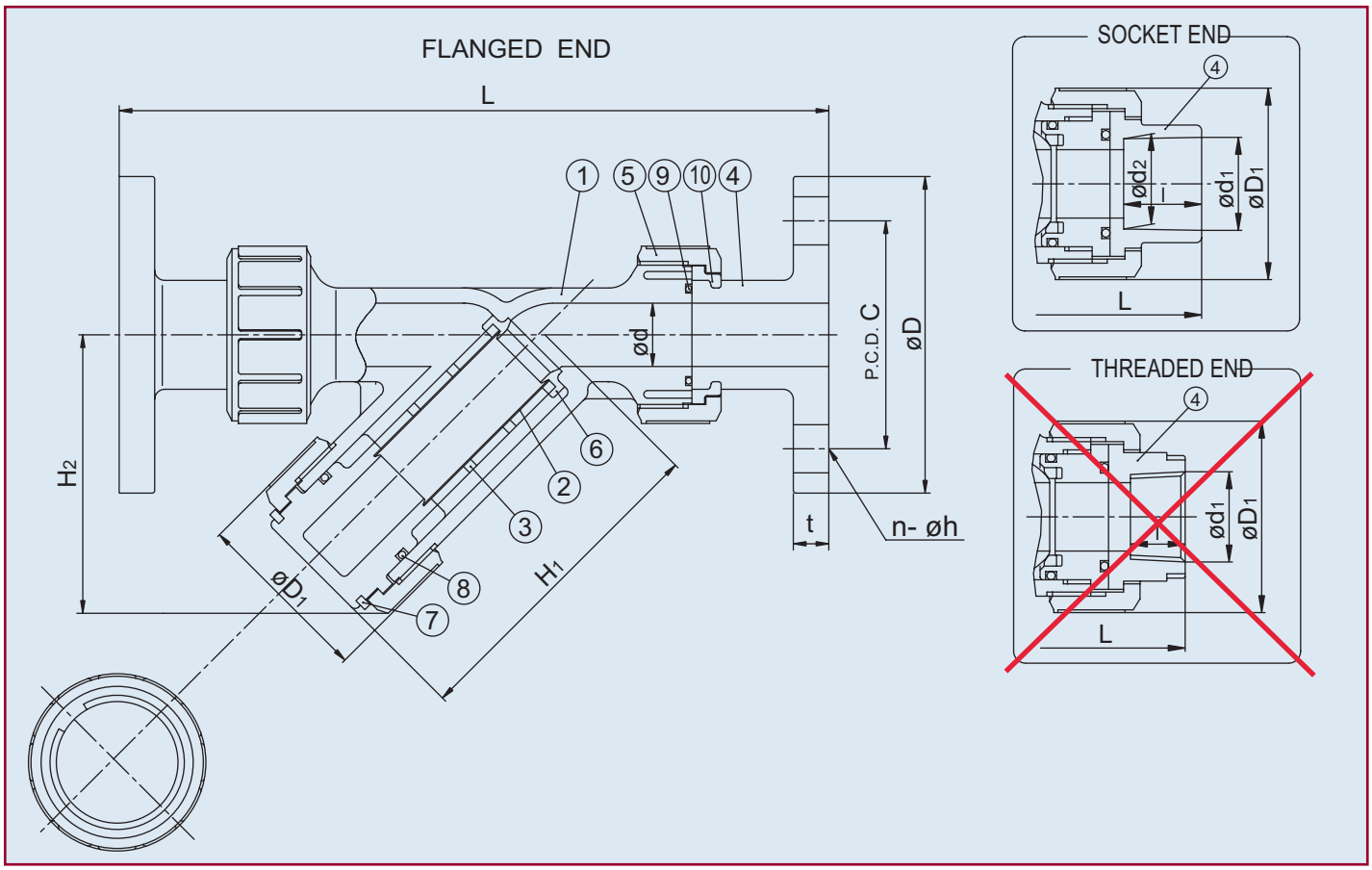
* * Used for flanged end

Sample Specification

All true union sediment strainers, sizes 1/2"– 4", shall be of true union design and shall be constructed of transparent PVC. All O-rings shall be EPDM or FKM. Screens shall be 20, 30 and 40 mesh PVC or 20, 40 and 60 mesh 316 stainless steel. Filter maintenance is achieved without removing strainer from the pipeline. PVC shall conform to ASTM D1784 Cell Classification 12454-A. Valves shall be rated to 150psi sizes 1/2" through 2" and 85psi sizes 3" and 4" at 70° F, as manufactured by Asahi/America, Inc.



Sediment Strainers



Dimensions (Sizes 1/2" – 4") (in.)

NOMINAL SIZE		FLANGED ANSI CLASS 150						SOCKET ASTM CLASS 40				THREADED						
INCHES	mm	D	C	n	h	L	t	d1	d2	l	L	d1	l	L	d	D1	H1	H2
1/2	15	3.50	2.38	1	0.62	8.11	0.47	0.848	0.836	0.87	6.93	1/2 - 14 NPT	0.59	6.59	0.59	1.89	3.82	3.07
3/4	20	3.88	2.75	1	0.62	10.00	0.55	1.058	1.046	1.00	8.30	3/4 - 14 NPT	0.67	7.95	0.79	2.36	4.72	3.86
1	25	4.25	3.12	1	0.62	11.02	0.55	1.325	1.310	1.12	9.37	1 - 11-1/2 NPT	0.79	8.82	0.98	2.76	5.24	4.37
1-1/4	32	-	-	-	-	-	-	1.670	1.655	0.94	11.28	1 1/4 - 11-1/2 NPT	0.87	11.30	1.57	3.94	6.97	5.87
1-1/2	40	5.00	3.88	1	0.62	13.23	0.63	1.912	1.894	1.38	12.13	1 1/2 - 11-1/2 NPT	0.98	11.30	1.57	3.94	6.97	5.87
2	50	6.00	4.75	1	0.75	14.20	0.63	2.387	2.369	1.50	13.31	2 - 11-1/2 NPT	1.10	12.76	2.07	4.17	7.48	6.29
3	80	7.50	6.00	4	0.75	18.78	0.71	3.516	3.492	1.87	17.83	3 - 8 NPT	1.38	17.17	3.07	5.98	10.67	9.21
4	100	9.00	7.50	8	0.75	23.94	0.71	4.518	4.491	2.25	23.54	4 - 8 NPT	1.77	23.47	3.94	8.27	14.21	12.44

Weight (lbs.)

NOMINAL SIZE		SOCKET THREADED	FLANGED
INCHES	mm		
1/2	15	0.66	1.10
3/4	20	1.32	2.20
1	25	1.76	3.31
1 -1/2	40	4.41	5.51
2	50	5.51	8.82
3	80	15.43	18.74
4	100	40.78	45.19

Cv Values

NOMINAL SIZE		Cv
INCHES	mm	
1/2	15	5.2
3/4	20	7.5
1	25	14
1 -1/2	40	34
2	50	50
3	80	110
4	100	165

Filter Screen Sizes*

MESH (HOLES PER LINEAR INCH)	20	30	40
MAXIMUM PARTICLE SIZE (INCH)	.0331	.0234	.0165
MICRON PARTICLE SIZE (mμ)	840	595	420

* For 60 mesh consult factory

Caution

- Never remove strainer from pipeline under pressure.
- Always wear protective gloves and goggles.

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ACCUDRAW® Calibration Cylinders



Polypropylene



PVC



Glass



- PVC with removable "O" ring sealed top for easy cleaning

- yellow polypropylene level indicator float for high visibility

ACCUDRAW® has been developed for the accurate calibration of metering pumps. Standard features include:

- translucent
- chemical resistant
- break resistant
- threaded, socket or flanged
- colored graduations and lettering
- PVC has dual scale USGPH & ml
- PVC sizes 100 - 20000 ml
- POLY sizes 100 - 4000 ml
- POLY meets ISO standards
- Glass sizes 100 - 20000 ml
- custom designs available

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E-Mail: primary@primaryfluid.com
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ACCUDRAW® Calibration Cylinders

"For Accuracy That Counts"

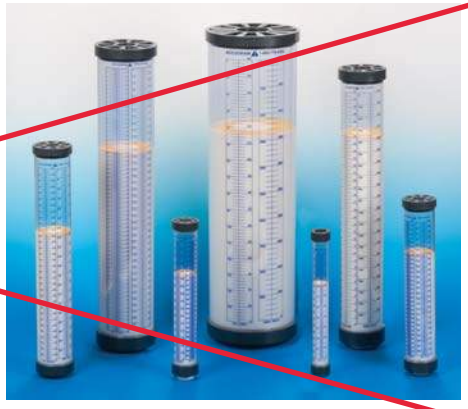
For complete product information visit our website: primaryfluid.com



Flanged: Glass, PVC



Flanged: PVC



PV#4

Sizing and Ordering Information:

ACCUDRAW Standard Materials of Construction

AC = All polypropylene construction (see below for options)
PV = All polyvinylchloride construction (see below for options)
ACS = Glass*

Note: Cylinders are NOT pressure vessels

Example: AC#1-1000B

AC = PP (polypropylene)
#1 = Bottom threaded connection only
1000 = 1000 ml
B = BSP Thread

e.g. Part # AC #1 - 1000 B

Type:
AC = Polypropylene
PV = PVC
ACS = Glass

Style:
1 = Bottom threaded conn. only
2 = Top and Bottom threaded conn.
3 = Bottom threaded conn. c/w removable vented dust cap
4 = Top/Bottom threaded conn. c/w removable "O" ring sealed top and float ring level indicator
Glass calibration cylinders available in Style 2 only

Graduation Scale:
PP - ml only
PVC - ml and GPH
Glass - ml only

Std. connection is NPT thread
Optional: add suffix as follows
S = Socket weld connection (PVC only)
GTV = Glass/TFE construction
GKV = Glass/PVDF construction
GCV = Glass/CPVC construction
GSV = Glass/SS construction
B = BSP Thread
F = Flanged

Substitute **E** for **V** for **EPDM** wetted "O" ring seal

Size:		Material	Conn.
100 =	100 ml (1.6 GPH)	PP, PVC, Glass	1/2"
250 =	250 ml (4 GPH)	PP, PVC, Glass	1/2"
500 =	500 ml (8 GPH)	PP, PVC, Glass	1/2"
1000 =	1000 ml (16 GPH)	PP, PVC, Glass	1/2"
2000 =	2000 ml (32 GPH)	PP, PVC, Glass	1"
4000 =	4000 ml (64 GPH)	PP, PVC, Glass	1"
6000 =	6000 ml	Glass only	1"
8000 =	8000 ml	Glass only	2"
10000 =	10000 ml (160 GPH)	PVC, Glass	2"
15000 =	15000 ml (240 GPH)	PVC only	2"
20000 =	20000 ml (320 GPH)	PVC, Glass	2"

Custom sizes and materials available.

Griffco Valve Inc.
188 Creekside Dr
Amherst, NY 14228 USA
Phone: +1 716 835-0891
Fax: +1 716 835-0893
sales@griffcovalve.com
www.griffcovalve.com

M-SERIES
PRESSURE RELIEF VALVES



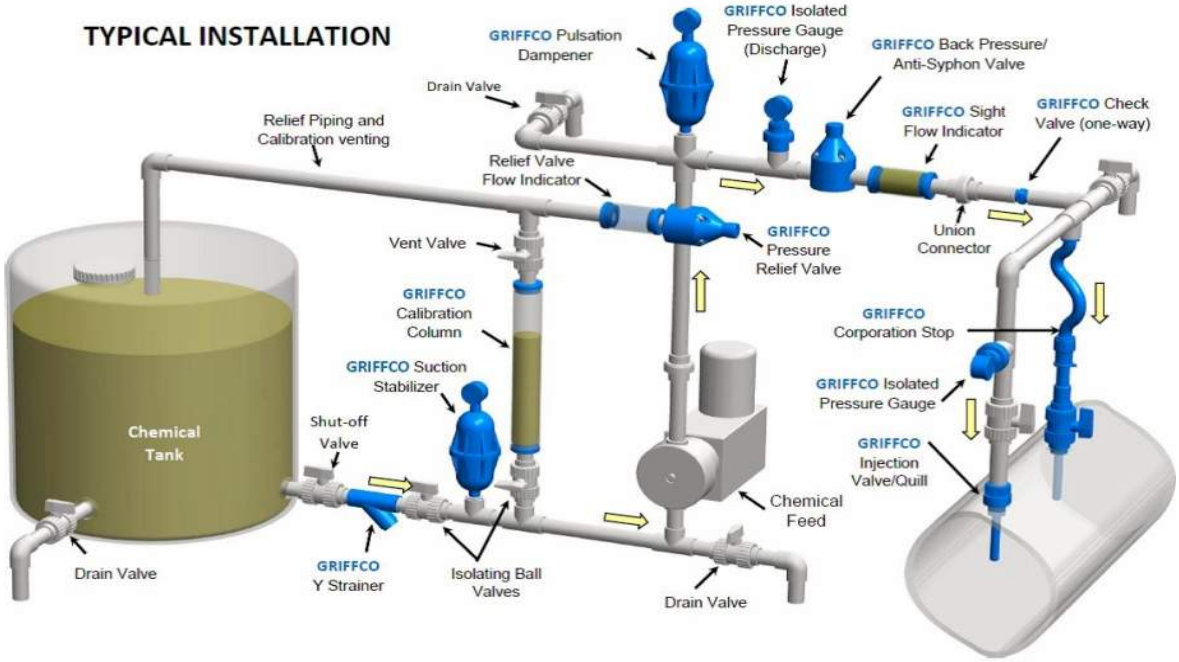
Griffco M-Series diaphragm pressure relief valves are designed to protect chemical feed systems from over pressure damage caused by defective equipment or a blockage in the chemical feed line. Robust construction ensures reliability in the rigorous service of municipal and industrial applications. Wetted materials include: **PVC, ~~CPVC, PP, PVDF, PTFE, Halar, 316 SS, A20 and Hastelloy C~~**. Available sizes: ~~1/4", 3/8",~~ and 1/2".

Features:

- **Molded Noryl Top**
- **High Reliability / Low Cost**
- **Compact Size for OEM Applications**
- **Adjustable Pressure Settings**
- **Optional 350 PSI Rated Valve**
- **~~3 Port,~~ 2 Port, & 90° Configuration**
- **Robust, Machined Body Construction**
- **Multiple Diaphragm Materials**
- **Wide Range of Valve Materials**

Operation:

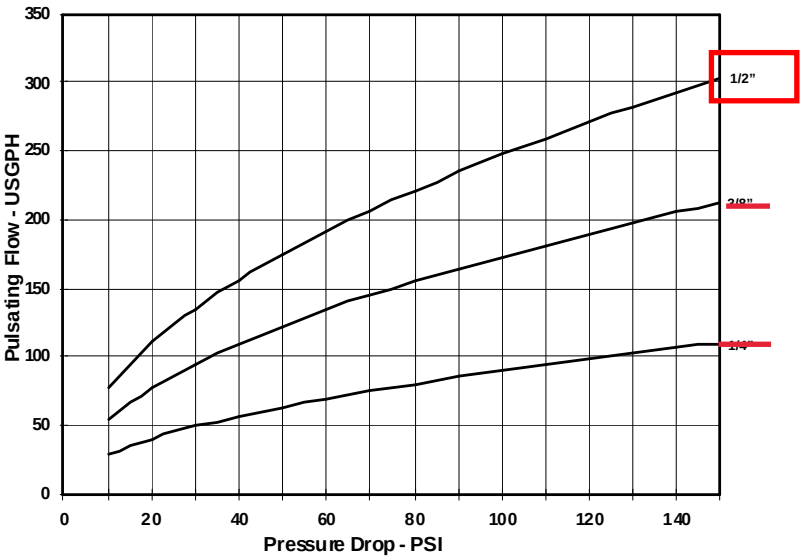
Griffco diaphragm pressure relief valves operate when the pressure in the chemical system exceeds the preset pressure of the valve. The diaphragm is held against the valve seat by an internal spring. When the preset pressure is exceeded the diaphragm is forced up and the chemical flows out the relief port, back to the chemical tank or to the suction side of the pump. The valves are pre-set at 50 psi, however they are field adjustable from 10 - 150 psi, via the adjustment screw. The relief valve should be set approximately 15 psi higher than the system pressure. Installation should be made as close to the pump as possible, without any valves or accessories between the relief valve and the pump. Consult your pump manufacturer for their recommendations.



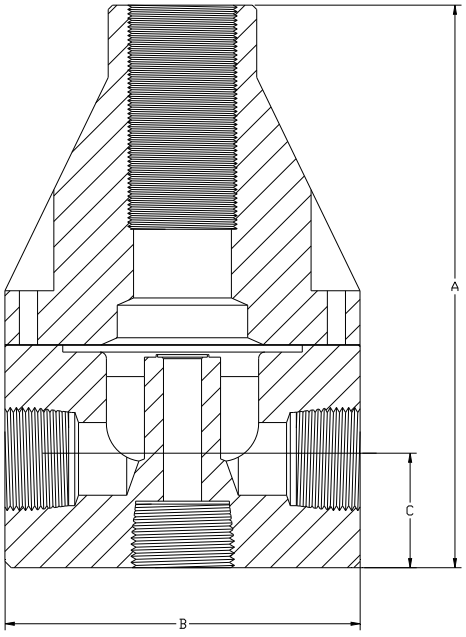
Technical Data:

Sizes: PRM			1/4", 3/8", 1/2"		
Connections:			NPT, Socket, Union, Flanged		
Pressure Adjustment			Standard 10 - 150 psi, Optional: 0 – 50 psi, 10 - 250 psi, 50 – 350 psi		
Flow Rates @ 150 psi			**Shipping Weight: lbs**		
Size	**Pulsating**	**Continuous**	**Plastic**	**Metal / Plastic Top**	**Metal / Metal Top**
1/4"	100 USgph	5 USgpm	1.0	2.5	3.0
3/8"	200 USgph	10 USgpm	1.0	2.5	3.0
1/2"	300 USgph	15 USgpm	1.0	3.0	3.5
Max Temperature: (°F)			PVC: 140°; CPVC & PP: 195°, PTFE & PVDF & Metal: 300°, (Peak 390°)		
Max Operating Pressure @ 70°F: (psi)			Plastic/Noryl: 375 psi, Metal /Metal: 2000 psi		
Materials of Construction:					
Diaphragm			PTFE / EPDM, Optional: Viton, Hypalon, Nitrile, PTFE / Viton		
Valve Top			Standard: Noryl, Optional: 316 SS L		
Valve Body			PVC, CPVC, PP, PTFE, PVDF, 316 SS L, A 20, Hast. C, Others on Request		

Performance Curves:



Standard PRM Dimensions:



***PRM2 and PRM3 Dimensions available upon request**

Product Codes For Ordering:

PRM	☐☐☐	☐	☐	☐
PRM2 (Optional 2 port)	1	2	3	4

PRM3 (Relief port is on the side of the valve instead of at the bottom)

1 = Size
- 025 – 1/4"
- 038 – 3/8"
- 050 – 1/2"

2 = Material
- P - PVC
- CP - CPVC
- PP - Polypro
- T - PTFE
- K - PVDF
- H - Hastelloy B
- S - 316 SS
- A - Alloy 20
- C - Hastelloy C

3 = Spring Opt
- Blank - 10-150 psi
- 1 - 0 - 50 psi
- 2 - 10 - 250 psi

For 50 - 350 psi spring use option code "MSS"

4 = Options
- Blank – NPT & PTFE/EPDM
- V - Viton Diaphragm
- TV – PTFE/Viton Diaph
- S - Socket Connection
- F - Flange Connection
- U - Union Connection
- OSS - 316 SS L Top
- MSS - 50-350 psi 316SSL Top
- AR - Priming Valve
- 90 - 90° Configuration

Note: Option MSS is only for use on 316SS, A20, & Hast C Valves.

DIMENSIONS: PRM - Series			
All Materials	(Orifice size = 0.312)		
Size	A (in.)	B (in.)	C (in.)
1/4"	3.550	2.350	0.750
3/8"	3.550	2.350	0.750
1/2"	4.250	2.350	1.080

Website: www.griffcovalve.com

Email: sales@griffcovalve.com

Griffco Valve Inc.
188 Creekside Drive
Amherst, NY 14228 USA
Phone: +1 716 835-0891
Fax: +1 716 835-0893
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www.griffcovalve.com

M-SERIES
BACK PRESSURE VALVES



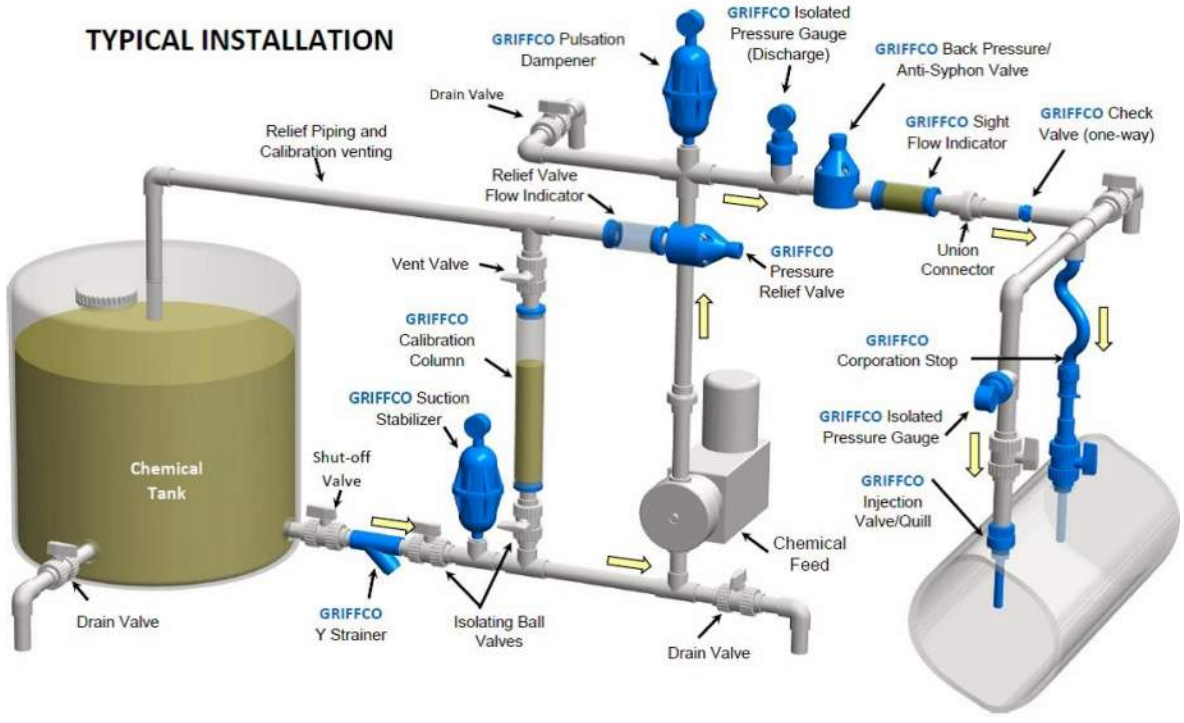
Griffco's new molded Noryl top extends the temperature and pressure rating of the standard valves. New valve designs continue to enhance the performance of chemical feed systems by applying a continuous back pressure to the chemical feed pump, while also acting as an anti-siphon valve. New construction ensures increased reliability in the rigorous service of municipal and industrial applications. Wetted materials include: **PVC, ~~CPVC, PP, PVDF, PTFE, 316 SS, A 20 and Hast. C~~**. Available sizes: ~~1/4", 3/8",~~ & 1/2".

Features:

- **Molded Noryl Top**
- **High Reliability / Low Cost**
- **Compact Size for OEM Applications**
- **Adjustable Pressure Settings**
- ~~**Optional 350 PSI Rated Valve**~~
- **Anti-Siphon Function**
- **Robust, Machined Body Construction**
- **Vulcanised PTFE/EPDM Diaphragm**
- **Wide Range of Materials**

Operation:

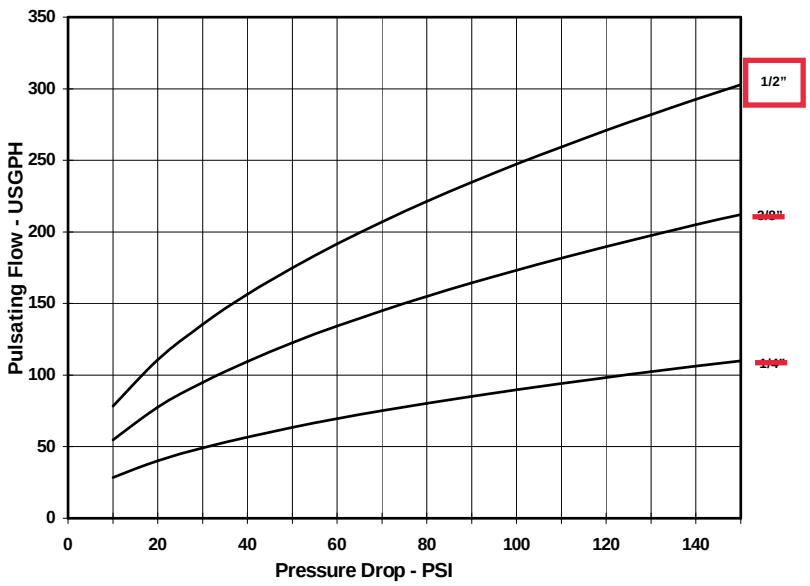
Griffco diaphragm back pressure valves apply positive discharge pressure to a metering pump system to prevent siphoning and eliminate varying dosage rates caused by fluctuating downstream pressure. The diaphragm is held against the valve seat by an internal spring. When the preset pressure is exceeded, the diaphragm is forced up and chemical flows through the valve to the injection point. The valves are preset for 50 psi, however they are field adjustable from 10 - 150 psi via the adjustment screw. Installation should be as close to the injection point as possible to prevent chemical line drainage, and it is most important that all chemical system equipment such as pulsation dampeners and pressure gauges are between the pump and back pressure valve.



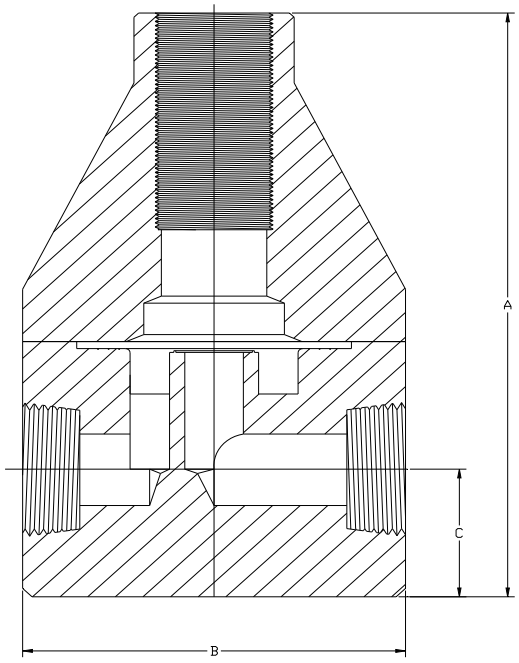
Technical Data:

Sizes: **Model BPM**			~~1/4", 3/8",~~ 1/2"		
Connections:			~~NPT, Socket, Union, Flanged~~		
Pressure Adjustment			Standard: 10 - 150 psi, ~~Optional: 0 - 50 psi, 10 - 250 psi, 50 – 350 psi~~		
Flow Rates @ 150 psi			**Shipping Weight: lbs**		
Size	**Pulsating**	**Continuous**	**Plastic**	**Metal / Plastic Top**	**Metal / Metal Top**
~~1/4"~~	~~100 USgph~~	~~5 USgpm~~	~~1.0~~	~~2.5~~	~~3.0~~
~~3/8"~~	~~200 USgph~~	~~10 USgpm~~	~~1.0~~	~~2.5~~	~~3.0~~
1/2"	300 USgph	15 USgpm	1.0	~~3.0~~	~~3.5~~
Max Temperature: (°F)			PVC: 140°; ~~CPVC & PP: 195°; PTFE & PVDF & Metal: 300°, (Peak 390°)~~		
Max Operating Pressure @ 70°F: (psi)			Plastic/Noryl: 375 psi, ~~Metal /Metal: 2000 psi~~		
Materials of Construction:					
Diaphragm			~~PTFE~~, EPDM, ~~Optional: Viton, Hypalon, Nitrile, PTFE / Viton~~		
Valve Top			Standard: Noryl, ~~Optional: 316 SS L~~		
Valve Body			PVC, ~~CPVC, PP, PTFE, PVDF, 316 SS L, A 20, Hast. C, Others on Request~~		

Performance Curves:



Dimensions:



Product Codes For Ordering:

BPM ☐☐☐ ☐ ☐ ☐

1 **2** **3** **4**

1 = Size

~~025 – 1/4"~~
~~038 – 3/8"~~
050 – 1/2"

2 = Material

P - PVC
~~CP - CPVC~~
~~PP - Polypro~~
~~T - PTFE~~
~~K - PVDF~~
~~H - Halar~~
~~S - 316 SS~~
~~A - Alloy 20~~
~~C - Hastelloy C~~

3 = Spring Opt

Blank - 10-150 psi
~~1 - 0 - 50 psi~~
~~2 - 10 - 250 psi~~

For 50 - 350 psi spring use option code "MSS"

4 = Options

Blank – NPT & PTFE/EPDM
~~V - Viton Diaphragm~~
~~TV – PTFE/Viton Diaph~~
S - Socket Connection
~~F - Flange Connection~~
~~U - Union Connection~~
~~OSS - 316 SS L Top~~
~~MSS - 50-350 psi 316SSL Top~~
~~AR - Priming Valve~~
~~90 - 90° Configuration~~

DIMENSIONS: BPM - Series			
All Materials	(Orifice size = 0.312)		
Size	A (in.)	B (in.)	C (in.)
~~1/4"~~	~~3.550~~	~~2.350~~	~~0.750~~
~~3/8"~~	~~3.550~~	~~2.350~~	~~0.750~~
1/2"	4.250	2.350	1.080

Note: Option MSS is only for use on 316SS, A20, & Hast C Valves.



Illustration may differ

Ordering information

Type	Part no.
PBS2-RB010SN1SS0NMA0Z	6073984

Other models and accessories ➜ www.sick.com/PBS_plus

Detailed technical data

Features

Medium	Liquid, gaseous
Pressure type	Gauge pressure
Pressure unit	bar
Measuring range	0 bar ... 10 bar, 0 psi ... 145 psi
Process temperature	–20 °C ... +85 °C
Zero point adjustment	Max. + 3 % of span
Output signal	IO-Link/PNP/NPN + 4 mA ... 20 mA / 0 V ... 10 V
Rotatable housing	Display against housing with electrical connection: 330 ° Housing against process connection: 320 °
Display	14-Segment LED, red, 4-digit, character height 9 mm, can be rotated electronically by 180° Update: 1,000, 500, 200, 100 ms (adjustable)

Mechanics/electronics

Process connection	¼" NPT
Wetted parts	Pressure connection: stainless steel 316L Pressure sensor: stainless steel 316L (for measurement ranges from 0 bar ... 10 bar rel stainless steel 13-8 PH)
Internal transmission fluid	Silicone oil (only with pressure ranges < 0 bar ... 10 bar and ≤ 0 bar abs ... 25 bar abs)
Pressure port	3.5 mm, Standard
Housing material	Lower body: stainless steel 304, Plastic head: PC + ABS, Buttons: TPE-E, Display window: PC
Connection type	Round connector M12 x 1, 4-pin, IP67
Supply voltage	15 V DC ... 35 V DC
Power consumption	45 mA (for configurations without analog output signal) 70 mA (for configurations with analog output signal)
Total current consumption	Max. 600 mA (including switching current)

Electrical safety	Protection class: III Overvoltage protection: 40 V DC Short-circuit protection: Q_A, Q_1, Q_2 towards M Reverse polarity protection: L^+ to M
Isolation voltage	500 V DC
CE-conformity	EMC Directive: 2014/30 / EU (EN 61326-1:2013; EN 61326-2-3:2013), Pressure equipment directive: 2014/68 / EU, Hazardous materials (RoHS): 2011/65 / EU (EN 50581:2012)
Weight sensor	Approx. 220 g
Seal	Without seal
Enclosure rating	IP67 / IP67
Protection class III	
MTTF	104 years

Performance

Non-linearity	≤ ± 0.25 %, of span (Best Fit Straight Line, BFSL) according to IEC 61298-2
Accuracy	≤ ± 0.5 % of the span
Setting accuracy of switching outputs	≤ ± 0.5 % of span
Response time	≤ 5 ms
Long-term drift/one-year stability	≤ ± 0.1 % of the span according to IEC 61298-2 ≤ 0.2 % of the span According to IEC 61298-2 for measuring range ≤ 0.6 bar or flush-mounted membrane (0 psi ... 10 psi)
Temperature coefficient in rated temperature range	Average TC of the zero point: ≤± 0.16% of the span / 10 K, Average TC of the span ≤± 0.16% of the span / 10 K
Rated temperature range	0 °C ... +80 °C
Service life	Minimum 100 Mio. life cycles

Ambient data

Ambient temperature	–20 °C ... +80 °C
Storage temperature	–20 °C ... +70 °C
Relative humidity	≤ 75 %
Shock load	50 g, 6 ms according to IEC 60068-2-27 (mechanical shock)
Vibration load	20 g, 10 Hz ... 2,000 Hz (IEC 60068-2-6, at resonance)

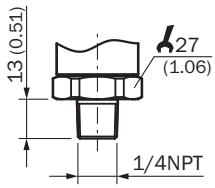
Classifications

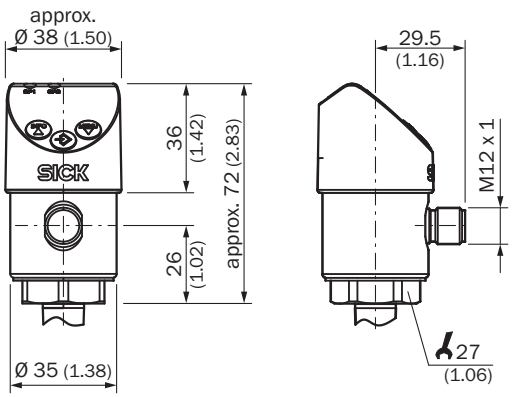
ECl@ss 5.0	27200620
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ECl@ss 6.0	27200620
ECl@ss 6.2	27200620
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ECl@ss 8.0	27200620
ECl@ss 8.1	27200620
ECl@ss 9.0	27200620
ECl@ss 10.0	27200620
ECl@ss 11.0	27200620
ETIM 5.0	EC000243
ETIM 6.0	EC000243

ETIM 7.0	EC000243
ETIM 8.0	EC000243
UNSPSC 16.0901	41112409

Dimensional drawing (Dimensions in mm (inch))

¼" NPT





Connection type

M12 x 1, 4-pin — 2 switching outputs/ 1 switching output + 1 analog output



L^+ = 1, M = 3, Q_1 = 4, Q_2 = 2
C/Q_1 = 4, Q_A = 2

M12 x 1, 5-pin — 2 switching outputs + 1 analog output



L^+ = 1, M = 3, Q_1 = 4, Q_2 = 2, Q_A = 5
C/Q_1 = 4

L^+: Positive supply connection
M: Negative supply connection
Q_1: Switching output 1
C/Q_1: With IO-Link: Communication/ switching output 1
Q_2: Switching output 2
Q_A: Analog output

TUFF GUARD™
Series TG

Gauge Guards

Materials: PVC, ~~CPVC, Natural Polypropylene, PVDF~~

Marquest Scientific's complete line of TUFF GUARD gauge and instrument isolators are engineered to provide total isolation of all instruments from corrosive and ultra pure fluids while offering a design with the most rugged features in the industry..

Features & Benefits

- Provides a compatible, protective barrier between process fluids and instruments
- Adds system reliability by eliminating instrument failures
- SS reinforcement of the instrument connection to prevent fracturing associated with metal to plastic threads. Integrally molded into port
- Integral wrench provisions for field service
- Diaphragms in Modified PTFE, ~~Viton®, EPDM, and Composite PTFE/FKM~~ for each application
- Displacement capacity for up to 4" diameter gauges and and large fill volume sensors
- Self-venting, 1/4" ~~& 1/2~~" female NPT instrument connections with Viton® O-ring instrument seal



SERIES TG-25S-PVC
2.5" ECONOMY GAUGE
1/2" Fem NPT Inlet
PVC Body

SERIES TG-25SB-CPV
2.5" STAINLESS/BRASS GAUGE
1/2" Fem NPT Inlet
CPVC Body

SERIES TG-25SS-PVD
2.5" ALL STAINLESS GAUGE
1/2" Fem NPT Inlet
PVDF Body

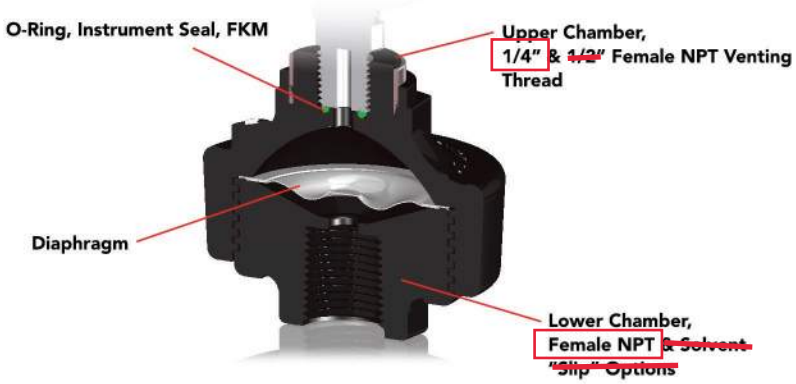
(1) Please see backside of data sheet for ordering info, including configuration & material options.

Specifications

Instrument Connection: Venting 1/4" ~~& 1/2" Female NPT~~
Process Connections: ~~1/4" &~~ 1/2" Fem NPT, ~~See "Slip"~~
Materials of Construction:
Housing: PVC, ~~CPVC, Polypropylene, PVDF~~
Diaphragm: Modified PTFE, ~~Viton®, EPDM, & Composite PTFE/FKM~~
Working Pressure: 0 - 250 psi at 70 Deg F.
Codes & Standards: ARRA Section 1605 "Buy American" Compliant. ASME A112.18.1M

Markets / Applications

- Wastewater Treatment
- Semiconductor Manufacturing
- Chemical Plants
- Chemical Feed Systems
- Food & Beverage
- Wet Processing
- Chemical Odor Control
- PCB Manufacturing
- Pharmaceutical Processing



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MARQUEST SCIENTIFIC
Fluid Handling Products

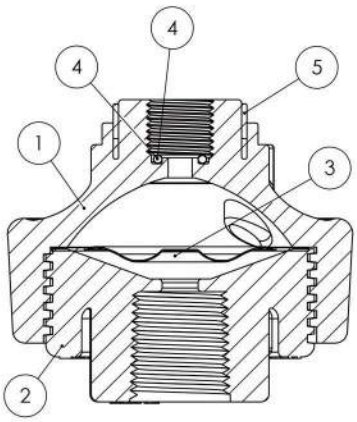
Viton® is a Registered Trademark of E.I. DuPont

Gauge Guards

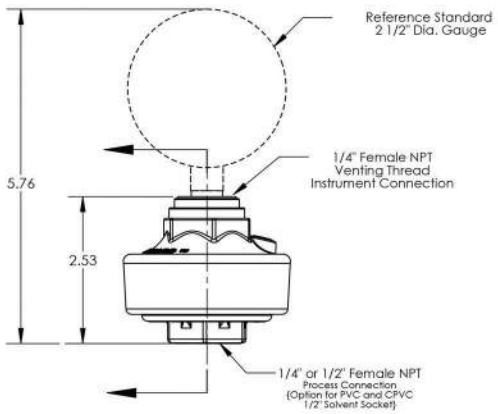
TUFF GUARD™
Series TG

Dimensional Data / Parts List

Fig. 1-1



ITEM NO.	DESCRIPTION	QTY
1	Upper Chamber	1
2	Lower Chamber	1
3	Diaphragm	1
4	O-Ring, Instrument Seal, FKM	1
5	Ring, Reinforcing 316 SS	1



*Dimensions in inches

(1) Model TG-25 shown above with 2.5" diameter case dimension.

Pressure / Temperature Data

WORKING PRESSURES PSI — **WEIGHTS**

Material	10°C 50°F	20°C 68°F	30°C 86°F	40°C 104°F	50°C 122°F	60°C 140°F	70°C 158°F	80°C 176°F	90°C 194°F	100°C 212°F	120°C 248°F	Net Weights Ounces*
PVC	200	250	250	220	140	135	----	----	----	----	----	6.2
CPVC	230	250	250	230	200	200	150	120	60	----	----	6.4
PP	200	240	240	210	145	125	75	60	----	----	----	5.1
PVDF	240	250	250	250	250	230	220	200	160	140	80	7.2

Temperature Ranges: PVC: 14 to 140°F (10 to 60°C), **CPVC:** 50 to 194°F (10 to 90°C), **PP:** 46 to 176°F (8 to 80°C), **PVDF:** -22 to 248°F (-30 to 120°C). * Weights are for unfilled 1/4" Female NPT x 1/2" MNPT without gauges.

How to Order Tuff Guard

Part No: TG - 2 5 T 060 SS - PVC

DIAPHRAGM MATERIAL
- T = Modified PTFE
- V = Viton®
- E = EPDM
- C = Composite PTFE/FKM

MODEL	INSTRUMENT PORT	PROCESS INLET PORT	GAUGE PRESSURE RANGE*	GAUGE INSTALLED	BODY MATERIAL
Tuff Guard	2 = 1/4" Vented Female NPT 5 = 1/2" Vented Female NPT (1) Viton FKM 0-ring seal is used for sealing instrument to thread. Zero pressure build during instrument install.	2 = 1/4" Female NPT 5 = 1/2" Female NPT 2S = 1/4" Solvent Soc 5S = 1/2" Solvent Soc	XXX = No Gauge Installed H030 = 0-30 in Hg Vacuum 015 = 0-15 PSI 030 = 0-30 PSI 060 = 0-60 PSI 100 = 0-100 PSI 160 = 0-160 PSI 200 = 0-200 PSI 300 = 0-300 PSI (1) Only specify pressure range when ordering with a gauge installed. When ordering a unit with no gauge installed, please place "XXX". (2) We offer offer both dual scale and compound pressure ranges. Please contact factory.	LEAVE BLANK = No Gauge S = Standard 2.5" Black Painted Steel Case, Marquest, Dry Case, 2-3-2 % Accuracy SB = Stainless Case / Brass Internals 2.5" Wika 212.53, Glycerin Filled Case, 2.5% Accuracy SS = All Stainless 2.5" Ashcroft 1008s, Glycerin Filled Case, 1.5% Accuracy (1) We offer a variety of other gauge & instrument options from Ashcroft, Wika, & US Ametek including 3.5", 4" Dial Sizes. The Tuff Guard is also perfectly suited for a variety of pressure sensors. Please contact factory.	PVC = Polyvinyl Chloride CPV = CPVC, Chlorinated Polyvinyl Chloride PPR = Reinforced, Glass Filled Polypropylene PVD = 100% HP Virgin PVDF

Example: TG-25T060SS-PVC (Gauge Installed)
PVC Tuff Guard Isolator, 1/2" Female NPT Inlet, Modified PTFE Diaphragm, 0-60 PSI All Stainless 2.5" Dia. Ashcroft 1008s Glycerin Filled Gauge Installed, Assembly Tested.

Example: TG-22CXXX-PVDF (No Gauge Installed)
PVDF Tuff Guard Isolator, 1/4" Vented Female NPT x 1/4" Female NPT Inlet, PTFE/FKM Composite Diaphragm, No Gauge Installed

(1) Assemblies with gauge installed have an Aqueous Glycerin (70% USDA 99.5% Glycerin / 30% Distilled Water) intermal fill in the upper chamber and gauge stem internals. Silicone & Halocarbon fills available. Units ordered with out an instrument, need to be filled per installation instructions.

Marquest Scientific, Inc.
2950 Airway Avenue, Costa Mesa, 92626 California
Toll Free 866 452 2349 Fax 714 491 9199
www.marquestscientific.com | www.GaugeGuards.com

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PLAST-O-MATIC

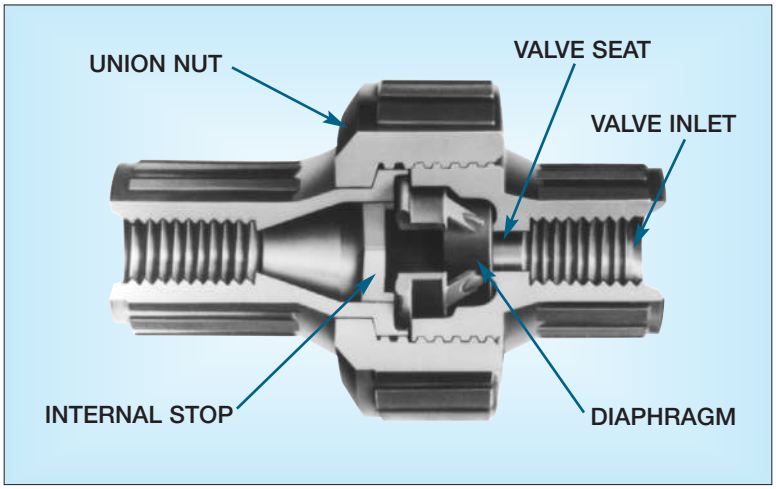
PRODUCT DATA

CATALOG CKL
(Series CKM ~~& CK~~)

Self-Closing Thermoplastic Check Valves...

Patented Diaphragm Design Assures Dependable, Repetitive, Bubble-Tight Sealing... and They Can Be Mounted in Any Position!

Sizes: 1/2", ~~3/4" and 1"~~



Features/Benefits:

- **Patented Design:** Self-sealing - are not dependent upon gravity, mounting position or reverse flow, a significant improvement over ball check valves.
- **Silent Operation:** No internal sliding or loose parts to slam or vibrate - chattering is eliminated!
- **Dependability:** Leak-free sealing protects against the potential hazards created by reverse flow of corrosive liquids such as acids, caustics and chlorine solutions.
- **Repetitive Long Term Sealing:** Diaphragm automatically positions itself against seat in the identical location. Superior to ball check valves which often leak at lower pressures.
- **Convenience:** Union nut on Series CKM simplifies valve inspection/removal with minimum piping breakdown.
- **Minimal Cracking Pressure:** Diaphragm begins to open at approximately 1.0 to 1.5 PSI.
- **Cost Efficient:** Designed to improve system performance and competitively priced.

Materials of Construction:

Plast-O-Matic Series CKM Check Valves are molded of Type 1, Grade 1, PVC (Polyvinyl Chloride), Glass-filled Polypropylene, Corzan® CPVC, and Kynar® PVDF in sizes 1/2", ~~3/4" and 1". A machined version, Series CK is available in PTFE in sizes 3/4" and 1"~~. Diaphragms are of ~~EPDM or~~ FKM (Viton®). ~~Threaded connections are standard on all models~~. Socket end connectors are available on all Series CKM models.

Note: For information on 1½", 2" and 3" models, refer to Catalog CKS.

PLAST-O-MATIC VALVES, INC.

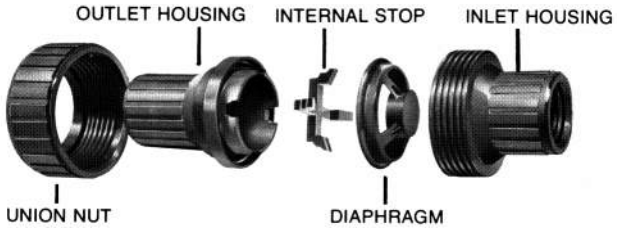
1384 Pompton Avenue, Cedar Grove, New Jersey 07009
(973) 256-3000 • Fax: (973) 256-4745 • www.plastomatic.com

Series CKM & CK Diaphragm Check Valves 1/2", ~~3/4" & 1"~~

Design

Series CKM ~~& CK~~ Check Valves, normally closed in design, feature a patented diaphragm seal that will neither stick nor chatter and is automatic in action. The valves are not dependent upon gravity so they can be mounted in any position. Even in the absence of reverse flow or pressure, the diaphragm will automatically reposition itself to seal against the valve seat. This is achieved with or without the presence of reverse flow. The unique and patented diaphragm will seal in the identical location every time producing a more reliable and repetitive seal.

The molded Series CKM models have only one moving part – the diaphragm. This provides both design simplicity and maximum operating dependability.

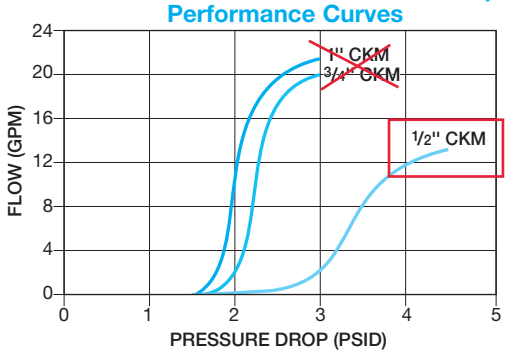


Operation

Flow entering the valve inlet will open the valve by pushing the diaphragm off the valve seat until it comes to rest on the internal stop. This supports the diaphragm and eliminates force or stress under high flow condition. In this position both the diaphragm and valve seat are kept clean by the flushing action of the internal flow, keeping the entire sealing area free of particles which could cause leakage.

If the inlet flow is either stopped, or if a backflow of a higher pressure is sensed, the diaphragm will automatically reposition itself, closing off the valve seat. Reverse flow or pressure is not required to close the valve when the inlet flow stops. If reverse pressure is present it simply creates a tighter seal.

Series CKM – Flow vs. Pressure Drop Performance Curves



Series CKM is a normally-closed design requiring 1.5 PSI or less to open

Installation

Because of its normally closed design the Plast-O-Matic CKM ~~and CK~~ Check Valves can be installed in any position; concern over the valve seat closing due to gravity (as with ball check designs) is of no consequence. Caution should be exercised to make certain that the direction of flow is correct. Threaded connections should never be made to metal piping and should always be wrapped with PTFE or other acceptable pipe sealant to effect a seal. The assembly need only be made hand tight followed by a one-quarter turn more with a strap wrench. *DO NOT* overtighten and *DO NOT* use a pipe wrench as a future valve fracture could result.

Dimensions and Material Availability

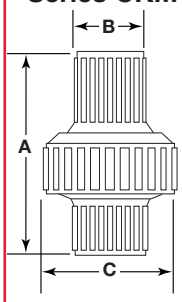
Series CKM – Molded Models: PVC, CPVC, GPP & PVDF

Pipe Size (NPT)	A		B		C	
	in.	mm	in.	mm	in.	mm
1/2"	3.8	97	1.3	33	2.4	62
~~3/4"~~	4.1	105	1.6	39	2.8	72
~~1"~~	4.7	120	1.9	48	2.8	72

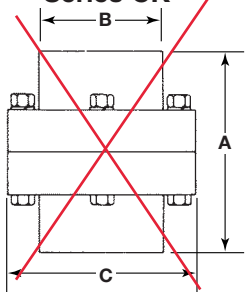
Series CK – Machined Models: PTFE

~~3/4"~~	3.6	92	1.9	48	3.0	76
~~1"~~	4.3	110	1.9	48	3.0	76

Series CKM



Series CK



Pressure Temperature Ratings

Series CKM – Molded Models: PVC, CPVC, GPP & PVDF

Valve Body Material	Valve Diaphragm Material	Maximum Working Pressure							
		77°F (25°C)		140°F (60°C)		180°F (82°C)		280°F (138°C)	
		Inlet	Back	Inlet	Back	Inlet	Back	Inlet	Back
PVC	EPDM	150	100	150	100	NR	NR	NR	NR
	~~FKM~~	~~150~~	~~100~~	~~150~~	~~100~~	~~NR~~	~~NR~~	~~NR~~	~~NR~~
GPP 20% Glass Filled	EPDM	100	100	100	100	100	100	NR	NR
	FKM	100	100	100	100	100	100	NR	NR
PVDF	EPDM	150	100	150	100	150	100	NR	NR
	FKM	150	100	150	100	150	100	60	60
CPVC	EPDM	150	100	150	100	150	100	NR	NR
	FKM	150	100	150	100	150	100	NR	NR

Series CK – Machined PTFE Models

PTFE	EPDM	40	40	40	40	40	40	5	5
	FKM	40	40	40	40	40	40	5	5

Ordering Information For Series CKM & CK

Pipe Size	CKM - PVC FKM Seals	CKM - PP FKM Seals	CKM-PF FKM Seals	CKM-CPVC FKM Seals	CK-TF FKM Seals
1/2"	CKM050V-PV	CKM050V-PP	CKM050V-PF	CKM050V-CP	N.A.
~~3/4"~~	~~CKM075V-PV~~	~~CKM075V-PP~~	~~CKM075V-PF~~	~~CKM075V-CP~~	~~CK075V-TF~~
~~1"~~	~~CKM100V-PV~~	~~CKM100V-PP~~	~~CKM100V-PF~~	~~CKM100V-CP~~	~~CK100V-TF~~

Note: Threads are standard. For socket ends add "S" after seal material. (ex. CKM050VS-PV). For other body materials consult factory. Above shown with FKM (Viton®) Seals. For EPDM seals change "V" to "EP". ~~N.A. – Not Available.~~

AUTHORIZED PLAST-O-MATIC DISTRIBUTOR

PLAST-O-MATIC VALVES, INC.
1384 Pompton Ave., Cedar Grove, NJ 07009 • (973) 256-3000 • Fax: (973) 256-4745 • www.plastomatic.com
5/06

Ball Valve Type 375



Ball Valve Type 375

Product description

The Ball Valve Type 375 is an affordable manual ball valve that was developed specially for use in water applications or with non-critical chemicals. Its construction ensures simple maintenance and hence a long service life. Its compact construction makes possible simple installation into and removal from the piping system.

Function

The ball valve uses a rotating ball with a hole through it that allows straight-through flow in the open position and shuts off flow when the ball is rotated 90° to block the flow passage. This valve is used primarily for open/close functions and also for throttling services.

Applications

- Water treatment
- Non-critical chemicals

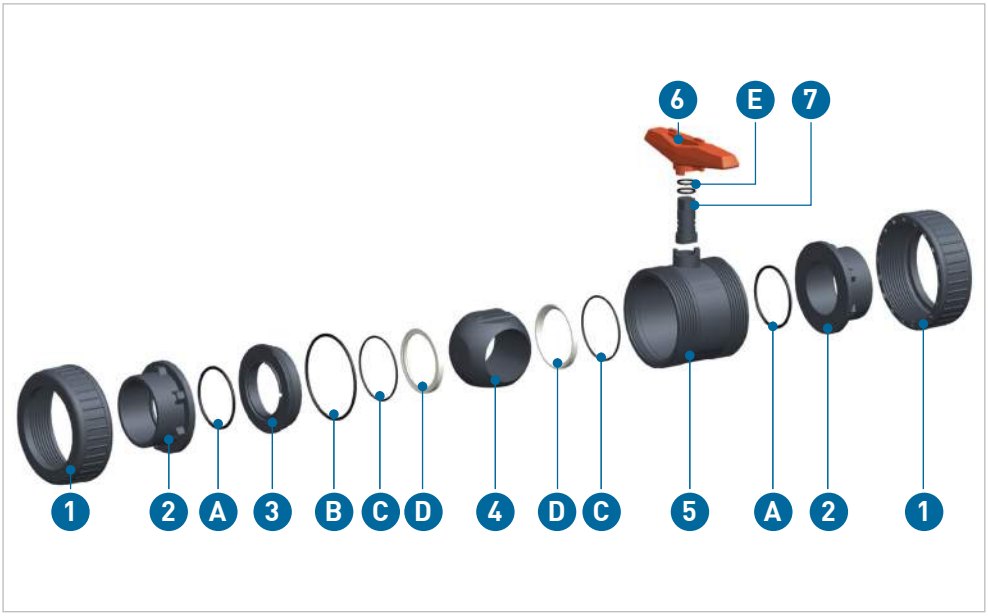
Benefits/features

- Manual valve for water applications and non-critical media
- Ergonomic hand lever with integrated tool for removing/adjusting the union bushing
- Simple maintenance and long service life
- Simple installation and removal due to compact construction
- PTFE ball seat
- Double o-ring on the stem
- Very compact "Z" dimension
- Wide range from 16mm to 110mm and from ½" to 4"

Flow media

Non-solid, neutral and non-aggressive media. The chemical resistance depends on the selected valve material (see online tool ChemRes PLUS).

Technical data



① Coupling nut
② Connecting part
③ Union bush
④ Ball
⑤ Valve body
⑥ Hand lever
⑦ Stem
A Face seal
B Body seal
C Backing seal
D Ball seat
E Stem seal

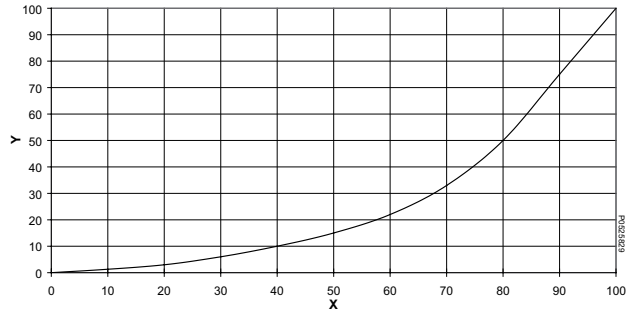
Specification		
Dimensions	d16/DN10 – d110/DN100, ⅜“ – 4“	
Materials	Valve body	PVC-U ~~PVC-C~~
	Lever	PVC-U
Gasket meterials	O-rings	EPDM, ~~FKM~~
	Ball seat	PTFE
Pressure levels	DN10 – 50	PN16
	DN65 – 100	PN10
Actuation variants	Manually operated	
Connections	Solvent cement sockets	ISO, BS, ASTM/ANSI
	Threaded sockets	NPT, Rp
	Butt fusion spigots, long	PE100 SDR11 ISO
Approvals	ACS, NSF 61, WRAS	

Kv 100 values

DN (mm)	inch (inch)	d (mm)	Kv 100 (l/min)	Cv 100 (US Gal./min)	Kv 100 (m^3/h)
~~10~~	~~⅜~~	~~16~~	~~70~~	~~4.9~~	~~4~~
15	½	20	185	12.9	11
~~20~~	¾	25	350	24.5	21
25	1	32	700	49.0	~~42~~
32	1 ¼	40	1'000	~~70.0~~	60
40	1 ½	50	1'600	112.0	96
50	2	63	~~3'100~~	217.1	186
65	2 ½	75	5'000	~~350.0~~	300
80	~~3~~	90	7'000	490.0	420
~~100~~	4	110	11'000	770.0	660

The kv values for each intermediate valve position can be determined by using the flow value characteristics and the kv 100 values.

Flow characteristics



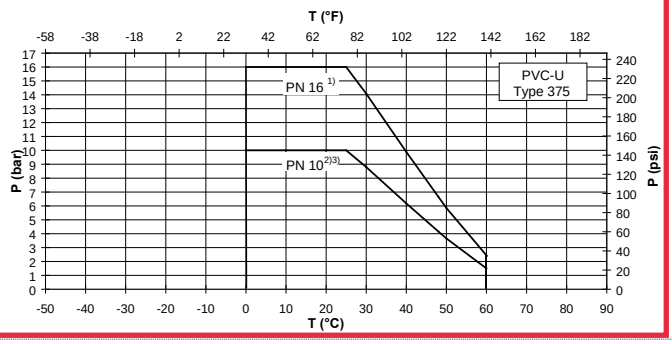
X Opening angle (%)
Y Kv, Cv value (%)

Pressure-temperature diagrams

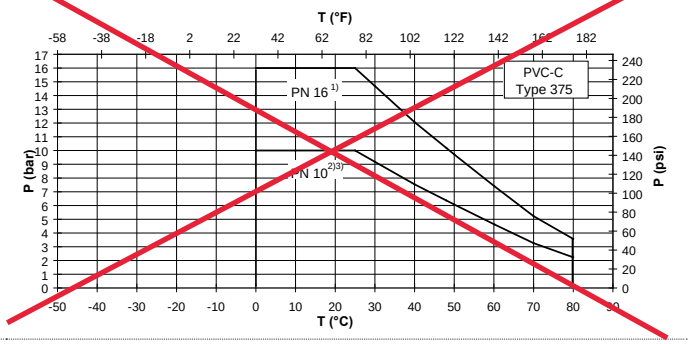
The following pressure-temperature diagrams are based on a service life of 25 years and water or similar media.

T Temperature (°C, °F)
P Permissible pressure (bar, psi)

PVC-U



PVC-C

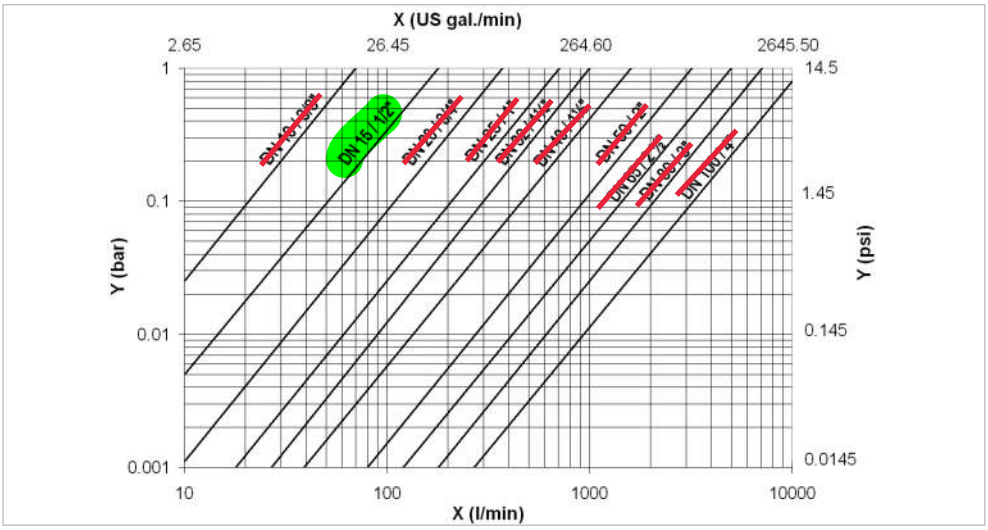


1) For the nominal diameters DN10 - DN50 the central part of the ball valve is designed for the nominal pressure PN16

2) For nominal diameters DN10 - DN50, the nominal pressure is reduced to PN10 depending on the connection

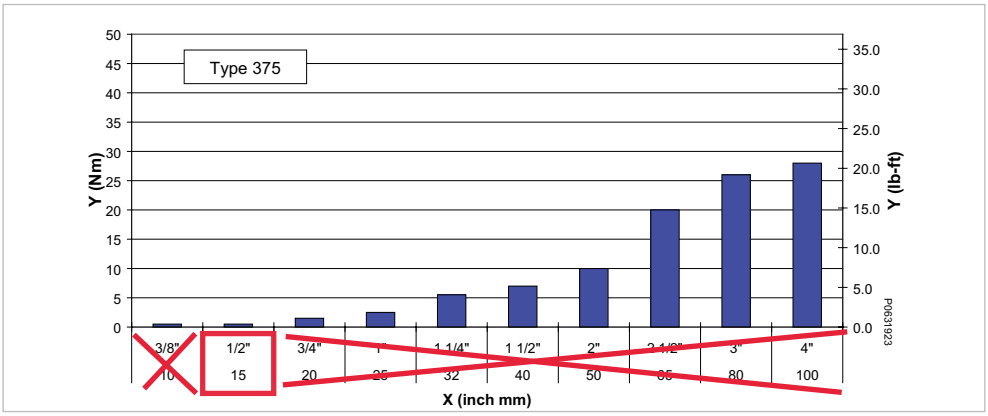
3) For the nominal diameters DN65 - DN100 the central part of the ball valve is designed for nominal pressure PN10

Pressure losses



X Flow rate (l/min, US gal/min)
Y Pressure loss Δp (bar, psi)

Operating torque

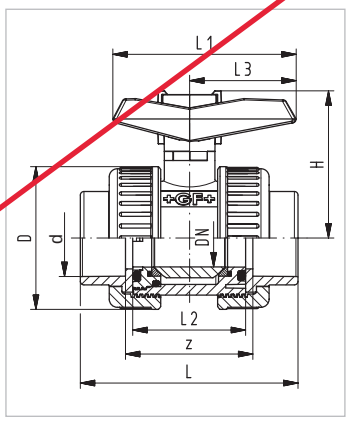


X Nominal diameter DN (mm, inch)
Y Tightening torque (Nm, lb-ft)

Dimensions

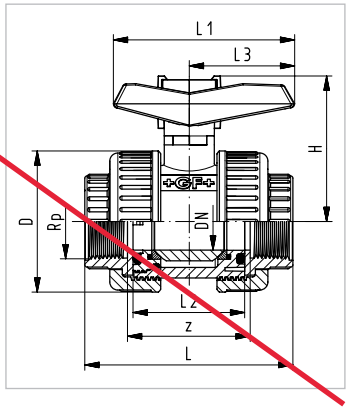
With solvent cement sockets, metric

d (mm)	DN (mm)	D (mm)	H (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	z (mm)
16	10	50	55	76	67	42	40	48
20	15	50	55	80	67	42	40	48
25	20	59	61	91	77	48	45	53
32	25	68	69	102	87	54	51	58
40	32	80	81	120	102	62	59	68
50	40	94	91	140	119	72	70	78
63	50	115	113	169	146	86	84	93
75	65	145	129	206	179	110	103	118
90	80	168	146	242	209	128	120	140
110	100	210	179	282	250	150	141	160



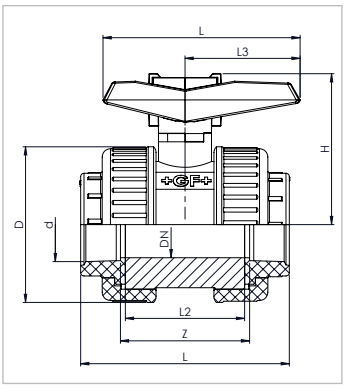
With threaded sockets, Rp

Rp (inch)	DN (mm)	D (mm)	H (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	z (mm)
⅜	15	50	55	76	67	42	40	48
½	15	50	55	80	67	42	40	48
¾	20	59	61	91	77	48	45	53
1	25	68	69	102	87	54	51	58
1 ¼	32	80	81	116	102	62	59	68
1 ½	40	94	91	126	119	72	70	78
2	50	115	113	149	146	86	84	93
2 ½	65	145	129	184	179	110	103	118
3	80	168	146	212	209	128	120	140
4	100	210	179	244	250	150	141	160



With threaded sockets, NPT

NPT (inch)	DN (mm)	D (mm)	H (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	z (mm)
½	15	50	55	88	67	42	40	48
¾	20	59	61	91	77	48	45	53
1	25	68	69	102	87	54	51	58
1 ¼	32	80	81	116	105	62	59	68
1 ½	40	94	91	126	119	72	70	78
2	50	115	113	149	146	86	84	93
2 ½	65	145	129	184	179	110	103	118
3	80	168	146	212	209	128	120	140
4	100	210	179	244	250	150	141	160



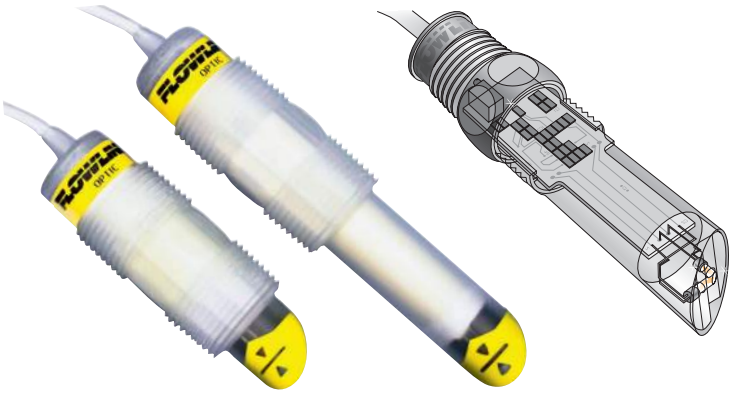
Switch-Tek™ LO10

Optic Liquid Leak Detection Switch

FLOWLINE™ LEVEL BEST

Application

The general purpose optic leak switch provides leak detection in and around secondary containment sumps, tanks and piping systems with a 1A relay output. Media examples include sulfuric acid and sodium hypochlorite. The submersible PP or PFA leak switch sensor is mounted through the containment wall or within the interstitial space, and connected to a PLC or relay controller.



Features

- Rugged polypropylene or PFA Teflon® sensor and cable for corrosive liquids
- 60VA SPST relay selectable NO or NC via power supply wiring polarity
- Sensor may be located up to 1000’ from a Flowline relay controller

Key Benefits

- Fail-safe leak sensor inverts “wet” to alert user for maintenance
- Submersible sensor and cable designed for insertion within a secondary containment wall
- Requires only a small amount of liquid to detect the presence of a leak

Compatible Products



LC4X

SWITCH-PRO™

Remote Level Controller

The general purpose remote level controller is offered in two configurations for leak alarm and/or pump or valve shut off. The LC40 accepts one leak sensor input and with one 10A relay ouput. The LC42 accepts two leak sensor inputs with two 10A relay outputs. For field mount installation, add a single or dual indicator NEMA box.



LC10

SWITCH-PRO™

Compact Level Controller

The general purpose compact level controller mounts directly on the sensor for leak alarm and/or pump or valve shut off. The LC10 accepts one leak sensor input with one 16A relay output. The optional flash alarm brings attention to alarm conditions. The controller may also be mounted on the top of Switch-Pak fitting with the leak sensor mounted on the bottom of the fitting.

Switch-Tek™ LO10

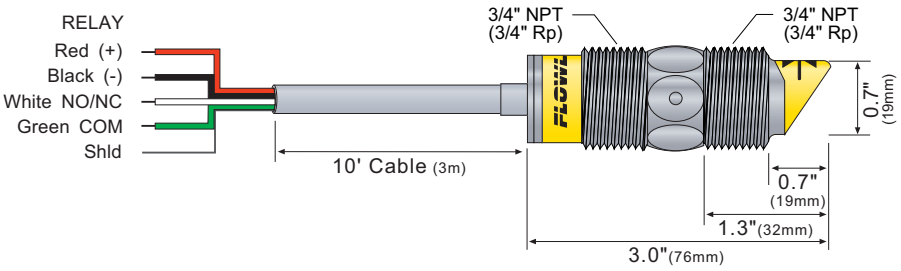
Optic Liquid Leak Detection Switch

FLOWLINE™ LEVEL BEST

Specifications

Orientation:	Universal
Accuracy:	± 1mm in water
Repeatibility:	± 0.5mm in water
Supply voltage:	12-36 VDC
Consumption:	25 mA maximum
Contact type:	(1) SPST relay
Contact rating:	60 VA, 1A maximum
Contact output:	Selectable NO / NC
Process temp.:	F: -40° to 176°
	C: -40° to 80°
Pressure:	150 psi (10 bar) @ 25° C, derated @ 1.667 psi (0.113 bar) per °C above 25° C
Sensor rating:	-1XX5: NEMA 6 (IP68)
	-2XX5: NEMA 4X (IP65)
Sensor material:	-1XX5: PP
	-2XX5: PFA
Cable jack. mat.:	-1XX5: PP
	-2XX5: PFA
Cable type:	4-conductor, shielded #22 AWG
Cable length:	10’ (3m)
Process mount:	3/4” NPT (3/4” G / Rp)
Mount. gasket:	Viton® (G version only)
Classification:	General purpose
Compliance:	CE

Dimensions



Fittings









P/N	DESCRIPTION
Switch-Pak™ Fitting Components	
LM45-7001	2” NPT plug fitting, 3/4” NPT nipple, PVC
LM45-1001	2” NPT plug fitting, 3/4” NPT nipple, PP
LM45-5001	2” NPT plug fitting, 3/4” NPT nipple, PVDF
Smart Trak™ Fitting Components	
LM10-1201	2’ track, 2” NPT plug fitting, 3/4” NPT nipple, PP
LM10-1401	4’ track, 2” NPT plug fitting, 3/4” NPT nipple, PP
LM10-1601	6’ track, 2” NPT plug fitting, 3/4” NPT nipple, PP
LM10-1801	8’ track, 2” NPT plug fitting, 3/4” NPT nipple, PP
LM10-1001	10’ track, 2” NPT plug fitting, 3/4” NPT nipple, PP
LM10-1101	1m track, 2” NPT plug fitting, 3/4” NPT nipple, PP
LM10-1301	2m track, 2” NPT plug fitting, 3/4” NPT nipple, PP
LM10-1701	3m track, 2” NPT plug fitting, 3/4” NPT nipple, PP
Smart Trak™ Level Switch Car Kit	
LM30-1001	Level switch car kit, 3/4” NPT, PP
LM30-1061	Level switch car kit, 3/4” Rp, PP
Side Mount Bracket	
LM50-1001	2” NPT bracket, PP

Ordering

LO10 - [ ] [ ] [ ] 5

SENSOR MATERIAL (1)
- **1** PP
- **2** PFA

SENSOR LENGTH
- **3** Short
- **4** Long

PROCESS MOUNT (2)
- **0** NPT (US)
- **2** G / Rp (Metric)

NOTES

1) To special order a 25’ (7.6m) or 50’ (15.2 m) level sensor cable, place the cable length at the end of the part number (ie: LO10-1305-25’). For PP, add $50 for 25’ (7.6m) or $100 for 50’ (15.2m) to the price. For PFA, add $200 for 25’ (7.6m) or $400 for 50’ (15.2m) to the price.
2) The short Metric level sensor has conical Rp threads on both sides of the wrench flat. The long Metric level sensor has straight G threads on the sensing side, and conical Rp threads on the cable side of the wrench flat.

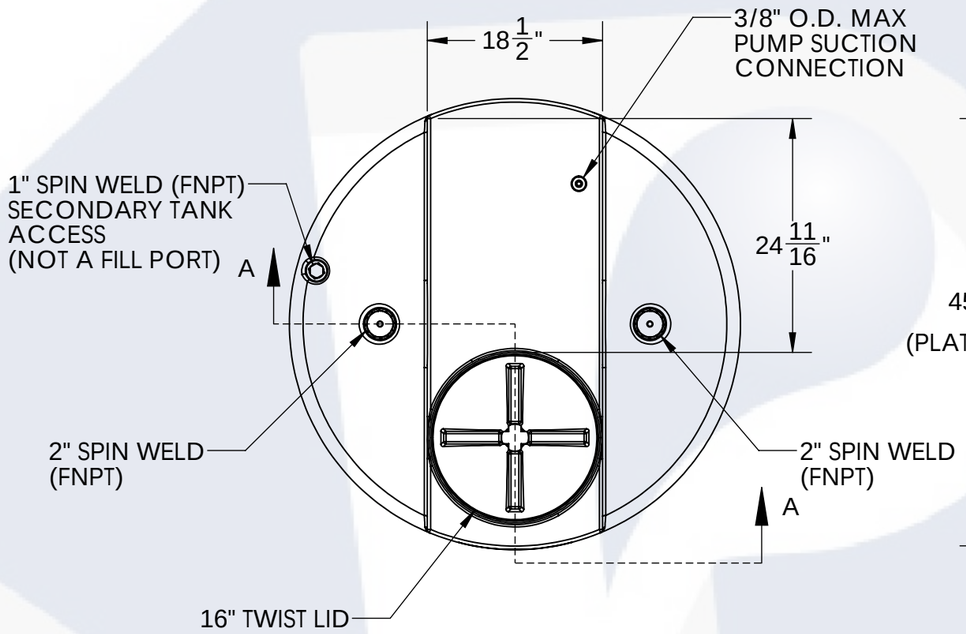
© 2024 Flowline | 10500 Humbolt Street, Los Alamitos, CA 90720 USA **p** 562.598.3015 **f** 562.431.8507 **w** flowline.com

Hypochlorite Storage Tank

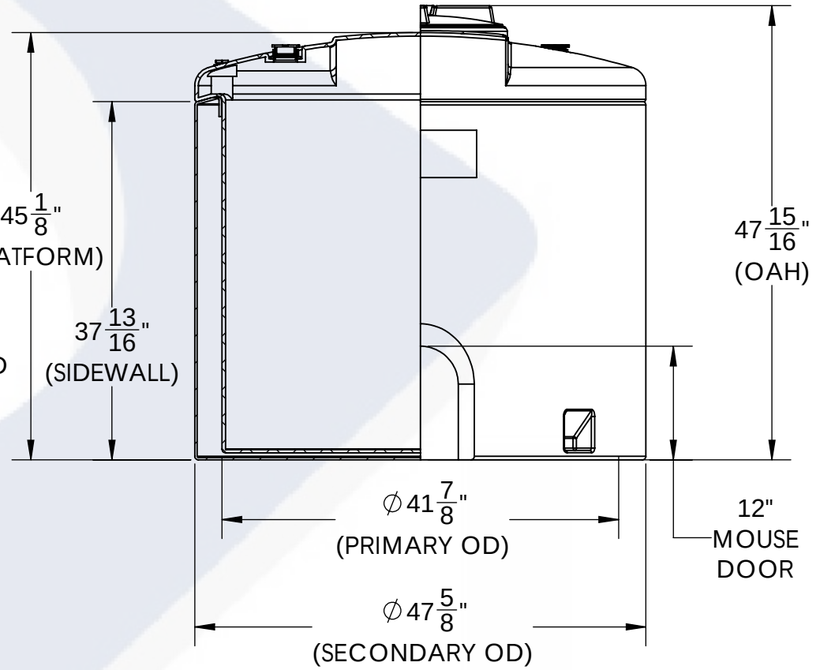
Fittings use at Owners discretion.
Fill
Pump Supply
Level Sensor
Vent



ISOMETRIC VIEW
(ASSEMBLED)



PLAN VIEW



SECTION A-A

220 GALLON GEMINI TANK, Ï 48" x 48"	PART NUMBER	
	BLUE	NATURAL
LPE (1.5)	01-14872	01-1074
LPE (1.9)	01-29778	01-29769
XLPE (1.5)	*CALL FOR INFO*	01-30132
XLPE (1.9)	*CALL FOR INFO*	01-30143
ALTERNATIVE MATERIALS, COLOR, AND ACCESSORIES ARE AVAILABLE. CALL FOR ADDITIONAL INFO.		

PROPRIETARY AND CONFIDENTIAL
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF PEABODY ENGINEERING. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF PEABODY ENGINEERING IS PROHIBITED.

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES: Ñ1/4"
ANGULAR: Ñ .5Á
ONE PLACE DECIMAL: Ñ .25
TWO PLACE DECIMAL: Ñ .125
THREE PLACE DECIMAL: Ñ .063

TANK MATERIAL: LPE
INNER TANK S/N:
OUTER TANK S/N:
CUSTOMER PO#
DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	SMF	06/02/22
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

220 GALLON GEMINI TANK, (INNER)
282 GALLON GEMINI TANK, (OUTER)

PEABODY eng neering

PROJECT: GEMINI DUAL CONTAINMENT TANKS
CUSTOMER: PEABODY STANDARD
SITE/LOCATION: -
SALES ORDER:

SIZE	DESC.	REV.
B	220 GALLON GEMINI TANK, Ï 48" x 48"	G

SCALE: 1:16 SHEET 1 OF 1

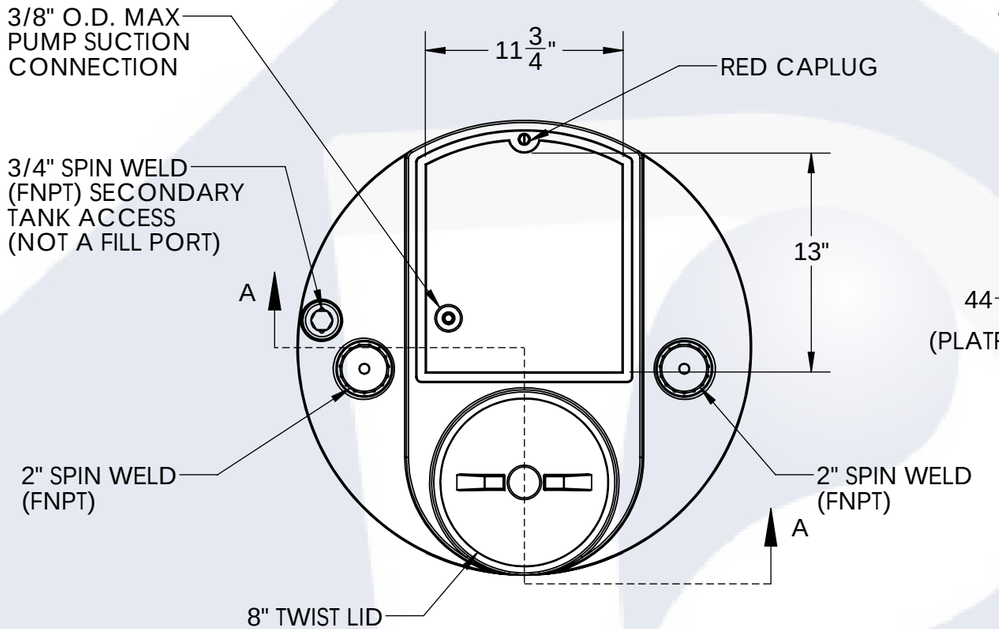
THE FOLLOWING DRAWINGS ARE CONCEPTUAL AND INTENDED FOR CLIENT REVIEW AND APPROVAL PURPOSES ONLY. THE DRAWINGS ARE AN ESTIMATION OF DESIGN INTENT. FINAL DESIGN, SUPPORTS AND FABRICATION METHODS SHALL BE DETERMINED UPON PRODUCT PRODUCTION. FINAL PRODUCT WILL SATISFY CONCEPTUAL DESIGN INTENT AND FUNCTION ADEQUATELY AS FABRICATED.

Ammonia Storage Tank

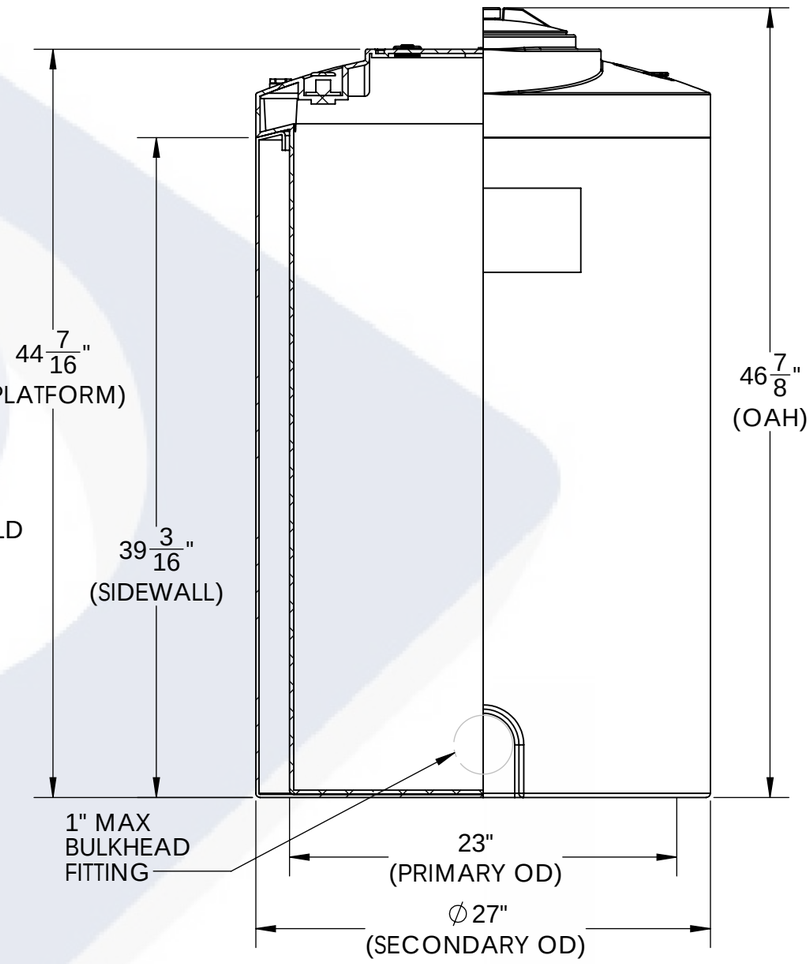
Fittings use at Owners discretion.
Fill
Pump Supply
Level Sensor
Vent



ISOMETRIC VIEW
(ASSEMBLED)



PLAN VIEW



SECTION A-A

65 GALLON GEMINI TANK, Ï 27" x 47"	PART NUMBER	
	BLUE	NATURAL
LPE (1.5)	01-29920	01-29921
LPE (1.9)	01-29922	01-29923
XLPE (1.5)	*CALL FOR INFO*	01-30129
XLPE (1.9)	*CALL FOR INFO*	01-30140
ALTERNATIVE MATERIALS, COLOR, AND ACCESSORIES ARE AVAILABLE. CALL FOR ADDITIONAL INFO.		

PROPRIETARY AND CONFIDENTIAL
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ANGULAR: Ñ .5á
ONE PLACE DECIMAL: Ñ .25
TWO PLACE DECIMAL: Ñ .125
THREE PLACE DECIMAL: Ñ .063

TANK MATERIAL: LPE
INNER TANK S/N:
OUTER TANK S/N:
CUSTOMER PO#
DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	SMF	06/02/22
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

65 GALLON GEMINI TANK, (INNER)
92 GALLON GEMINI TANK, (OUTER)

PEABODY engineering

PROJECT: GEMINI DUAL CONTAINMENT TANKS
CUSTOMER: PEABODY STANDARD
SITE/LOCATION: -
SALES ORDER:

SIZE	DESC.	REV.
B	65 GALLON GEMINI TANK, Ï 27" x 47"	F

SCALE: 1:9 SHEET 1 OF 1

THE FOLLOWING DRAWINGS ARE CONCEPTUAL AND INTENDED FOR CLIENT REVIEW AND APPROVAL PURPOSES ONLY. THE DRAWINGS ARE AN ESTIMATION OF DESIGN INTENT. FINAL DESIGN, SUPPORTS AND FABRICATION METHODS SHALL BE DETERMINED UPON PRODUCT PRODUCTION. FINAL PRODUCT WILL SATISFY CONCEPTUAL DESIGN INTENT AND FUNCTION ADEQUATELY AS FABRICATED.

200C SERIES CAPACITIVE CERAMIC
Continuous Submersible Level Transmitter

- Higher Accuracy | Superior Chemical Resistance
- Works on Foam | Vapor | Turbulence | Condensate
- Integrally Molded Internal Weight | No Floating

PVC | PP | PVDF | PTFE | RoHS Compliant | CE



The Solution to Tough Applications Where Ultrasonic Sensors Simply **DO NOT WORK!**



Capacitive Ceramic Sensing Technology

Capacitive Ceramic is Designed for Continuous Level Measurement of Aggressive Liquid Media

- Superior Chemical Resistance
- Larger Sensing Area
- Suitable for Viscous Media

200C Features

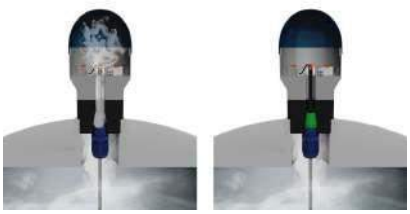
- Lower Temperature Range | -40°F
- Flush Sensor - Non Clogging Design
- Heavy Duty PTFE Teflon® Cable
- High Accuracy | 0.25% Full Scale
- Capable of Measuring Liquid Levels 150'
- No Lost Signals
- No Dead-Band

Displays

The 200C Series can be connected to one of our many displays.



LP Submersible Junction Box





VaporBloc®



Features

- VaporBloc®
- Technology Corrosion
- Resistant NEMA 4X

200C SERIES CAPACITIVE CERAMIC
Continuous Submersible Level Transmitter

Level pro®

Input Pressure Range

Level ft/H2O	ft	14	20	34	54
Overpressure		14X	14X	10X	10X

Output Signal | Supply

Standard	4-20mA ~~4-20mA + Hart 2 Wire | 0.5-4.5 VDC Ratiometric | 0-5 VDC | RS-485 3 Wire~~
Power Supply	4-20mA | 24 VDC | ~~0.5-4.5VDC Ratiometric || 0.5-4.5VDC } 5VDC || RS-485 HART } 24VDC~~

Performance

Accuracy	<±.25% Std | .125% Opt
Permissible Load	R_{max} = [(Vs-V_{smin})/0.02 A]Ω
Influence Effects	Supply: 0.05% Full Scale/10V Load: 0.05% Full Scale/KΩ
Long Term Stability	<± 0.1% Full Scale over One Year
Response Time	<150 msec or better

Thermal Effects | Offset and Span

Thermal Drift	<± 0.02% FSO/K in Compensated Range | -20 -178°F

Permissible Temperatures

Storage Temperatures Media Temperatures	PVC | 32°F - 140°F | ~~PP | -20°F - 178°F | PVDF | -40°F - 212°F | PTFE | -40°F - 212°F~~

Electrical Protection

Short-Circuit Protection	Permanent
Reverse Polarity Protection	No Damage to Sensor
Electromagnetic Compatibility	Emission Immunity According to EN 61326
Short-Circuit Protection	Permanent

Electrical Connection

Jacketed Cable	PTFE | Teflon® -40 - 200°F
3-Wire Cable with Integrated Air Tube for Reference to Atmospheric Pressure	

Materials | Wetted

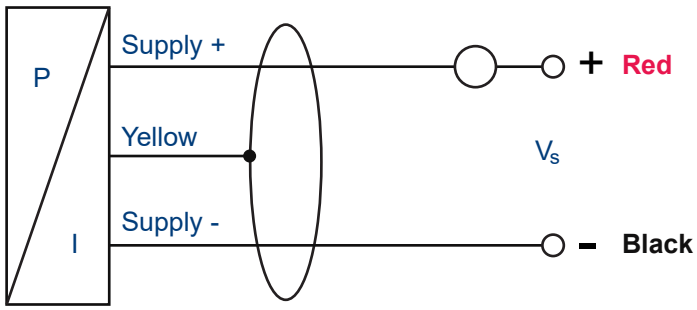
Housing	PVC | ~~PP | PVDF | PTFE Teflon®~~
Seal	FFKM - Kalrez®
Diaphragm	Pure Ceramic 99.9% Al_2O_3

200C SERIES CAPACITIVE CERAMIC
Continuous Submersible Level Transmitter

Specifications

Current Consumption	Max. 25mA
Weight Grams	PVC 575g ~~PP 475g | PVDF 625g | PTFE Teflon® 875g~~
Ingress Protection	IP 68
CE-Conformity	EMC Directive: 2004 | 108 | EC

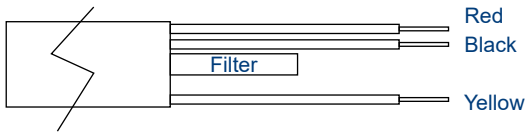
Wiring



2-Wire-System | 4-20mA

Electrical Connection

24VDC	Cable Colours
Supply +	Red
Supply -	Black



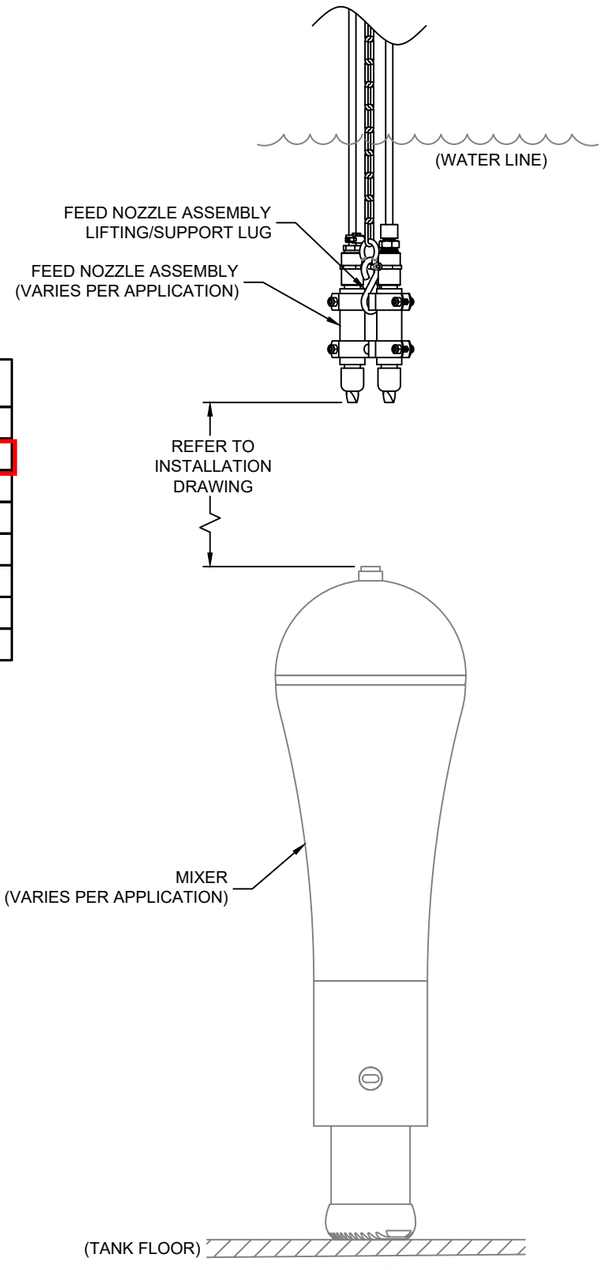
Ordering Code

| | | |

NOTES:

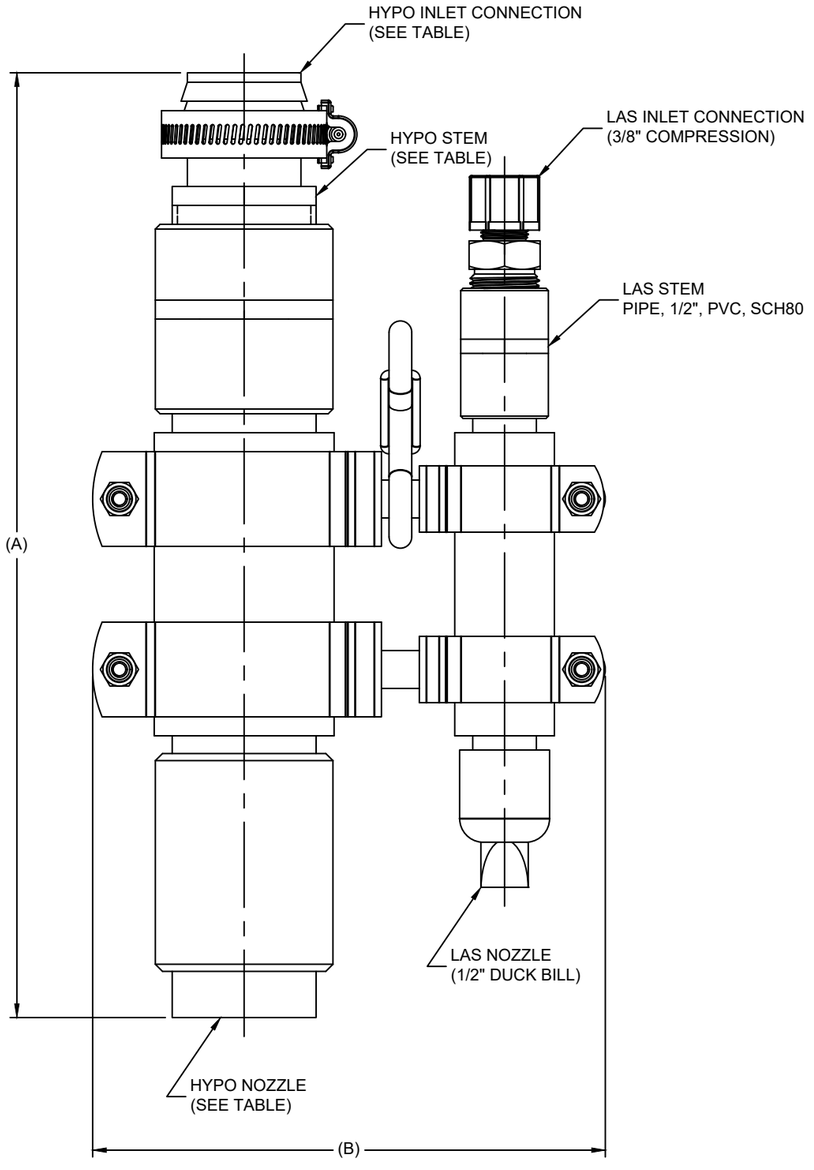
1. MIXER SIZE/TYPE/STYLE VARIES PER INSTALLATION.
2. AS SHOWN MIXER/FEED NOZZLE DISTANCE DECREASED FOR CLARITY.

HYPO FEED NOZZLE CONFIGURATOR					
ASSEMBLY #	HYPO STEM	HYPO CONNECTION	HYPO NOZZLE	"A"	"B"
000000-FN033C-AB	1/2", PVC, SCH80	3/8" COMPRESSION	1/2" DUCK BILL	9 1/2"	5 1/2"
000000-FN053C-AB	1/2", PVC, SCH80	1/2" COMPRESSION	1/2" DUCK BILL	9 1/2"	5 1/2"
000000-FN023C-AB	1/2", PVC, SCH80	1/4" HOSE BARB	1/2" DUCK BILL	9"	5 1/2"
000000-FN053C-AB	1/2", PVC, SCH80	1/2" HOSE BARB	1/2" DUCK BILL	9"	5 1/2"
000000-FN073C-AB	1", PVC, SCH80	3/4" HOSE BARB	1" PIPE	12 1/4"	6 1/4"
000000-FN103C-AB	1", PVC, SCH80	1" HOSE BARB	1" PIPE	11 1/2"	6 1/4"
000000-FN153C-AB	1 1/2", PVC, SCH80	1 1/2" HOSE BARB	1 1/2" PIPE	12 1/2"	6 3/4"



FEED NOZZLE INSTALLATION

NTS



REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
A	09/10/20	CL	INITIAL RELEASE				
B	04/08/24	LT	ADDED OPTION FOR 3/8" COMPRESSION HYPO/LAS				

This drawing represents an investment by PSI WATER TECHNOLOGIES, INC of substantial sums, including our engineering skills and experience. It is, therefore, loaned without consideration other than the agreement and condition that it is not to be used in whole or in part to assist in making or to furnish any information to others for the making of drawings, print apparatus, or parts thereof. The acceptance of this drawing will be construed as an acceptance of the forgoing conditions and as an admission of the exclusive ownership in and to the drawings of PSI WATER TECHNOLOGIES, INC.

PSI Water Technologies
A UGSI SOLUTIONS COMPANY

DRAWN BY: C. LEVASH	DATE: 08/30/21
CHECKED BY: B. FRITZ	DATE:
SCALE: 1:6	SIZE: D

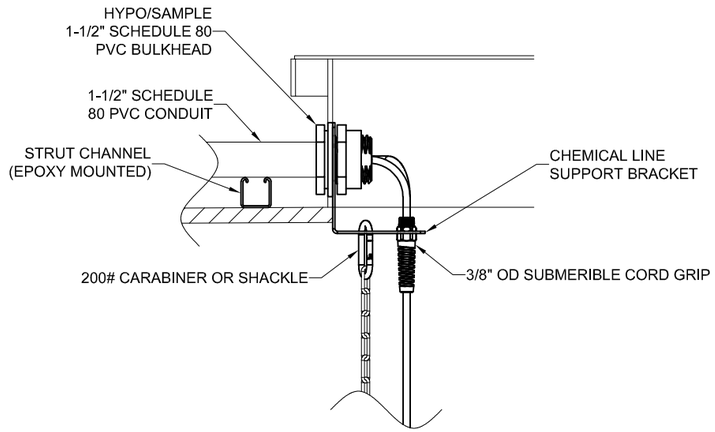
PROJECT: PSI WATER TECHNOLOGIES, INC. STANDARD DRAWING

SUBJECT: CHEMICAL FEED NOZZLE ASSEMBLY INSTALLATION DETAIL

DWG #: 000000-FN0000-OU | SHEET 1 OF 1 | REV. B

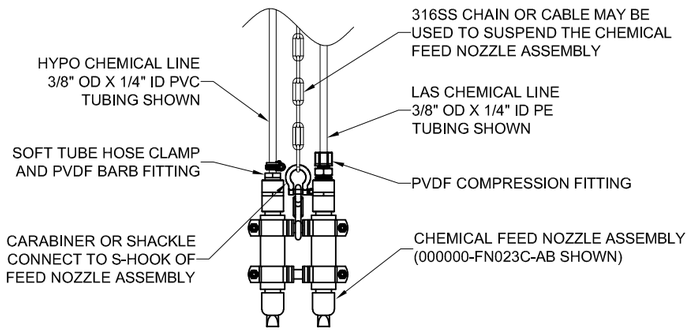
NOTES:

1. PAX IMPELLER MIXER SHOWN W/HYPO AND LAS LINES. CONFIGURATION VARIES PER PROJECT.
2. REFER TO PROJECT O&U & P&ID DRAWINGS FOR MIXER CONFIGURATION/SIZE.
3. REFER TO PROJECT O&U & P&ID DRAWINGS FOR ALL PROCESS LINE SIZES.
4. SPRAY EACH SECTION OF TUBING WITH BLEACH WHILE LOWERING INTO TANK.
5. EPOXY STRUT TO TANK USING THE FOLLOWING:
   - STEEL TANKS: 3M SCOTCH WELD DP420
   - CONCRETE TANKS: QUICK-CRETE HIGH STRENGTH CONSTRUCTION ADHESIVE



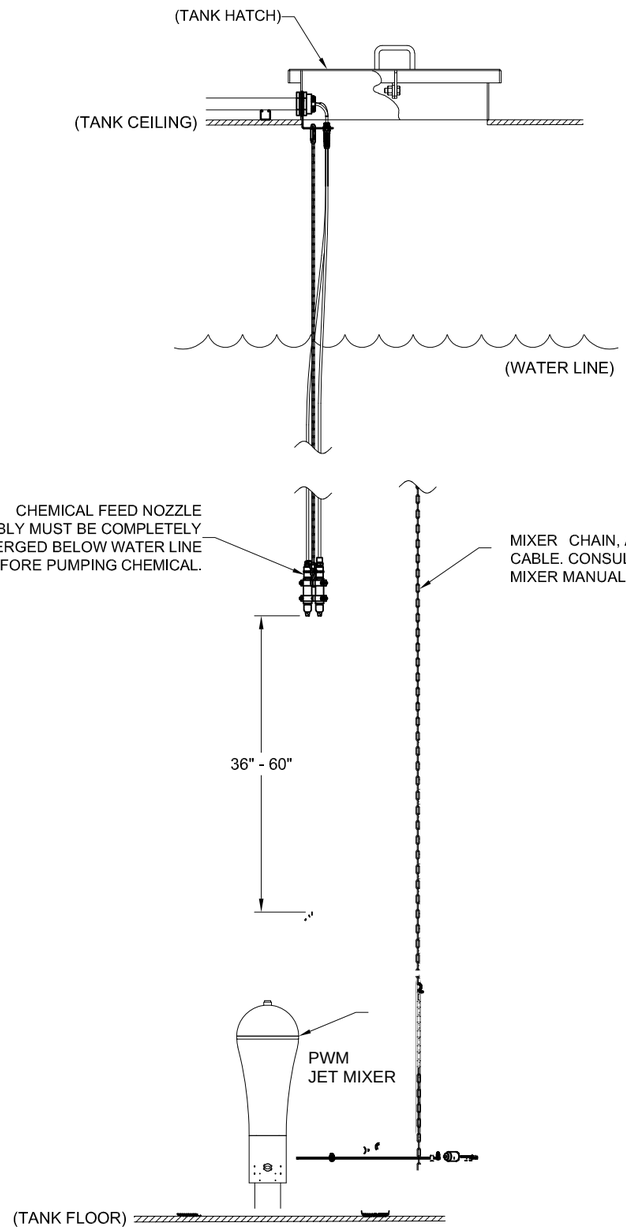
DETAIL-A

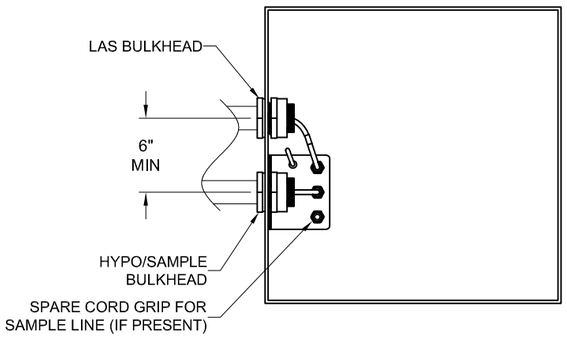
HATCH PENETRATION DETAIL



DETAIL-B

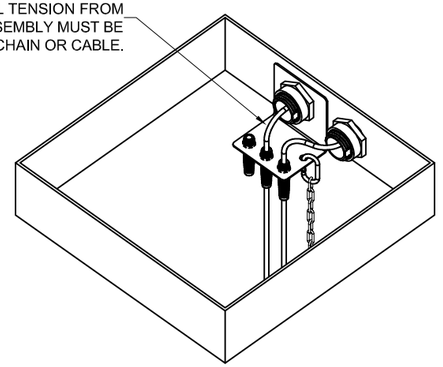
CHEMICAL FEED NOZZLE





PLAN VIEW

GROOM CHEMICAL LINES SO THERE IS NO TENSION ON THE TUBING. ALL TENSION FROM HANGING FEED NOZZLE ASSEMBLY MUST BE APPLIED TO THE SUPPORT CHAIN OR CABLE.



ISO TOP VIEW

REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
A	09/10/20	CL	INITIAL RELEASE				

This drawing represents an investment by PSI WATER TECHNOLOGIES, INC of substantial sums, including our engineering skills and experience. It is, therefore, loaned without consideration other than the agreement and condition that it is not to be used in whole or in part to assist in making or to furnish any information to others for the making of drawings, print apparatus, or parts thereof. The acceptance of this drawing will be construed as an acceptance of the forgoing conditions and as an admission of the exclusive ownership in and to the drawings of PSI WATER TECHNOLOGIES, INC.

PSI Water Technologies
A UGSI SOLUTIONS COMPANY

DRAWN BY: C. LEVASH	DATE: 08/30/21
CHECKED BY: B. FRITZ	DATE:
SCALE: 1:6	SIZE: D

PROJECT: PSI WATER TECHNOLOGIES, INC. STANDARD DRAWING

SUBJECT: CHEMICAL FEED NOZZLE ASSEMBLY INSTALLATION DETAIL

DWG #: 000000-FN0000-DT-01 | SHEET 1 OF 1 | REV. A

PSI WATER TECHNOLOGIES

A cleanwater1 Company

SECTION 8.3

RESEVOIR MIXING SYSTEM

8.3.1 Mixer Product Specification

8.3.2 Mixer Quick Start Guide

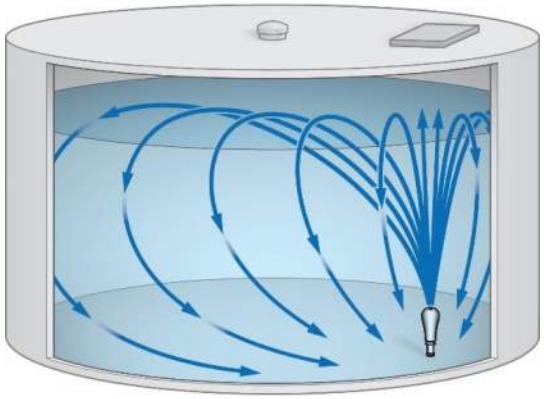
8.3.3 Mixer Product Data Sheets

PWM250 MIXER
Powerful Jet Mixer for Mid Range Tanks

The PAX Water Mixer (PWM250) is an active jet mixer for small water storage tanks. The mixer creates a powerful vortex flow pattern to thoroughly circulate the entire tank volume and prevent water quality issues. Compact and lightweight, the mixer can be easily lowered into the tank from the hatch and self-rights on the tank floor, even on a sloped surface.

Benefits

- Lightweight and easy-to-install
- Eliminates thermal stratification
- Improves disinfectant residual levels
- Protects tank from ice damage and corrosion



The PAX Water Mixer creates a powerful vortex flow pattern to thoroughly mix the entire tank volume.

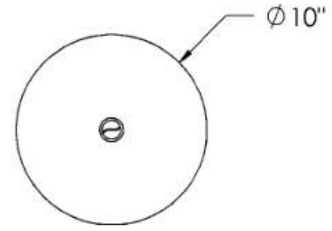


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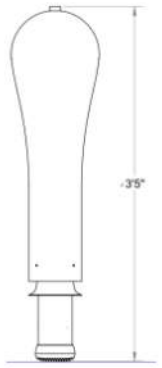
PWM250 MIXER

MIXER SPECIFICATIONS	PWM250 with Control Center (PCC255)
Power Supply Requirement	230 VAC, 50/60 Hz, Single Phase Non-GFCI protected, 20 amp circuit
Motor Type	230 VAC, 2 HP, 60 Hz, water-filled, water-lubricated
Nominal Power Draw	1.99 kVA (1890 watts)
Footprint Diameter	10” (25 cm)
Height	3’ 5” (104 cm)
Weight: Mixer Assembly	56 lbs. (27 kg)
Material: Housing	316 stainless steel
Material: Motor Seals	Chlorine/chloramine-resistant NBR rubber
Material: Feet	Chlorine/chloramine-resistant EPDM rubber
Wiring	NSF 61 & UL-listed submersible pump cable 14 AWG (2.1 mm²) XLPE (.78” x .28” / 20 mm x 7 mm)
Control Center Dimensions	70 lbs. (32 kg) (25” x 24” x 10” / 63.5 cm x 61 cm x 25 cm)
Material: Control Center	Powder-coated carbon steel, Type 4 enclosure

TOP VIEW



SIDE VIEW



CONTROL CENTER



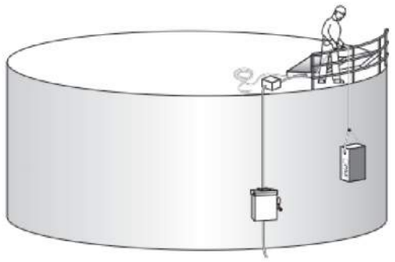
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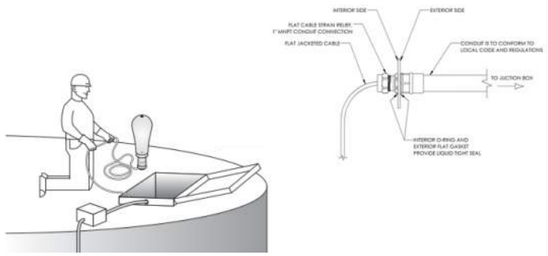
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The information provided in this literature contains merely general descriptions or characteristics of performance which in actual case of use do not always apply as described or which may change as a result of further development of the products. An obligation to provide the respective characteristics shall only exist if expressly agreed in the terms of a written contract.



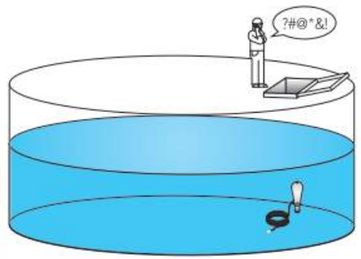
5. Install PAX Water Mixer

Bring mixer to roof of tank.



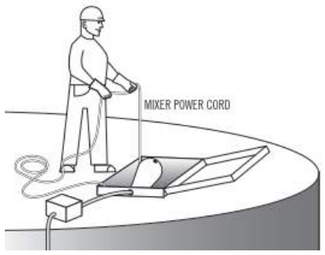
6. Install Strain Relief

Remove mixer from packaging and tie off power cord (halfway between mixer and end of cord) to ensure mixer cannot fall off the top of the tank. Thread the end of the power cord through a strain relief, the tank penetration and conduit that connects to junction box.



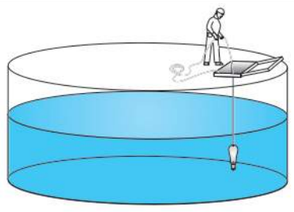
7. Drop Protection

Be sure to COMPLETE step 6 before you proceed to lowering the mixer into the tank. You DO NOT want to accidentally drop the end of the power cord into the tank.



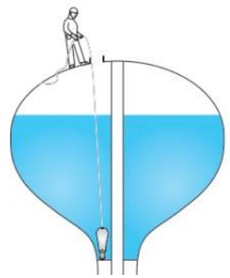
8. Lower the Mixer

Hold mixer over open hatch by gripping power cord and slowly lowering into water. The power cord is designed to support the weight of the mixer as it is being lowered.



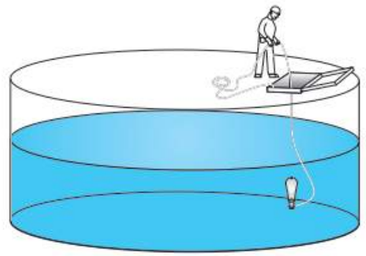
9. Contact Floor Surface

Continue to lower mixer—a few feet at a time– until it makes contact with the tank floor. The mixer is designed to rest up-right on the floor of the tank.



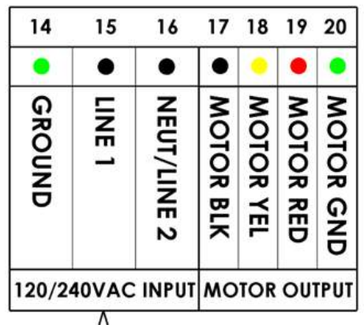
10. Sloped Surface

On a sloped floor, the mixer will come to rest at a low point on the tank floor.



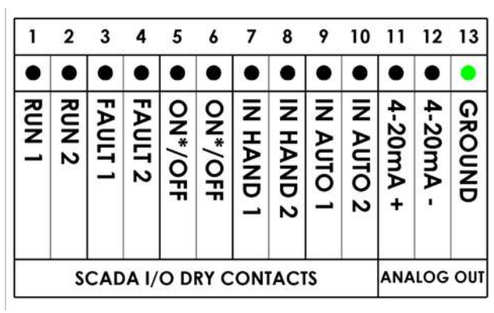
11. Cord Slack

After mixer makes contact with floor, allow 3-4 feet (1-1.5 m) of slack in power cable.



13. Connect Mixer Motor Wires in Control Center

- Connect mixer motor wires to Terminal Blocks 17, 18 and 19
- Connect ground wire to Terminal Block 20
- Refer to Manual, Section 8



14. Connect SCADA Interface

- Connect SCADA on/off signal to Terminal Blocks 5 and 6
- Connect SCADA to the run signal to Terminal Blocks 1 and 2
- Connect SCADA to the fault signal to Terminal Blocks 3 and 4
- Refer to Manual, Section 9

4" SUBMERSIBLE MOTORS

These motors are built for dependable operation in 4" diameter or larger water wells.

BASIC FEATURES

- Corrosion-resistant stainless steel exterior
- Stainless steel splined shaft
- Hermetically-sealed windings
- StatorShield™ resin system
- Filter check valve
- Water lubrication
- Kingsbury-type thrust bearing
- Pressure-equalizing diaphragm
- Built-in lightning arrestors (all single-phase; 200 & 300 V three-phase)
- Removable Water-Bloc™ lead
- Franklin-manufactured control boxes available for single-phase motors
- UL 778 recognized (North American voltages)
- CSA certified
- ANSI/NSF 61 certified
- Industry standard NEMA mounting dimensions



SPECIAL FEATURES

- Flow inducer sleeve not required in water up to 86 °F (30 °C) for motors through 2 hp
- Two-wire motors are split-phase designs with integral starting components and do not require a control box; features Franklin's patented 2-wire BIAC starting switch, which provides reverse impact torque to aid starting in adverse environments and prevents extreme fast cycling (e.g. water-logged tank)
- Three-wire motors through 1 hp use Franklin's exclusive three-wire QD (Quick Disconnect) Control Box with the patented QD Relay. This relay provides the ultimate in operational life
- Single-phase motors can be used with Pumptec products to protect against dry-run and other installation conditions that can damage motors and/or pumps; see single-phase protection devices for details

POLLUTION RECOVERY OPTION

- Pollution Recovery motors are equipped for use in monitoring and recovery wells in which hydrocarbons and other chemicals may be present
- Features nitrile rubber parts and other chemical-resistant materials as listed in the construction materials chart

4" SUBMERSIBLE MOTORS - SPECIFICATIONS AND MATERIALS

MOTOR SPECIFICATIONS

Hz	Model	Phase	HP Range	kW Range	Poles	RPM	Max. Ambient Temp.	Duty Rating
50	Super Stainless	1	0.5 - 1.5	0.37 - 1.1	2	2875	86 °F / 30 °C	Continuous
		1	0.3 - 3	0.25 - 2.2				Continuous*
		3	0.5 - 3	0.37 - 2.2				Continuous*
	Pollution Recovery	1	0.5 - 1.5	0.37 - 1.1				Continuous
		1	0.3 - 2	0.25 - 1.5				Continuous*
		3	0.5 - 2	0.37 - 1.5				Continuous*
	High Thrust	1	1.5 - 5	1.1 - 3.7				Continuous*
		3	1.5 - 10	1.1 - 7.5				Continuous*
60	Super Stainless	1	0.3 - 1.5	0.25 - 1.1		3450		Continuous
		1	0.3 - 3	0.25 - 2.2				Continuous*
		3	0.5 - 3	0.37 - 2.2				Continuous*
	Pollution Recovery	1	0.3 - 1.5	0.25 - 1.1				Continuous
		1	0.3 - 2	0.25 - 1.5				Continuous*
		3	0.5 - 2	0.37 - 1.5				Continuous*
	High Thrust	1	1.5 - 5	1.1 - 3.7				Continuous*
		3	1.5 - 10	1.1 - 7.5				Continuous*

** 3 hp motors require 0.25 ft/sec flow past motor*

CONSTRUCTION MATERIALS

Model No.	-	-	-8602G	-8802G	-3529G (not including 15HP)	-0630G	-8502G	-8702G	-8801G
Model Type	Super Stainless	Super Stainless	High Thrust	High Thrust	High Thrust	High Thrust	High Thrust	High Thrust	High Thrust
Component	Watwer Well	Pollution Recovery	Water Well	Sand Fighter®	CBM+	SERIES 600M	316 SS	Oil Stripper	ES
Top Castings	304 SS over Iron	304 SS over Iron	303 SS	303 SS	316 SS	303 SS	316 SS	316 SS	316 SS
Bottom Castings	Cast iron	Cast iron	304 SS over cast iron	304 SS over cast iron	316 SS	304 SS over cast iron	316 SS	316 SS	304 SS over cast iron
Stator Shell	301 SS	301SS	304 SS	304 SS	316 SS	316 SS	316 SS	316 SS	304 SS
Stator Ends	Low-carbon steel	Low-carbon steel	Low-carbon steel	Low-carbon steel	316 SS	Low-carbon steel	316 SS	316 SS	Low-carbon steel
Shaft Extension	17-4 SS	17-4 SS	17-4 SS	17-4 SS	17-4 SS	17-4 SS	17-4 SS	17-4 SS	17-4 SS
Fasteners	300 Series SS	316 SS	300 Series SS	300 Series SS	316 SS	300 Series SS	316 SS	316 SS	300 Series SS
Seal Cover	Acetal	Tefzel	Acetal	Sintered bronze	316 SS	Sintered bronze	316 SS	316 SS	Sintered bronze
Seal	Lip-Nitrile	Lip-FKM	Lip-Nitrile	Mech-Nitrile, SiC face	Mech-FKM, SiC face	Mech-FKM, SiC face	Mech-Nitrile, SiC face	Mech-FKM, SiC face	Mech-FKM, SiC face
Diaphragm	Nitrile	FKM	Nitrile	Nitrile	FKM	Nitrile	Nitrile	FKM	FKM
Diaphragm Cup	N/A	N/A	316 SS	316 SS	316 SS	316 SS	316 SS	316 SS	316 SS
Diaphragm Spring	N/A	N/A	316 SS	316 SS	316 SS	316 SS	316 SS	316 SS	316 SS
Diaphragm Cover	304 SS	304 SS	304 SS	304 SS	316 SS	316 SS	316 SS	316 SS	304 SS
Slinger	Nitrile	FKM	Nitrile	Nitrile	FKM	Nitrile	Nitrile	FKM	FKM
Lead Wire/Cable	XLPE or EPCV	sold separately	XLPE or EPCV	XLPE or EPCV	sold separately	XLPE or EPCV	XLPE or EPCV	Nitrile	Sold separately
Lead Potting	Epoxy	N/A	Epoxy	Epoxy	N/A	Epoxy	Epoxy	Epoxy	N/A
Lead Type	303 SS jam nut	304 SS jam nut	316 SS screws/clamp	316 SS screws/clamp	316 SS screw/clamp	316 SS screws/clamp	316 SS screws/clamp	316 SS screws/clamp	316 SS screw/clamp
Filter	Polyester	Polyester	Acetal/polyester	Acetal/polyester	316 SS plug	Acetal/polyester	316 SS plug	316 SS plug	316 SS plug
Max Temp Range	30C	30C	30C (1/4 ft/sec)	30C (1/4 ft/sec)	50C (1/4 ft/sec)	30C (1/4 ft/sec)	30C (1/4 ft/sec)	80C (1 ft/sec)	30C (1/4 ft/sec)
Thrust Rating	300 to 900	300 to 900	1500	1500	1500	300 to 1500	1500	1500	1500



MENU

4" SUBMERSIBLE MOTORS - ORDERING INFORMATION

2-WIRE MODELS

HP	Description	Volts	Hz	S.F.	Motor Lead	Model No.	In Stock	Thrust Rating	Wt. (Lbs)
1/3	Water Well	115	60	1.75	-	2445020117GS	-	300	16
		115	60	1.75	Yes	2445029004GS	Yes	300	16
		230	60	1.75	-	2445030117GS	-	300	16
		230	60	1.75	Yes	2445039004GS	Yes	300	16
	Pollution Recovery	115	60	1.75	-	2445020917GS	-	300	16
		230	60	1.75	-	2445030917GS	-	300	16
1/2	Water Well	115	60	1.6	-	2445040117GS	-	300	18
		115	60	1.6	Yes	2445049004GS	Yes	300	18
		220	50	1.0	-	2445550117GS	-	300	18
		230	60	1.6	-	2445050117GS	-	300	18
		230	60	1.6	Yes	2445059004GS	Yes	300	18
	Pollution Recovery	115	60	1.6	-	2445040917GS	-	300	18
		230	60	1.6	-	2445050917GS	-	300	18
3/4	Water Well	220	50	1.0	-	2445570117GS	-	300	21
		230	60	1.5	-	2445070117GS	-	300	21
		230	60	1.5	Yes	2445079004GS	Yes	300	21
	Pollution Recovery	230	60	1.5	-	2445070917GS	-	300	21
1	Water Well	220	50	1.0	-	2445581203GS	-	650	24
		230	60	1.4	-	2445081203GS	-	650	24
		230	60	1.4	Yes	2445089003GS	Yes	650	24
	Pollution Recovery	230	60	1.4	-	2445082303GS	-	650	24
1.5	Water Well	220	50	1.0	-	2443591217GS	-	650	31
		230	60	1.3	-	2443091217GS	-	650	31
		230	60	1.3	Yes	2443099004GS	Yes	650	31
	Pollution Recovery	230	60	1.3	-	2443092317GS	-	650	31

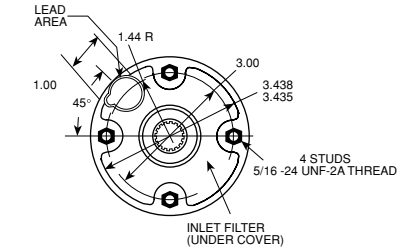
NOTE: Pack Designation (--S) = Single Pack, available in any quantity; All 3 hp motors are single-packed; Contact factory for lead time for non-stocked items; Pallet packs available but not shown; Contact customer service for availability

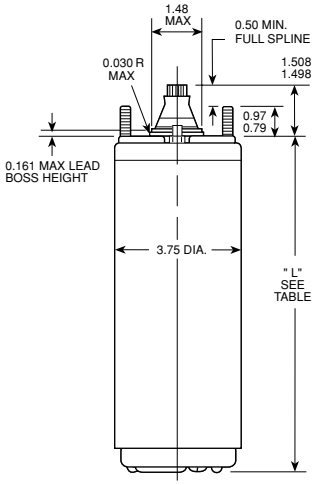
4" SUBMERSIBLE MOTORS - DIMENSIONS AND WEIGHTS

SUPER STAINLESS

HP / kW	Phase	L (in)	Motor Carton Size (in)			Shipping Wt.	
			W	H	L	lbs	kg
0.333 / 0.25	1	8.76	4.25	4.38	16.00	16	7.3
	1	8.76	4.25	4.38	16.00	17	7.7
0.5 / 0.37	1	9.51	4.25	4.38	16.00	18	8.2
	1	9.51	4.25	4.38	16.00	19	8.6
	3	9.51	4.25	4.38	16.00	18	8.2
0.75 / 0.55	1	10.64	4.25	4.38	19.00	21	9.5
	1	10.64	4.25	4.38	19.00	21	9.5
	3	10.64	4.25	4.38	16.00	21	9.5
1 / 0.75	1	11.73	4.25	4.38	19.00	24	10.9
	1	11.73	4.25	4.38	19.00	24	10.9
	3	11.73	4.25	4.38	19.00	24	10.9
1.5 / 1.1	1	15.1	4.25	4.38	21.25	31	14.1
	1	13.6	4.25	4.38	21.25	28	12.7
	3	11.73	4.25	4.38	19.00	24	10.9
2 / 1.5	1	15.1	4.25	4.38	21.25	33	15
	3	13.6	4.25	4.38	21.25	28	12.7
3 / 2.2	1	19.04	4.25	4.38	21.25	41	18.6
	3	16.04	4.25	4.38	21.25	35	15.9

NOTE: All dimensions listed above are for models supplied with lead; consult factory for other models

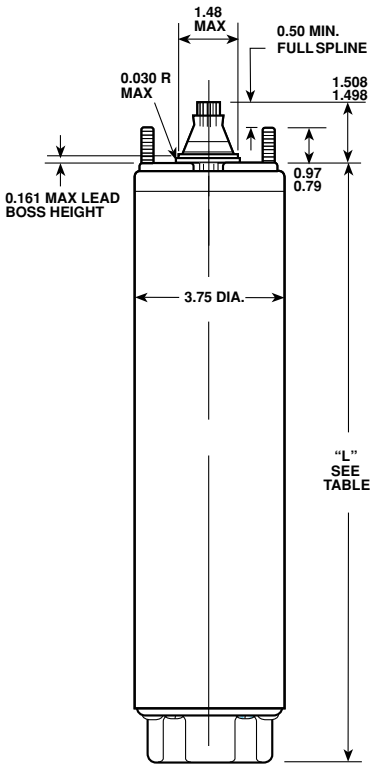




HIGH THRUST

HP / kW	Model	Phase	L (in)	Motor Carton Size (in)			Shipping Wt.	
				W	H	L	lbs	kg
1.5 / 1.1	Standard, Sand Fighter®	1	19.1	6.50	6.25	21.50	35	15.9
	Standard, Sand Fighter®	3	17.98	6.50	6.25	21.50	37	16.8
2 / 1.5	Standard, Sand Fighter®	1	20.6	6.50	6.25	24.25	43	19.5
	Oil Stripper	1	22.85	6.50	6.25	25.75	46	20.9
	Standard, Sand Fighter®	3	19.1	6.50	6.25	24.25	44	20
	Oil Stripper	3	21.35	6.50	6.25	25.75	42	19.1
3 / 2.2	Standard, Sand Fighter®	1	23.18	6.50	6.25	27.25	56	25.4
	Oil Stripper	1	23.18	6.50	6.25	33.25	56	25.4
	Standard, Sand Fighter®	3	20.18	6.50	6.25	24.25	44	20
	Oil Stripper	3	20.18	6.50	6.25	25.75	44	20
5 / 3.7	Standard, Sand Fighter®	1	29.18	6.50	6.25	33.25	71	32.2
	Oil Stripper	1	29.18	6.50	6.25	34.75	71	32.2
	Standard, Sand Fighter®	3	23.18	6.50	6.25	27.25	56	25.4
	Oil Stripper	3	25.66	6.50	6.25	28.75	63	28.6
5.5 / 4	Standard, Sand Fighter®	3	25.66	6.50	6.25	33.25	63	28.6
7.5 / 5.5	Standard, Sand Fighter®	3	29.18	6.50	6.25	33.25	71	32.2
	Oil Stripper	3	29.18	6.50	6.25	34.75	71	32.2
10 / 7.5	Standard, Sand Fighter®	3	32.18	6.50	6.25	36.25	77	34.9
15 / 11.2	CBM+	3	47.5	6.50	6.25	50.00	115	52.3

NOTE: Consult factory for 316 SS weights and dimensions



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Paige pumpwire spec P7327-SP

WE SPECIALIZE IN SUBMERSIBLES

HYDROFLEX FLAT SUBMERSIBLE PUMP CABLE 3 CONDUCTOR WITH GROUND



INSULATION: (EPR) ETHYLENE PROPYLENE
JACKET: (CPE) CHLORINATED POLYETHYLENE RUBBER
SIZES: 14 – 6 AWG

90°C WET/DRY, Min. Ambient Temp. -40°C

UL RoHS COMPLIANT

1.0 APPLICATIONS:

1.1 Extra Flexible, high ampacity, Flat Rubber Submersible Pump Cable for use within well casings for wiring deep-well submersible water pumps, mining applications. Hydroflex is especially efficient for use in municipal applications, cold weather and high ampacity requirements.

2.0 CONSTRUCTION:

2.1 ***Conductors:***
Class K flexible stranded, soft drawn, bare copper circuit conductor.

2.2 ***Insulation:***
Heat and moisture resistant, ethylene propylene rubber (EPR) insulation.

2.3 ***Jacket :***
(CPE) Chlorinated Polyethylene Rubber.

2.4 ***Color Code:***
Black, Yellow, Red and Green grounding conductor. Appendix E, Method 1 of ICEA S-73-532 (NEMA WC 57).

2.5 ***Surface Marking:***
The overall jacket (TPE) will have the following information printed: PAIGE ELECTRIC HYDROFLEX SUBMERSIBLE PUMP CABLE NUMBER AND SIZE (AWG) OF CONDUCTORS, EPR/TPE 600V 90°C.

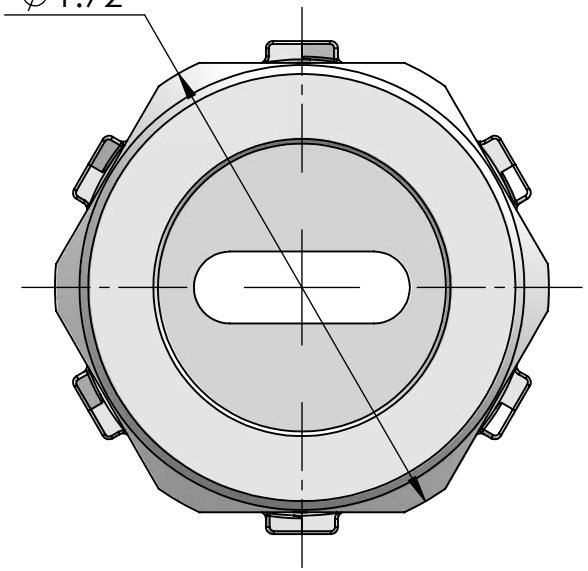
2.6 ***Temperature:***
The insulation is acceptable for use in wet or dry locations at 90°C.

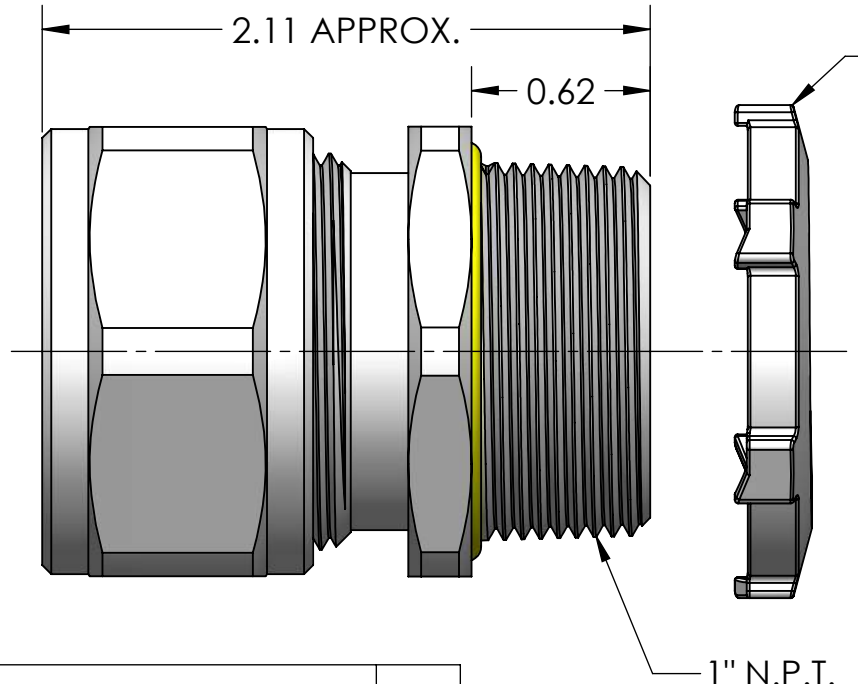
2.7 ***Ratings:***
UL LISTED

3.0 PHYSICAL CHARACTERISTICS:

Paige Part Numbers	Conductor Size	Grounding Conductor Size	Insulation Thickness		Average Jacket Thickness	Cable Weight	AmpacityCable O.D.	
	AWG	AWG	Circuit	Gound	mils		inches	mm
7327SP1	14	14	41	30	45	85	.0.630 x 0.230	16.00 x 5.8
7327SP2	12	12	45	30	45	161	0.850 X 0.290	21.59 x 7.4
7327SP3	10	10	45	30	50	260	1.000 X 0.330	25.40 x 8.4
7327SP4	8	8	60	67	55	400	1.310 X 0.420	33.27 x 10.7
7327SP5	6	6	60	65	55	590	1.525 X 0.505	38.74 x 12.8

Paige Electric LP





ITEM NO.	PART NUMBER	DESCRIPTION	MATERIAL	QTY.
1	RSSS-300-B	BODY	304 STAINLESS	1
2	RSSS-300-N	NUT	304 STAINLESS	1
3	SBF-3001-3002-3003	BUSHING	NEOPRENE	1
4	SW-300-SS	WASHER	304 STAINLESS	1
5	SOR-3	O-RING	BUNA-N	1
6	LN-100	LOCK NUT	ADD: L, C.R.S. ZINC PLATED	1
7	LNSS-100	LOCK NUT	ADD: LS, STAINLESS STEEL	

RoHS COMPLIANT

PART NUMBER	SLOT SIZE	BODY BORE
RSSS-3001	.660 X .240	.990
RSSS-3002	.750 X .250	.990
RSSS-3003	.890 X .290	.990

REV	DATE	CHANGE
A	10/6/15	DRAWING RELEASED

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ± 1/64
ANGULAR: MACH ±1° BEND ±1°
ONE PLACE DECIMAL ±.015
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005

INTERPRET GEOMETRIC TOLERANCING PER:

MATERIAL STAINLESS

FINISH

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	IAZ	10/15
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

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REMKE
REMKE INDUSTRIES
310 CHADDICK DR, WHEELING, IL. 60090

TITLE:
RSSS-3000 SERIES

SIZE A | DWG. NO. RSSS-3000 ASSEMBLY

SCALE 3:2 | SHEET 1 OF 1

5 4 3 2 1

T:\SOLIDWORKS FILES\ASSYMBLIES (CUSTOMER DRAWINGS)\304 STAINLESS\DRW\

SECTION 9.0

INSTRUMENTATION AND CONTROLS

9.1 Smart Control Center

9.2 Chemical Feed Skid Remote I/O Panel

9.3 Mixer Control Center

9.4 Piping and Instrumentation Diagram

SECTION 9.1

SMART CONTROL CENTER

9.1.1 Smart Control Center Product Specification
9.1.2 Smart Control Center Panel Layout Drawing
9.1.3 Smart Control Center Panel Interior Layout Drawing
9.1.4 Smart Control Center Ladder Logic Diagram
9.1.5 Smart Control Center Product Data Sheets

PSI Water Technologies
A UGSI SOLUTIONS COMPANY

Product Specification

SMART CONTROL CENTER

The Smart Control Center is the brain of the Monoclor® Residual Control System for managing distribution system water quality. The Smart Control Center continuously analyzes water quality data and issues dosing commands to the Chemical Feed System to maintain residual levels at a predetermined set-point. The Smart Control Center enables operators to set, maintain and monitor residual levels in the tank.

The Smart Control Center features:

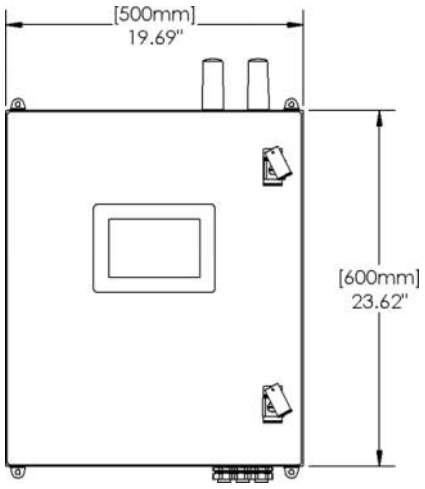
- Real-time water quality analysis and control
- Touch-screen dashboard to set residual level at predetermined set-point
- Remote monitoring of water quality in the distribution system (SCADA compatible)



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Product Specification

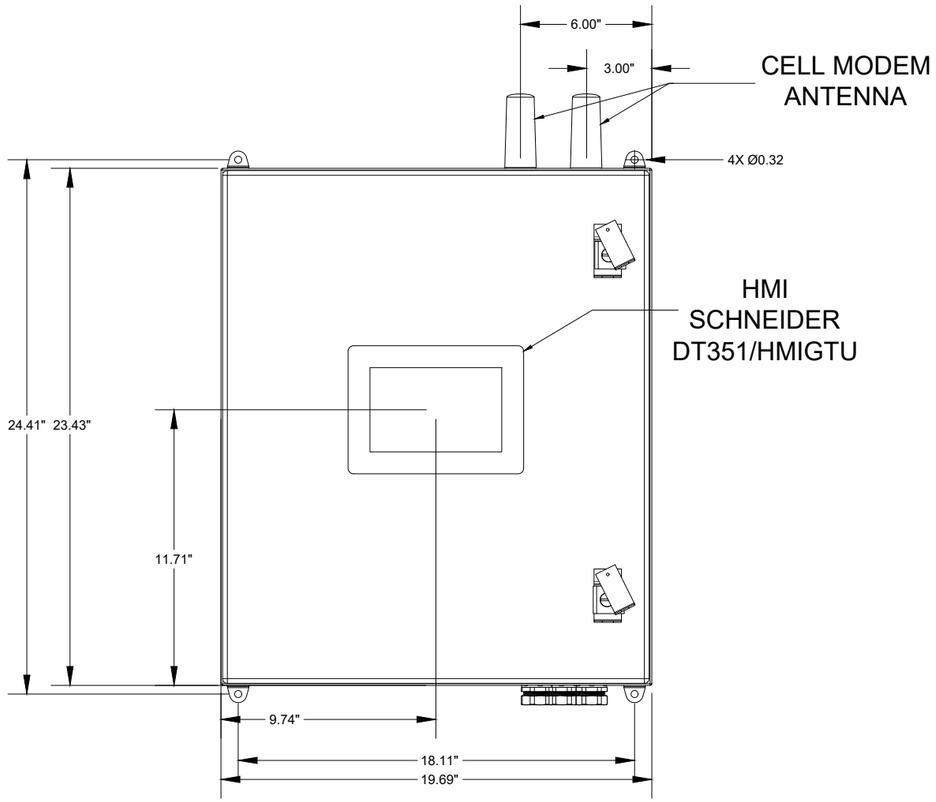
FRONT VIEW

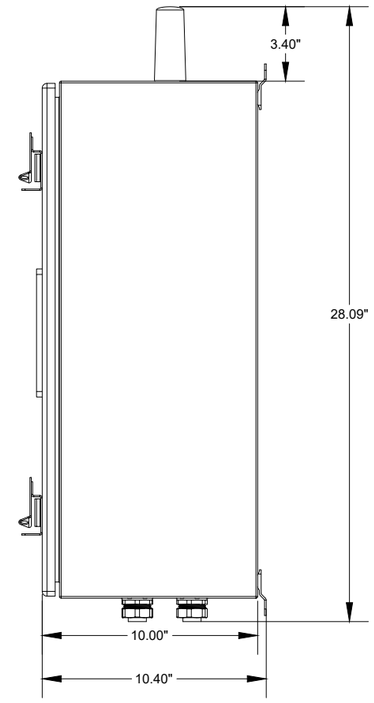


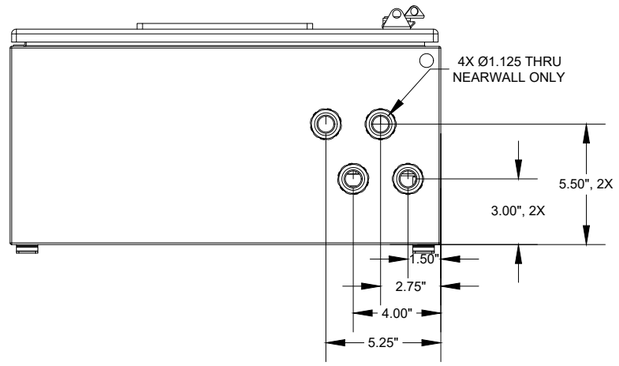
SIDE VIEW



SMART CONTROL CENTER SPECIFICATIONS	
HMI	7" LCD Touch screen
Water Quality Station Communication	RS-485 2 conductor cable (Plug and Play)
CFS Controller Communication	Quick disconnect RS-485 cable with RJ-45 Connector (Plug and Play)
PAX Mixer Control Center Communication	Single Digital/Analog Cable or quick disconnect RS-485 cable with RJ-45 Connector (Plug and Play)
Data-logging	USB flash drive
Remote Monitoring System (RMS)	RMS sends e-mail to transmit alarm and/or performance to PSI's secure server (optional)
SCADA	2 Analog Output (0-10 V) 6 Digital Outputs ("Dry-Contact")
Power	Standard 100-120 VAC 10 Amp circuit breaker
Communication	Ethernet and Modbus TCP/IP
Operating Temperature	35-113°F (2-45°C)
Enclosure	24"H x 20"W x 10"D (61 cm x 51 cm x 25 cm), powder-coated carbon steel Equal to or greater than Type 4R
PLC	Allen Bradley MicroLogix 1400 1766L32BWAA
I/O	10 Digital Inputs, 6 Digital Outputs 4 Analog Inputs (4-20 mA) 2 Analog Outputs (0-10 VDC)
Cell Modem	Digi TransPort WR31 4G LTE







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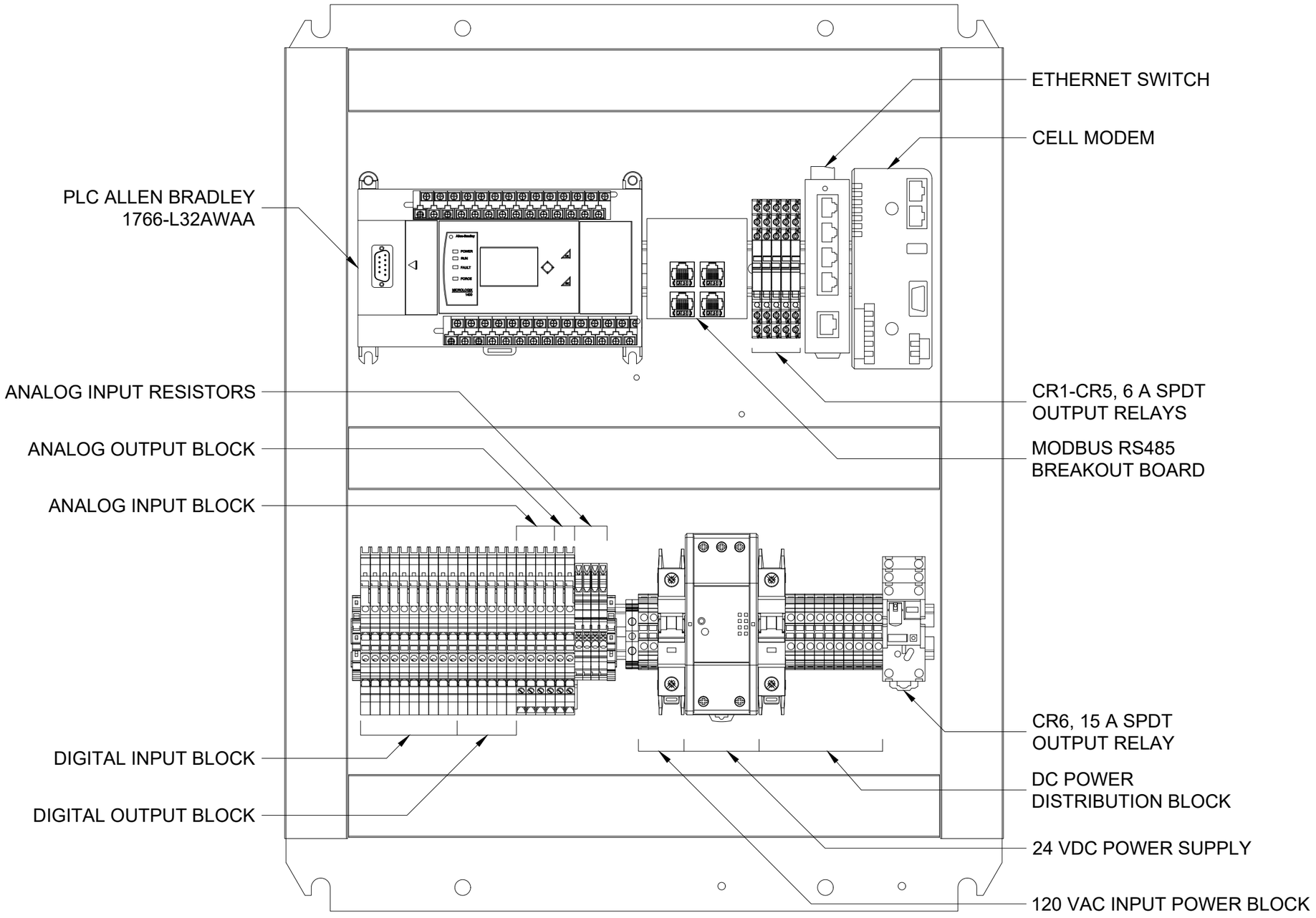
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CHECKED BY: C. LAQUE	DATE: 05/27/2021
SCALE: N/A	SIZE: D

PROJECT:

SUBJECT:
MONOCLOR
SMART CONTROLLER (SCC1000-E)
ENCLOSURE LAYOUT

DWG #: MN0000-EL | SHEET 6 OF 6 | REV. A

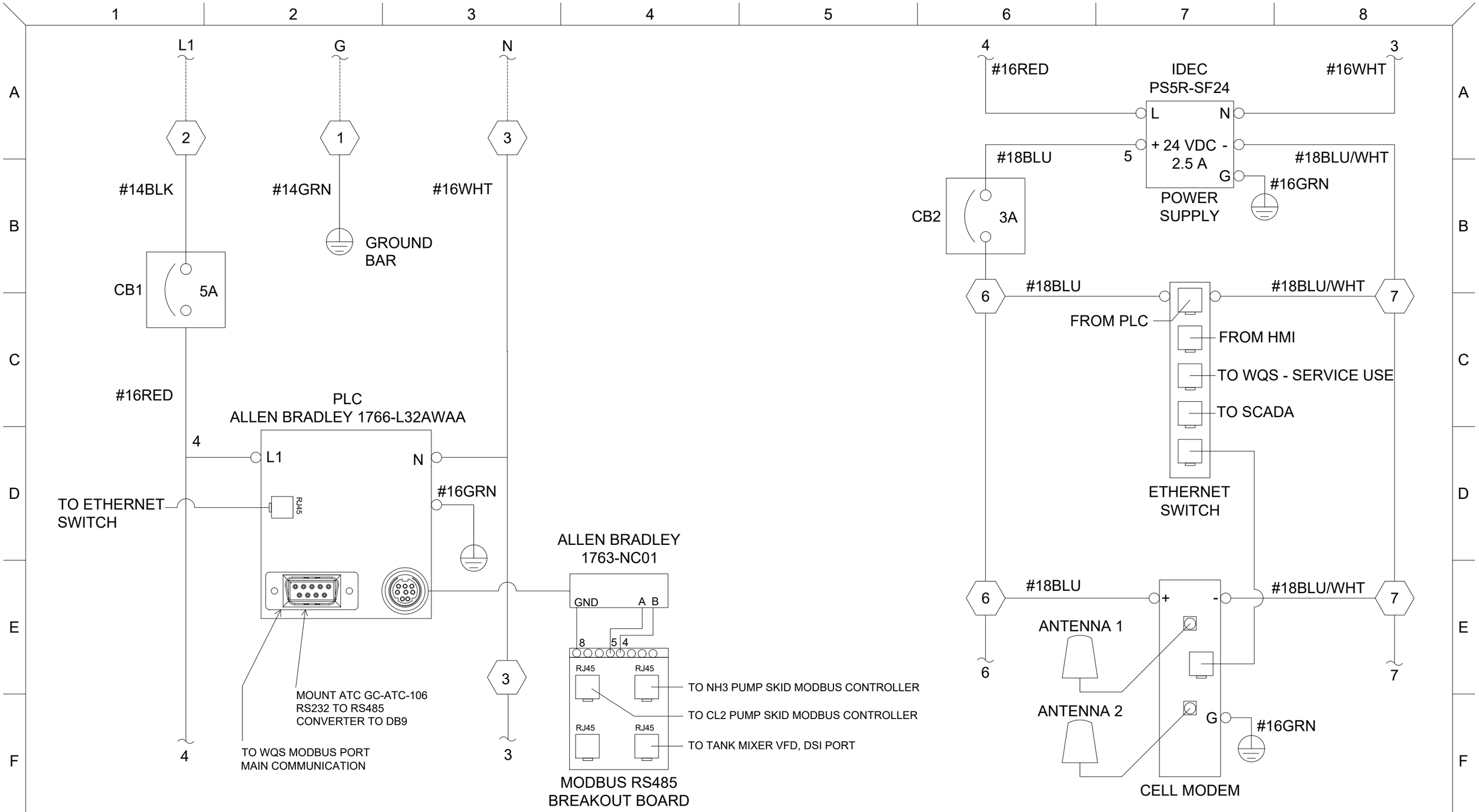


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CHECKED BY: C. LAQUE	DATE: 05/27/2021	SUBJECT: MONOCLOR SMART CONTROLLER (SCC1000-E) BACK PANEL LAYOUT
SCALE: N/A	SIZE: D	DWG #: MN0000-EL SHEET 2 OF 8 REV.

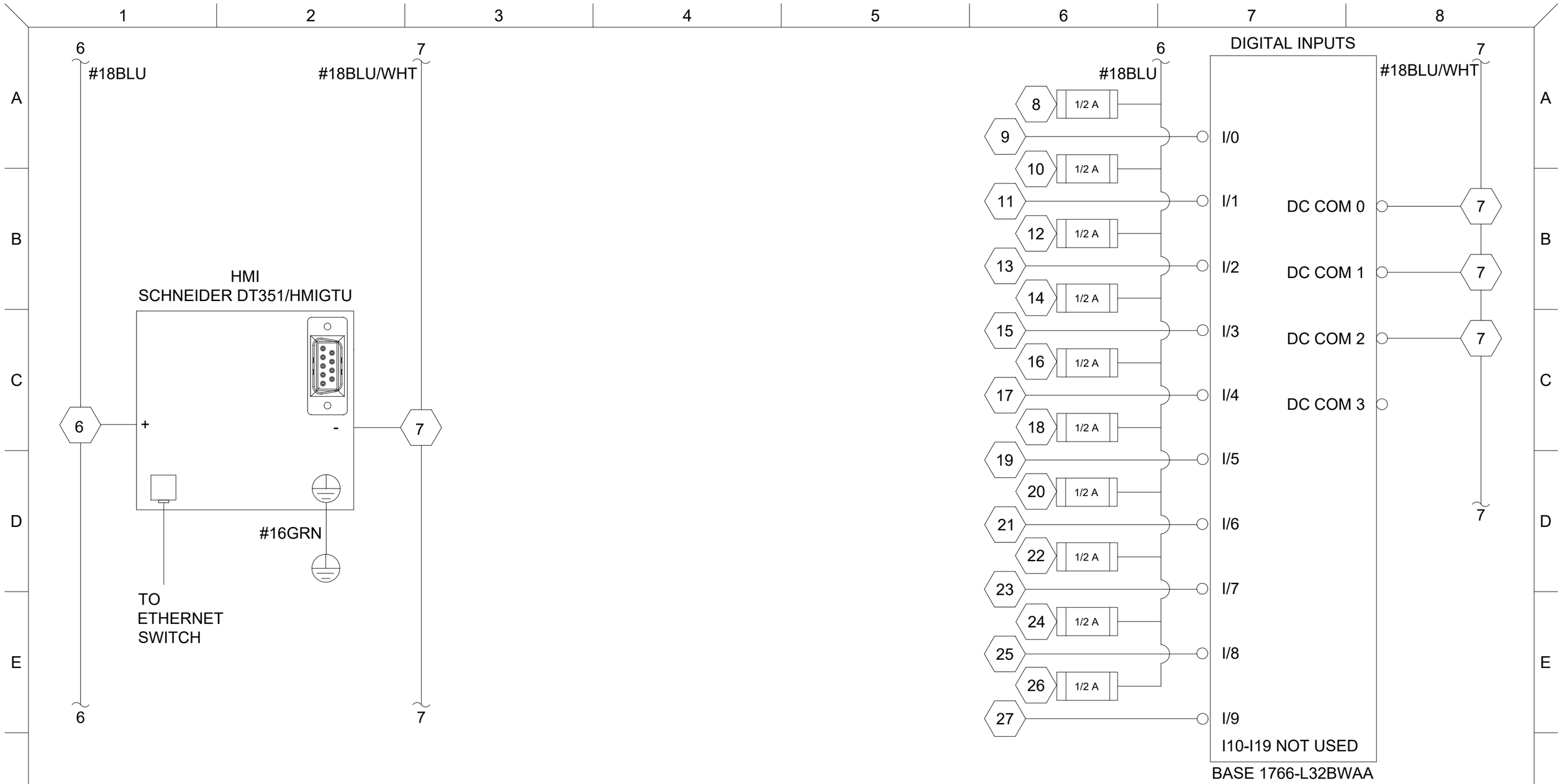


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CHECKED BY: C. LAQUE	DATE: 05/27/2021	SUBJECT: MONOCLOR SMART CONTROLLER (SCC1000-E) POWER DISTRIBUTION AND COMMUNICATION PORTS -
SCALE: N/A	SIZE: D	DWG #: MN0000-EL SHEET 6 OF 7 REV. A

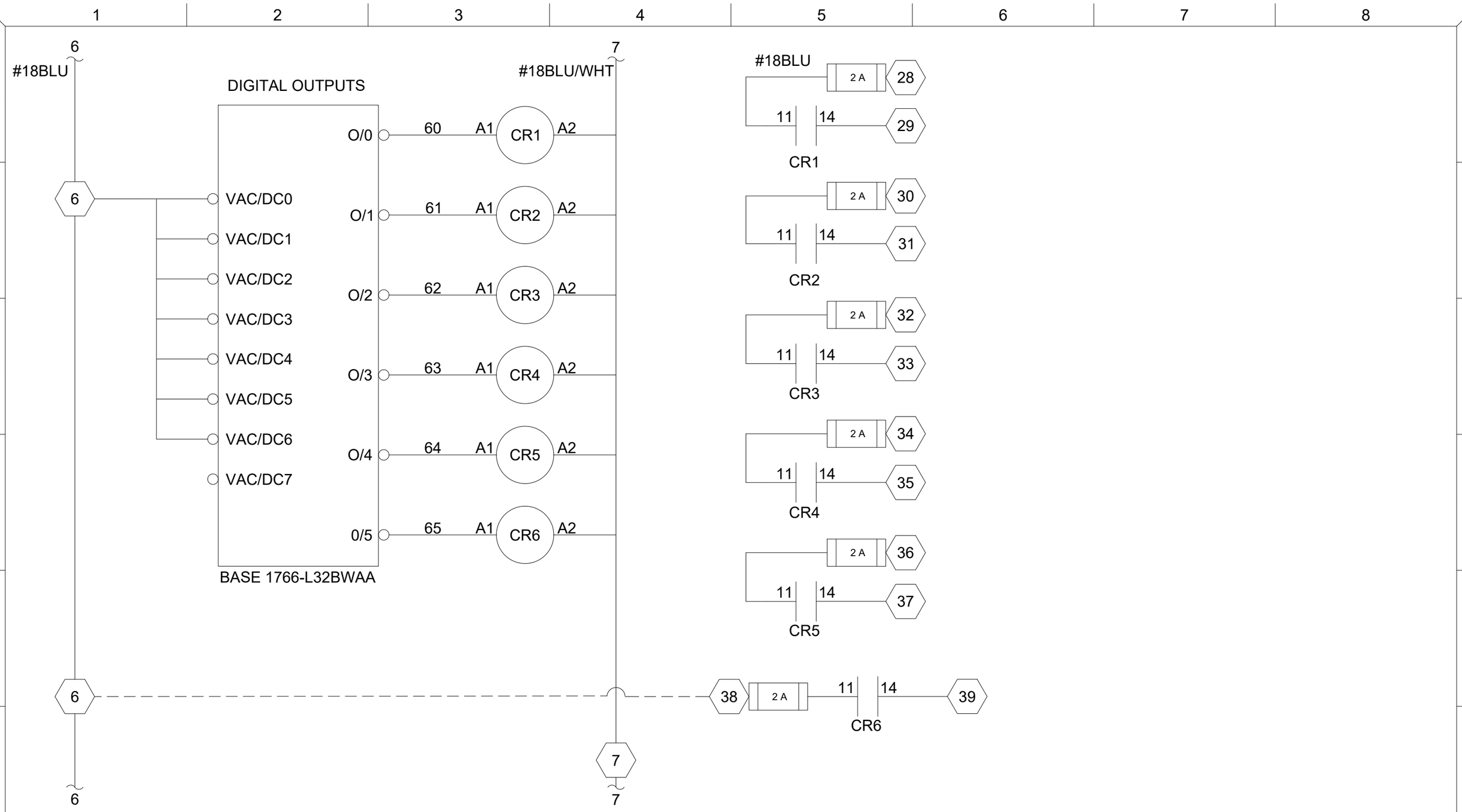


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CHECKED BY: C. LAQUE	DATE: 05/27/2021	SUBJECT: MONOCLOR SMART CONTROLLER (SCC1000-E) HMI AND DIGITAL INPUTS
SCALE: N/A	SIZE: D	DWG #: MN0000-EL SHEET 6 OF 9 REV. A



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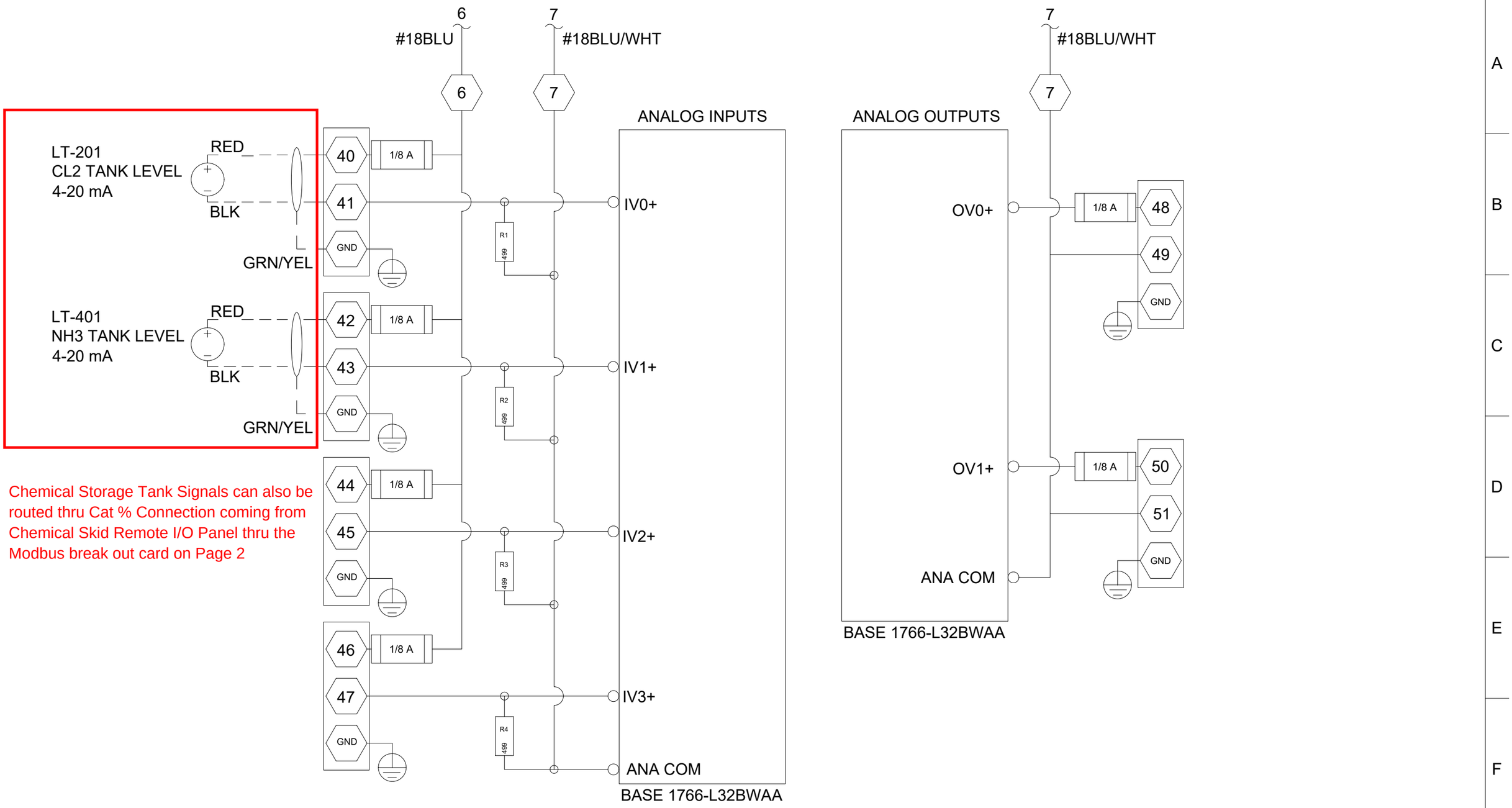
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PROJECT:

SUBJECT:
MONOCLOR
SMART CONTROLLER (SCC1000-E)
DIGITAL OUTPUTS

DWG #: -MN0000-EL | SHEET 6 OF 7 | REV. A



Chemical Storage Tank Signals can also be routed thru Cat % Connection coming from Chemical Skid Remote I/O Panel thru the Modbus break out card on Page 2

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SCALE: N/A	SIZE: D

PROJECT:

SUBJECT:
MONOCLOR
SMART CONTROLLER (SCC1000-E)
ANALOG INPUTS/OUTPUTS

DWG #: MN0000-EL | SHEET 6 OF | REV.

Wallmounted enclosure – WM 8017.561 - WM242010NC

: 12.02.2019 build on www.rittal.com/ca-en



Product description

Material:	Door: Carbon steel, all-round foamed-in PU seal Housing: Carbon steel
Surface finish:	Housing and door: Dipcoat primed, powder-coated on the outside, textured paint Mounting plate: Zinc-plated
Color:	RAL 7035
Protection category IP to IEC 60 529:	IP 66
Protection category NEMA:	NEMA 4
Supply includes:	Housing with door(s) Door hinged on left Mounting plate Rear wall mounting holes Quarter turn latch with slotted head insert

Product features

Dimensions:	Height: 600 mm (24 ″) Width: 500 mm (20 ″) Depth: 250 mm (9.8 ″)
Material thickness::	Housing: 1.5 mm (0.06 ″) Door: 1.5 mm (0.06 ″) Mounting plate: 2.5 mm (0.1 ″)
Mounting plate:	Height: 570 mm (22 ″) Width: 449 mm (18 ″)

© Rittal 2019

Packaging unit:	1 pc(s).
Weight/packaging unit:	22 kg (48.5 lb.)
EAN:	83140

Approvals

Approvals:	UL

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MicroLogix 1400

Small Programmable Logic Controller

Allen-Bradley

Features and Benefits

- Expand your application capabilities with up to 7 expansion I/O modules for a maximum of 256 discrete I/O
- Up to 6 embedded 100 kHz highspeed counters (on controllers with dc inputs)
- 2 Serial ports with DF1/ DH485/ Modbus RTU/DNP3/ASCII protocol support
- Ethernet port provides you with EtherNet/IP, DNP3 over IP and Modbus TCP/IP protocol support as well as web server and email capabilities
- Built-in LCD with backlight allows you to view controller and I/O status, and provides a simple interface for messages, bit / integer monitoring and manipulation



Product Description

The Allen-Bradley® MicroLogix™ 1400 from Rockwell Automation complements the existing MicroLogix family of small programmable logic controllers. MicroLogix 1400 combines the features you demand from MicroLogix 1100, such as EtherNet/IP, online editing, and a built-in LCD, plus provides you with enhanced features, such as: higher I/O count, faster High Speed Counter/PTO and enhanced network capabilities

Take advantage of the built-in LCD with back lighting to set the Ethernet network configuration, display floating point values on a user configurable display, display OEM logos at startup and read or write any binary, integer and long file elements in the data table.

Three embedded communication ports provide you with excellent communications capabilities. MicroLogix 1400 offers an isolated RS232C/ RS485 combination port; a non-isolated RS232C port; and an RJ-45 port for 10/100 Mbps EtherNet/IP peer-to-peer messaging, DNP3 over IP and Modbus TCP/IP protocol.

Similar to the rest of the MicroLogix family, MicroLogix 1400 is programmed with RSLogix 500 programming software (Version 8.1 and above) as well as RSLogix Micro programming software.

Product Specifications

MicroLogix	1766-L32BWA	1766-L32AWA	1766-L32BXB	1766-L32BWAA	1766-L32AWAA	1766-L32BXBA
Input Power	120/240 V AC		24V DC	120/240 V AC		24V DC
Memory	non-volatile battery backed RAM					
User Program / User Data Space	10K / 10K configurable					
Data Logging / Recipe Storage	128 K (without Recipe) / up to 64 K (after subtracting Data Logging)					
Battery Back-up	Yes					
Back-up Memory Module	Yes					
Digital Inputs	(12) Fast 24VDC (8) Normal 24VDC	(20) 120VAC	(12) Fast 24VDC (8) Normal 24VDC	(12) Fast 24VDC (8) Normal 24VDC	(20) 120VAC	(12) Fast 24VDC (8) Normal 24VDC
Digital Outputs	(12) Relay	(12) Relay	(6) Relay (3) Fast DC (3) Normal DC	(12) Relay	(12) Relay	(6) Relay (3) Fast DC (3) Normal DC
Analog Inputs / Outputs	None			(4) Voltage Inputs / (2) Voltage Outputs		
Serial Ports	(1) RS232C/RS485* , (1) RS232C**					
Serial Protocols	DF1 Full Duplex, DF1 Half Duplex Master/Slave, DF1 Radio Modem, DH-485, Modbus RTU Master/Slave, ASCII, DNP 3 Slave					
Ethernet Ports	(1) 10/100 EtherNet/IP port					
Ethernet Protocols	EtherNet/IP messaging, DNP3 over IP and Modbus TCP/IP					
Trim Potentiometers	2 Digital					
High-Speed Inputs	Up to 6 channels @ 100 kHz	N/A	Up to 6 channels @ 100 kHz	Up to 6 channels @ 100 kHz	N/A	Up to 6 channels @ 100 kHz
Real Time Clock	Yes, embedded					
PID	Yes (limited by loop and stack memory)					
PWM /PTO	N/A		3 channel PTO (100kHz)\PWM (40kHz)	N/A		3 channel PTO (100kHz)\PWM (40kHz)
Embedded LCD	Yes					
Floating Point Math	Yes					
Online Editing	Yes					
Operating Temperature	-20°C...+60°C					
Storage Temperature	-40°C (or -30°C)...+85°C					

* Isolated. RS232/RS485 combo port. Same as MicroLogix 1100 Comm 0

** Non-isolated RS232. standard D-sub connector.

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Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

Publication 1766-PP001D-EN-P - April, 2011
Supercedes Publication 1766-PP001C-EN-P October, 2010

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~~8GB, 16GB~~, 32GB and 64GB*

Cruzer Fit™ USB Flash Drive

Whether it's your favorite music or your most important work documents, the Cruzer Fit™ USB flash drive gives you the storage you need in a compact and portable device.

Highlights

- Low-profile design
- Store, protect and transfer your videos, music, photos or other files
- Password protect and encrypt your private files with SanDisk SecureAccess™ software[1]

With its low-profile design, the Cruzer Fit USB flash drive easily fits USB ports and blends in with your notebooks, tablets, TVs and car audio systems. Whether it's your favorite music, pictures, music collection, video collection or your work documents, the Cruzer Fit USB flash drive gives you the ever-present storage you need in a compact and portable device. Protect access to your private data with the included SanDisk SecureAccess™ software[1].

When your data matters, you can trust SanDisk®.

SanDisk SecureAccess™



SanDisk®
a Western Digital brand

Cruzer Fit™ USB flash drive Specifications	
Capacities	8GB, 16GB, 32GB and 64GB*
Dimensions	7.37 x 12.70 x 17.53 mm or 0.26 x 0.50 x 0.69 in. (L x W x H)
Operating temperature	32° – 95°F (0° – 35°C)
Storage temperature	14° – 158°F (-10° – 70°C)
Software	SanDisk SecureAccess™ software[1]
Compatibility	USB 2.0 port
Warranty	United States: 2-year limited warranty All other regions: 5-year warranty

For more information, please visit www.sandisk.com

SanDisk®
a Western Digital brand

At SanDisk®, we're expanding the possibilities of data storage. For more than 25 years, SanDisk's ideas have helped transform the industry, delivering next generation storage solutions for consumers and businesses around the globe.

Western Digital Technologies, Inc.
951 SanDisk Drive | Milpitas | CA 95035 | USA

Western Digital Technologies, Inc. is the seller of record and licensee in the Americas of SanDisk® products.

[1] Password protection uses 128-bit AES encryption and is supported by Windows® Vista, Windows® 7, Windows 8, Windows 10 and Mac OS X v10.7+ (software download required for Mac, see www.SanDisk.com/SecureAccess)

* 1GB = 1,000,000,000 bytes. Actual user storage less.

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Product datasheet
Characteristics

HMIDT351
7W Touch Advanced Display WVGA



Main

Range of product	Magelis GTU
Product or component type	Advanced touchscreen panel
Terminal type	Touchscreen display

Complementary

Pixel resolution	800 x 480
[Us] rated supply voltage	12...24 V DC power supply
Supply voltage limits	10.8. V
Power consumption in W	6.5 W
Display size	7 inch
Display type	Colour TFT LCD
Display resolution	800 x 480 pixels WVGA
Display colour	262144 colors
Backlight lifespan	50000 hours
Touch panel	Single touch analogue resistive
Type of installation	Indoor installation
Type of cooling	Natural convection
Inrush current	30 A
Cut-out dimensions	190 (+ 1/- 0) x 135 (+ 1/- 0) mm
Width	203.6 mm
Height	148.6 mm
Depth	36 mm
Product weight	1.2 kg

Environment

IP degree of protection	IP66 (front panel) IP67 (front panel)
NEMA degree of protection	NEMA 4X (front panel)

Disclaimer: This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications

Standards	CSA C22.2 No 142 ANSI/ISA 12-12-01 IEC 61132-2 CSA C22.2 No 213 : class I division 2 UL 508
Product certifications	CE cULus RCM KC
Ambient air temperature for operation	0...60 °C conforming to EN 61131-2
Ambient air temperature for storage	-20...60 °C
Pollution degree	2
Relative humidity	10. 90 % (non-condensing)
Operating altitude	2000 m
Vibration resistance	3.5 mm constant amplitude (f = 5. 9 Hz) conforming to EN/IEC 61131-2 9.8 m/s² (f = 9. 150 Hz) conforming to EN/IEC 61131-2
Shock resistance	147 m/s² conforming to EN/IEC 61131-2
Electromagnetic compatibility	Electrostatic discharge immunity test, level 3 conforming to EN/IEC 61000-4-2

Offer Sustainability

Sustainable offer status	Green Premium product
RoHS (date code: YYWW)	Compliant - since 1347 - Schneider Electric declaration of conformity Schneider Electric declaration of conformity
REACh	Reference not containing SVHC above the threshold Reference not containing SVHC above the threshold
Product environmental profile	Available Product environmental
Product end of life instructions	Available End of life manual

Contractual warranty

Warranty period	18 months

Product data sheet
Characteristics

HMIG3U
Premium BOX for Universal Panel

Product availability : Stock - Normally stocked in distribution facility

Price*: 1312.80 USO



Main

Range of product	Magelis GTU
Product or component type	Base unit
Device short name	Premium Box
Processor name	CPU RISC 600 MHz
Operating system	Magelis
Software package	Vijeo Designer run time

Complementary

Range compatibility	Magelis GTU
Data storage equipment	1 GB SD card
Port Ethernet	10BASE-T/100BASE-TX/1000BASE-T
Memory description	Internal 256 MB RAM Backup memory 512 kB NVRAM
Number of slots	2 SD card
Type of cooling	Natural convection
Integrated connection type	USB 2.0 port mini B USB Auxiliary port terminal block Expansion unit fieldbus card Ethernet TCP/IP with 2 RJ45 COM1 serial link RJ45 RS485, transmission rate: 110...115200 bit/s COM1 serial link RJ45 RS485, transmission rate: 187.5 kbit/s COM2 serial link SUB-D 9 RS232C/RS422/RS485, transmission rate: 110...115200 bit/s COM2 serial link SUB-D 9 RS232C/RS422/RS485, transmission rate: 187.5 kbit/s USB 2.0 port with 2 USB type A
Communication port protocol	Modbus Modbus TCP/IP Uni-Telway
[Us] rated supply voltage	12...24 V DC power supply
Local signalling	Multi-colour LED status
Depth	1.77 in (45 mm)

determining suitability or reliability of these products for specific user applications

Life Is On Schneider Electric

Height	5.16in(131 mm)
Width	7.4 in (188 mm)
Product weight	1.98 lb(US) (0.9 kg)
Number of slots available for expansion	2 SD card

Environment

Standards	CSA C22.2 No 142 ANSI/ISA 12-12-01 CSA C22.2 No 213 class I division 2 IEC 61132-2 UL 508
Product certifications	CCS EAC KC ATEX RCM CUL IEC-Ex GL ABS BV DNV LR RINA CULus CE
Pollution degree	2 conforming to EN 61131-2 Ed.3
Electromagnetic compatibility	Electrostatic discharge immunity test EN/IEC 61000-4-2 level 3
Ambient air temperature for storage	-4...140 °F (-20...60 °C)
Relative humidity	10...90 % non-condensing
Ambient air temperature for operation	32...140 °F (0...60 °C)
Operating altitude	6561.68 ft (2000 m)
Vibration resistance	3.5 mm constant amplitude 5...9 Hz conforming to EN/IEC 61131-2 9.8 m/s^2 9...150 Hz conforming to EN/IEC 61131-2
Shock resistance	147 m/s^2 conforming to EN/IEC 61131-2

Ordering and shipping details

Category	22567 - MAGELIS HMI GTU
Discount Schedule	MC2
GTIN	00785901116318
Nbr. of units in pkg.	
Package weight(Lbs)	2.7600000000000002
Returnability	y
Country of origin	CN

Offer Sustainability

Sustainable offer status	Green Premium product
RoHS (date code: YYWW)	Compliant - since 1347 - Schneider Electric declaration of conformity Schneider Electric declaration of conformity
REACh	Reference not containing SVHC above the threshold Reference not containing SVHC above the threshold
Product environmental profile	Available Product Environmental Profile
Product end of life instructions	Available End of life manual
California proposition 65	WARNING: Cancer and Reproductive Harm - www.P65Warnings.ca.gov

4G LTE
M2M ROUTER



DIGI TRANSPORT® WR31

Intelligent 4G LTE router designed for critical infrastructure and industrial applications

The Digi TransPort WR31 is an intelligent 4G LTE router designed for critical infrastructure and industrial applications. It provides a secure, reliable connection to industrial controllers, process automation equipment and smart grid assets on third party sites or remote locations. Software-defined, multi-carrier networking and global LTE and HSPA+ options make it easy to get connected. This drop-in connectivity gives operators a way to reduce downtime and service calls and also increase revenue by bringing distributed sites online faster.

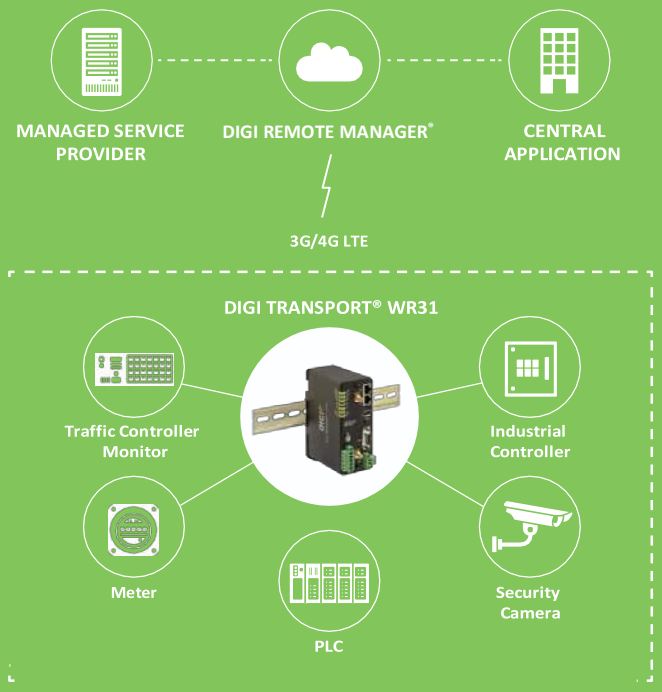
Ideal for Connecting:

- Building and process automation controllers
- Smart grid assets (meters, switches, controllers)
- IP cameras and access controllers
- Remote data loggers, flow meters and sensing equipment
- Telco infrastructure
- Traffic and obstruction lighting

BENEFITS

- Global HSPA+ and 4G LTE support and certification on major carrier networks around the world
- Ethernet, serial I/O and Modbus bridging for connecting diverse field assets
- Extremely resilient cellular connection through Digi's patented SureLink™, VRRP+ protocol, and dual SIM slots
- License-free enterprise software: VPN, firewall, logging and authentication
- Digi Remote Manager provides mass configuration, device management, and troubleshooting tools
- Rugged enclosure, optimized for DIN rail or shelf mounting
- C1D2 and ATEX rated

APPLICATION EXAMPLE



RELATED PRODUCTS

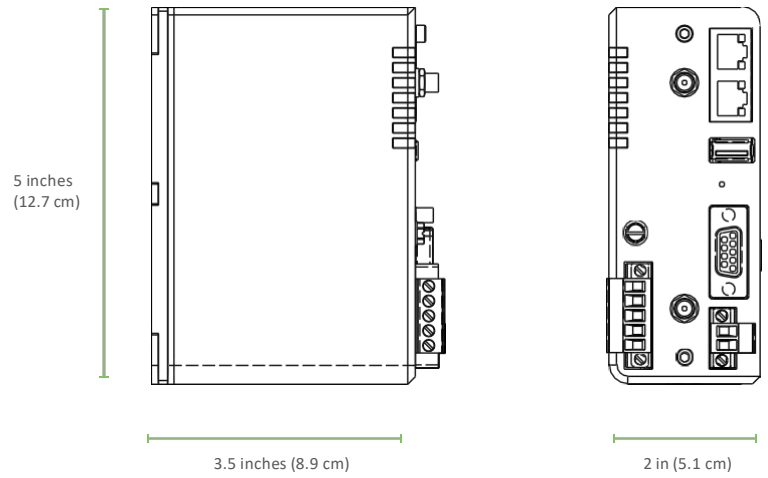


SPECIFICATIONS	Digi TransPort® WR31
WIRELESS INTERFACES	
WWAN	
LTE – NORTH AMERICA (L5)	Software defined multi-carrier LTE CAT 3: 700(B13,B17)/850(B5)/AWS(B4)/1900(B2,B25) 3G HSPA+: 850/900/1700AWS/1900/2100 MHz 3G EVDO: 800/1900 MHz 2G EDGE/GPRS: 850/900/1800/1900 MHz 2G 1XRTT: 800/1900 MHz Transfer rate (max): 100 Mbps down, 50Mbps up Approvals: Verizon Private Network, DMNR and PNTM, AT&T, Sprint, Telus, Bell
LTE 450 - EMEA/APAC (M2)	LTE CAT 3: 450(B31)/800(B20)/1800(B3)/2600 (B7) HSPA+: 900/2100 MHz EDGE: 900/1800 MHz Transfer rate (max): 100Mbps down, 50Mbps up
LTE – EMEA/APAC (L1)	LTE CAT 3: 800(B20)/850(B5)/900(B8)/1800(B3)/1900(B2)/2100(B1)/2600(B7) 3G HSPA+: 850/900/1900/2100 MHz 2G EDGE/GPRS: 850/900/1800/1900 MHz Transfer rate (max): 100 Mbps down, 50Mbps up Approvals: Vodafone
GLOBAL HSPA+ (U9)	3G HSPA+: 850/900/1700AWS/1900/2100 MHz 2G EDGE/GPRS: 850/900/1800/1900 MHz Transfer rate (max): 21 Mbps down, 5.76 Mbps up Approvals: PTCRB, Vodafone
CONNECTORS	(2) 50 Ω SMA (Center pin: female)
SIM SLOTS	(2) Mini-SIM (2FF)
SIM SECURITY	Screw-down SIM cover
SOFTWARE & MANAGEMENT	
REMOTE MANAGEMENT	Digi Remote Manager® (cloud based); SNMP v1/v2c/v3 (user installed/managed)
LOCAL MANAGEMENT	WebUI (HTTP/HTTPS); CLI (Telnet, SSH, SMS)
MANAGEMENT/ TROUBLESHOOTING TOOLS	FTP, SFTP, SCP; Protocol analyzer with PCAP for Wireshark; Event logging with Syslog and SMTP; NTP/SNTP
WIRED INTERFACES	
ETHERNET	
PORTS	(2) RJ-45; 10/100 Mbps (auto-sensing)
SERIAL	
PORTS	(1) DB-9; DCE
STANDARD	RS-232/422/485
SIGNAL SUPPORT	TXD, RXD, RTS, CTS, DTR, DCD, DSR, RI
FLOW CONTROL	Software (XON/XOFF), Hardware supported
I/O	
CONNECTOR	5-pin screw down terminal block
DIGITAL	0-30 VDC, 200mA max.; (2) I/O, software -selectable
ANALOG	(1) analog I/O; 4-20mA or 0-10V, Software selectable; 12 bit resolution
USB	
PORTS	(1) USB 2.0 Type A
PHYSICAL	
DIMENSIONS (L X W X H)	5 in x 3.5 in x 2 in (12.7 cm x 8.9 cm x 5.1 cm)
WEIGHT	1.1 lb. (.5 kg)
STATUS LEDS	Power, Service, WWAN, 3x Signal strength, User Programmable
ENCLOSURE/RATING	Aluminum / IP30
MOUNTING	DIN rail mount included
POWER REQUIREMENTS	
POWER INPUT	9 – 30 VDC, 18W min power source required
POWER CONNECTOR	Screw down removable terminal block
POWER CONSUMPTION	4W typical (Idle); 12W typical (Peak Tx/Rx)

SPECIFICATIONS	Digi TransPort® WR31
ENVIRONMENTAL	
HAZARDOUS (CLASS 1 DIV 2)	Yes
OPERATING TEMPERATURE	-34° C to +74° C (-29° F to +165° F); (Reduced cellular performance may occur above +60° C)
STORAGE TEMPERATURE	-40° C to +85° C (-40° F to +185° F)
ETHERNET ISOLATION	1.5 kV RMS
SERIAL PORT PROTECTION (ESD)	15 kV
RELATIVE HUMIDITY	5% to 95% (non-condensing)
APPROVALS	
CELLULAR	PTCRB
SAFETY	Hazardous locations: ANSI/ISA-12.12.01-2015, CAN/CSA C22.2 NO.213-15 Ordinary locations: UL 60950-1, 2nd Edition, 2014-10-14; UL 62368: 2014, 2nd Edition ATEX standards: Protection method Ex II 3 G Ex nA IIC T4 Gc EN 60079-0:2012+A11:2013, EN 60079-15:2010, DEMKO 15 ATEX 1574X Rev. 1
IECEX STANDARDS	US/UL/ExTR17.0077/00
EMISSIONS/IMMUNITY	CE, FCC Part 15 Class B, AS/NZS CISPR 22, EN55024, EN55022 Class B
WARRANTY	
PRODUCT WARRANTY	5 years

ENTERPRISE SOFTWARE	DESCRIPTION
PROTOCOL SUPPORT	HTTP, HTTPS, FTP, SFTP, SSL, SMTP, Device Cloud SNMP, SNMP (v1/v2c/v3), SSH, Telnet and CLI for web management; remote management via Digi Remote Manager; SMS management, protocol analyzer, ability to capture PCAP for use with Wireshark; DynDNS, Dynamic DNS client compatible with BIND9/No-IP/DynDNS
SECURITY/VPN	IP filtering, Stateful inspection firewall with scripting, address and port translation; VPN: IPSec with IKEv1, IKEv2, NAT Traversal; SSL, SSLv2, SSLv3, FIPS 197, Open VPN client and server; PPTP, L2TP; (5) VPN Tunnels (upgradable to a maximum of 50); Cryptology: SHA-1, MD5, RSA; Encryption: DES, 3DES and AES up to 256-bit (CBC mode for IPsec); Authentication: RADIUS, TACACS+, SCEP for X.509; certificates; Content Filtering (via 3rd party); MAC Address Filtering; VLAN support
ROUTING/FAILOVER	IP pass-through; NAT, NAPT with IP Port Forwarding; Ethernet Bridging; GRE; Multicast Routing;Routing Protocols: PPP, PPPoE, RIP (v1, v2) OSPF, SRI, BGP, iGMP routing (multicast); RSTP (Rapid Spanning Tree Protocol); IP Failover: VRRP, VRRP+TM; Automatic failover/ failback to second GSM network/Standby APN
OTHER PROTOCOLS	DDHCP; Dynamic DNS client compatible with BIND9/No-IP/DynDNS; QoS via TOS/DSCP/WRED; Modbus UDP/TCP to serial; X.25 including XOT, SNA/IP, TPAD and PAD; Protocol switch; Modbus bridging for connecting diverse field assets

PRODUCT IMAGES



DIGI REMOTE MANAGER®



CAPABILITIES

- Centralized management of remote devices over 3G/4G LTE
- Define standard configurations and automatically monitor individual devices for PCI security compliance
- Report and alert on performance statistics, including connection history, signal quality, latency, data usage and packet loss
- No servers or applications to operate and maintain
- Complete tasks for your entire device network in minutes
- Edit configurations and update firmware for your individual devices or groups
- Monitor the status and location of your remote device via a web browser
- Active or deactivate cellular lines and monitor data to ensure you never incur overage charges

INFRASTRUCTURE

- Hosted in a commercial-grade SAS 70-certified environment
- Superior availability, operating to 99.9% or greater
- Open APIs available to support application development

SECURITY

- Certified SSAE-16 and ISO27001 facilities
- Member of the Cloud Security Alliance
- Over 175 security controls in place to protect your data
- Enables compliance with security frameworks like PCI, HIPAA, NIST and more
- Earned SkyHigh's Cloud Trust Program highest ranking of Enterprise-ready
- PCI certified; Attestation of Compliance

PART NUMBERS	DESCRIPTION
WR31-L12A-DE1-TB	4G LTE International
WR31-L52A-DE1-TB	4G LTE Multi-Carrier Software Defined, North America
WR31-M22A-DE1-TB	4G LTE 450MHz International
WR31-U92A-DE1-TB	HSPA+ Global

FOR MORE INFORMATION PLEASE VISIT WWW.DIGI.COM

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91003183

B9/1117

Industrial Ethernet Switch - FL SWITCH SFNB 5TX - 2891001

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Ethernet switch, 5 TP RJ45 ports, automatic detection of data transmission speed of 10 or 100 Mbps (RJ45), autocrossing function

Why buy this product

- Auto negotiation and autocrossing detection simplifies installation and setup
- Local diagnostic indicators with LEDs
- RJ45 ports support a transmission speed of 10/100 Mbps

RoHS

Ethernet

Key Commercial Data

Packing unit	1 pc
Weight per Piece (excluding packing)	280.000 g
Custom tariff number	85176200
Country of origin	Taiwan

Technical data

Note

Utilization restriction	EMC: class A product, see manufacturer's declaration in the download area

Dimensions

Width	28 mm
Height	110 mm
Depth	70 mm

Ambient conditions

Degree of protection	IP20
Ambient temperature (operation)	-10 °C ... 60 °C
Ambient temperature (storage/transport)	-20 °C ... 85 °C

Industrial Ethernet Switch - FL SWITCH SFNB 5TX - 2891001

Technical data

Ambient conditions

Permissible humidity (operation)	5 % ... 95 % (non-condensing)
Permissible humidity (storage/transport)	5 % ... 95 % (non-condensing)
Air pressure (operation)	86 kPa ... 108 kPa (up to 1500 m above sea level)
Air pressure (storage/transport)	66 kPa ... 108 kPa (up to 3500 m above sea level)

Interfaces

Interface 1	Ethernet (RJ45)
No. of ports	5 (RJ45 ports)
Note on the connection method	Auto negotiation and autocrossing
Transmission physics	Ethernet in RJ45 twisted pair
Transmission speed	10/100 Mbps

Function

Basic functions	Unmanaged switch / auto negotiation, complies with IEEE 802.3, store and forward switching mode
Additional functions	Autonegotiation
Status and diagnostic indicators	LEDs: U_S, link and activity per port

Network expansion parameters

Cascading depth	Network, linear, and star structure: any
Maximum conductor length (twisted pair)	100 m

Supply voltage

Supply voltage	24 V DC
Residual ripple	3.6 V_{PP} (within the permitted voltage range)
Supply voltage range	12 V DC ... 48 V DC
Typical current consumption	185 mA (at U_S = 24 V DC)
Max. current consumption	345 mA (at 12 V DC)

General

Mounting type	DIN rail
Type AX	Block design
Net weight	263.4 g
Housing material	Aluminum

Standards and Regulations

Electromagnetic compatibility	Conformance with EMC Directive 2004/108/EC
Noise emission	EN 61000-6-4
Noise immunity	EN 61000-6-2
UL, USA/Canada	Class I, Div. 2, Groups A, B, C, D

Industrial Ethernet Switch - FL SWITCH SFNB 5TX - 2891001

Technical data

Environmental Product Compliance

REACh SVHC	Lead 7439-92-1
China RoHS	Environmentally Friendly Use Period = 10;
	For details about hazardous substances go to tab “Downloads”, Category “Manufacturer's declaration”

Classifications

eCl@ss

eCl@ss 4.0	27250501
eCl@ss 4.1	27250501
eCl@ss 5.0	19030117
eCl@ss 5.1	19030100
eCl@ss 6.0	19170100
eCl@ss 7.0	19170106
eCl@ss 8.0	19170106
eCl@ss 9.0	19170106

ETIM

ETIM 2.0	EC000734
ETIM 3.0	EC000734
ETIM 4.0	EC000734
ETIM 5.0	EC000734
ETIM 6.0	EC000734

UNSPSC

UNSPSC 6.01	43172901
UNSPSC 7.0901	43201404
UNSPSC 11	43172015
UNSPSC 12.01	43201410
UNSPSC 13.2	43222612

Approvals

Approvals

Approvals

UL Listed / cUL Listed / EAC / EAC / KC / cULus Listed

Industrial Ethernet Switch - FL SWITCH SFNB 5TX - 2891001

Approvals

Ex Approvals

UL Listed / cUL Listed / cULus Listed

Approval details

UL Listed		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 140324
cUL Listed		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 140324
EAC			EAC-Zulassung
EAC			RU *-DE.A*30.B.01735
KC		http://eng.kcc.go.kr/user/ehpMain.do	KCC-REI-PCK-FL289100
cULus Listed			

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Laird
Smart Technology. Delivered.

4G/3G Multiband Phantom® Antenna

TRA6927M3



4G/3G PhANTOM® ANTENNA IDEAL FOR 700/806/850/1800/1900/2100/2300/2500/2600 Mhz APPLICATIONS

The Laird Phantom antenna operates simultaneously in the 698-960 MHz and 1700-2700 MHz bands, making it ideal for 4G/3G applications. The mechanically robust design is suitable for both indoor and outdoor applications with wide bandwidth and a low angle radiation pattern that is superior to traditional gain antennas in most applications. The antenna is ideal for both ceiling and surface mount applications.

The industry standard NMO mounting socket mates with all Laird magnetic, trunk lid and hole mount configurations. A threaded permanent stud mount model is also available for vandal resistant mounting on brackets, panels, ceilings or any other kind of housing.

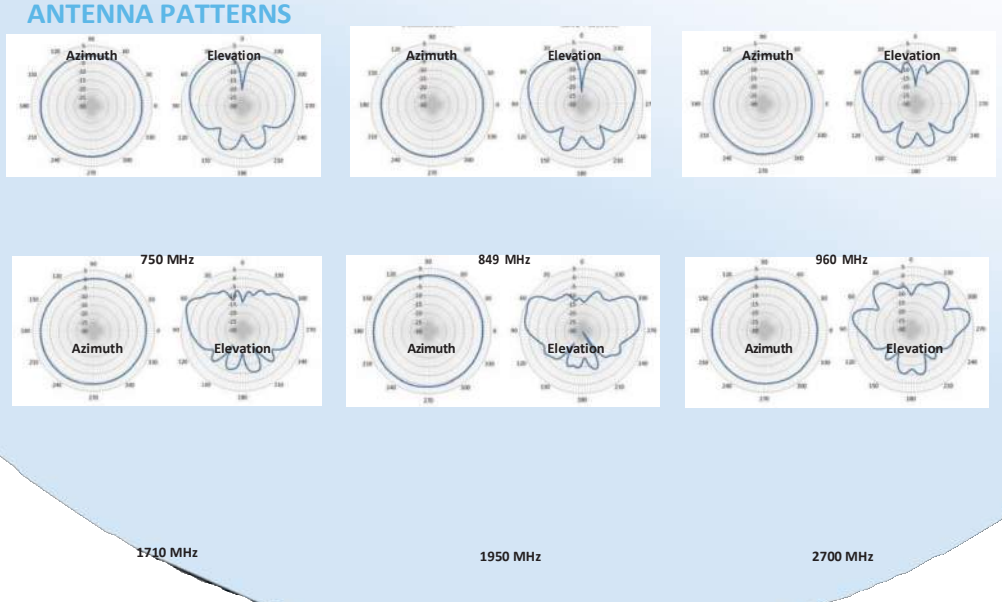
FEATuRES RoHS

- Mechanically robust for both Indoor/Outdoor applications
- Applicable for both 3G and 4G application
- Domestic LTE 700 band and Global LTE 2600 band
- WiMAX 2300/2500/2600 bands
- Domestic Cellular and Global GSM
- Phantom out-performs a 3 dBi whip in many applications

MARkETS

- Public Safety
- Cellular
- M2M
- Utilities
- Data transport
- Transportation
- IBW

ANTENNA PATTERNS



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IAS-AmericasEastSales@lairdtech.com
Europe: +44.1628.858941

Laird
Smart Technology. Delivered.

4G/3G Multiband Phantom® Antenna
TRA6927M3

SPECIFICATIONS

ELECTRICAL	
Frequency Range	698-960 MHz, 1710-2700 MHz
VSWR	
698-806 MHz	< 2.5: 1.0
806-960 MHz	< 2.0: 1.0
1710-2110 MHz	< 2.0: 1.0
2110- 2170 MHz	< 2.5: 1.0
2300- 2700 MHz	< 2.0: 1.0
Nominal Peak Gain	
698-960 MHz	3.5 dBi
1710-1990 MHz	5.5 dBi
2100-2700 MHz	4.6 dBi
Average Efficiency	
698-960 MHz	90% (max: 96%)
1710-1990 MHz	91% (max: 95%)
2100-2700 MHz	80% (max: 86%)
Polarization	Vertical
Pattern	Omnidirectional
Input Impedance	50 Ω
Maximum Power	100 W
Cable & Mount	MB195 (Sold Separately)
Terminations	NMO or P-Mount w/Type N(f)

MECHANICAL	
Color	Black or white available
Radome Material	High Heat ABS
Dimensions (Ht. x dia.)	3.3" (8.38 cm) x 1.44" (3.65 cm)
Operating Temperature	-40° C to 85°C

MODEL AND ORDERING INFORMATION

MODEL	DESCRIPTION	COLOR	RADOME HEIGHT	WEIGHT CONNECTOR
TRA6927M3PB-001	4G/3G Phantom®	Black	3.30"	0.38 lbs Type N(f)
TRA6927M3NB-001	4G/3G Phantom®	Black	3.30"	0.28 lbs NMO
TRA6927M3PW-001	4G/3G Phantom®	White	3.30"	0.38 lbs Type N(f)
TRA6927M3NW-001	4G/3G Phantom®	White	3.30"	0.28 lbs NMO

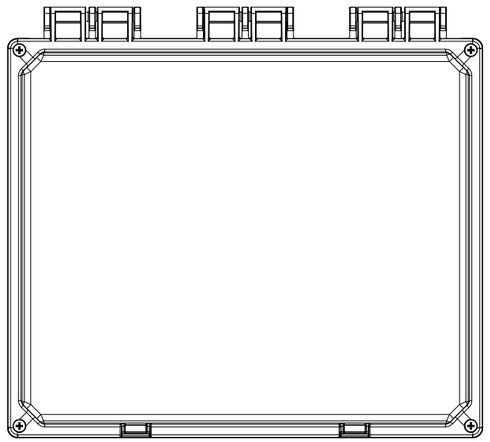
Permanent Mounting Option:
The letter "P" in the above part numbers indicates a permanent mounting option

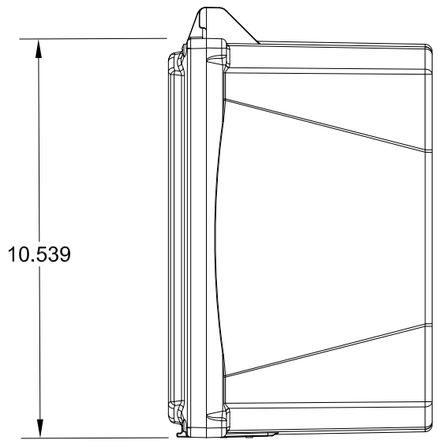
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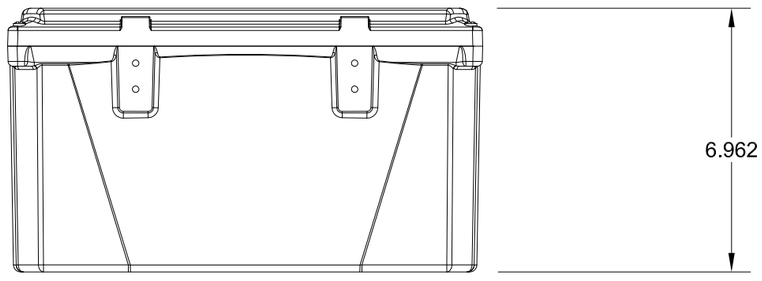
SECTION 9.2

CHEMICAL FEED SKID REMOTE I/O PANELS

9.2 Chemical Feed Remote I/O Panel Drawings







REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
A	11/22/2021	TY	INITIAL RELEASE				

This drawing represents an investment by PSI WATER TECHNOLOGIES, INC. of substantial sums, including our engineering skills and experience. It is, therefore, loaned without consideration other than the agreement and condition that it is not to be used in whole or in part to assist in making or to furnish any information to others for the making of drawings, print apparatus, or parts thereof. The acceptance of this drawing will be construed as an acceptance of the forgoing conditions and as an admission of the exclusive ownership in and to the drawings of PSI WATER TECHNOLOGIES, INC.

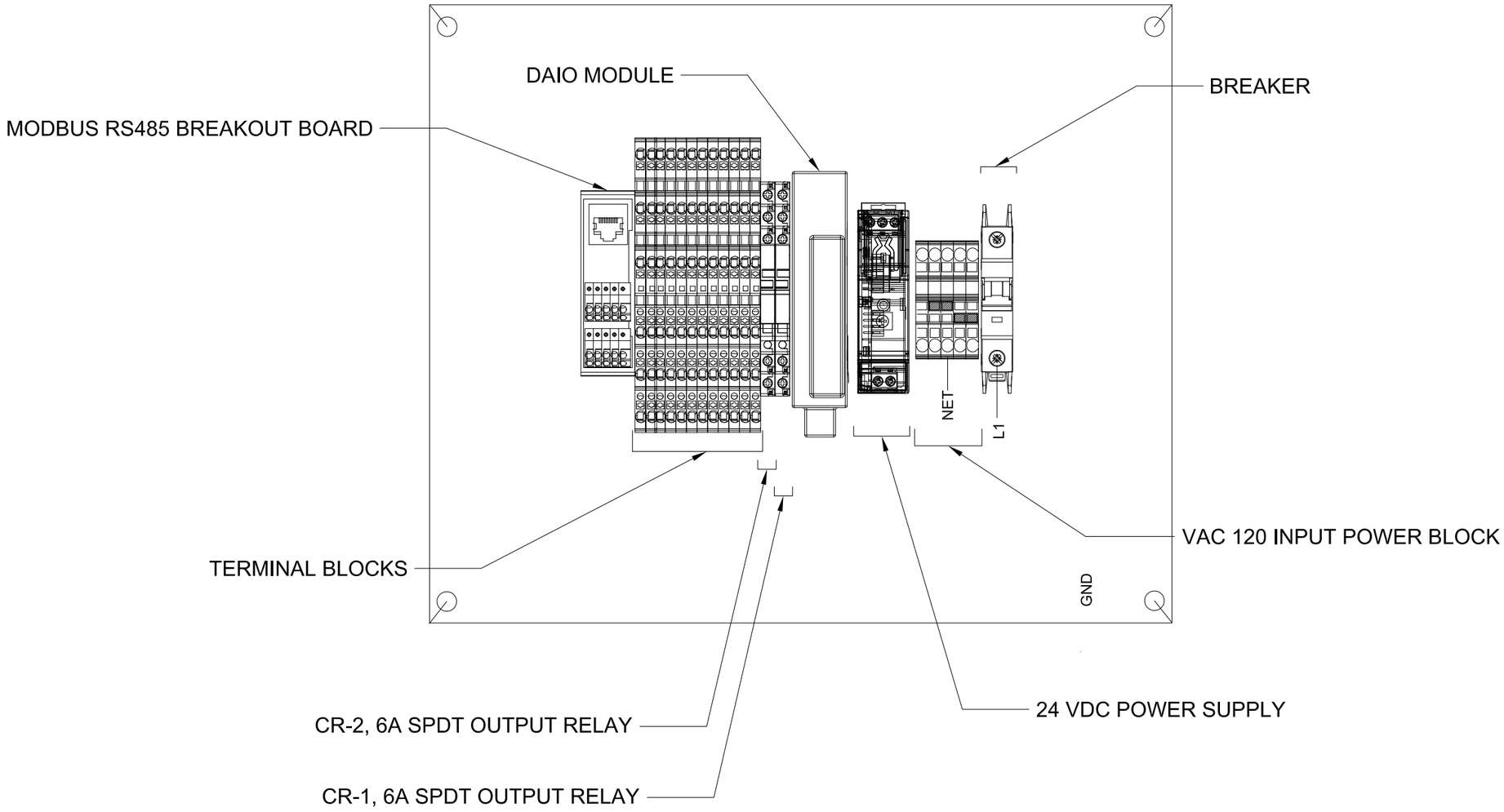
PAX Water Technologies
A UGSI SOLUTIONS COMPANY

DRAWN BY: T.YOUNG	DATE: 11/22/2021
CHECKED BY: B. FRITZ	DATE: 11/22/2021
SCALE: NONE	SIZE: D

PROJECT:
PAX WATER TECHNOLOGIES INC.
STANDARD DRAWING

SUBJECT:
SINGLE PUMP SKID MODBUS CONTROLLER
SMC1001-A
ENCLOSURE LAYOUT

DWG #: 1101-7489-01 | SHEET 1 OF 7 | REV. A



REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
A	11/22/2021	TY	INITIAL RELEASE				

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PAX Water Technologies
A UGSI SOLUTIONS COMPANY

DRAWN BY:	T.YOUNG	DATE: 11/22/2021
CHECKED BY:	B. FRITZ	DATE: 11/22/2021
SCALE:	NONE	SIZE: D

PROJECT:
PAX WATER TECHNOLOGIES INC.
STANDARD DRAWING

SUBJECT:
SINGLE PUMP SKID MODBUS CONTROLLER
SMC1001-A
BACK PANEL LAYOUT

DWG #: 1101-7489-01 | SHEET 2 OF 7 | REV. A

L1

G

N

L1

GND

N

#14BLK

#14GRN

#16WHT

CB1

5A

GROUND BAR

TO SHEET 4 RUNG 107

#16RED

#16WHT

TO SHEET 6 RUNG 090

3

2

IDEC PS5R-SF24

L

N

+ 24 VDC - 2.5 A

G

#18BLU

#18BLU/WHT

#16GRN

POWER SUPPLY

103

102

103

102

DAIO MODULE 1

103

V+

COM

102

3

4

RS485 COM PORT

4

5

MODULE CONFIG NOTE:
SET WATCHDOG TIMER ADDRESS 40101 TO 15 SECONDS

DIP SWITCH SETTING:
CL2 PUMP 1, NODE 2
- ON = 2

OFF = 1, 3-10
NH3 PUMP 1, NODE 3
- ON = 1,2
- OFF = 3-10

103

102

REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
A	11/22/2021	TY	INITIAL RELEASE				

This drawing represents an investment by PSI WATER TECHNOLOGIES, INC. of substantial sums, including our engineering skills and experience. It is, therefore, loaned without consideration other than the agreement and condition that it is not to be used in whole or in part to assist in making or to furnish any information to others for the making of drawings, print apparatus, or parts thereof. The acceptance of this drawing will be construed as an acceptance of the forgoing conditions and as an admission of the exclusive ownership in and to the drawings of PSI WATER TECHNOLOGIES, INC.

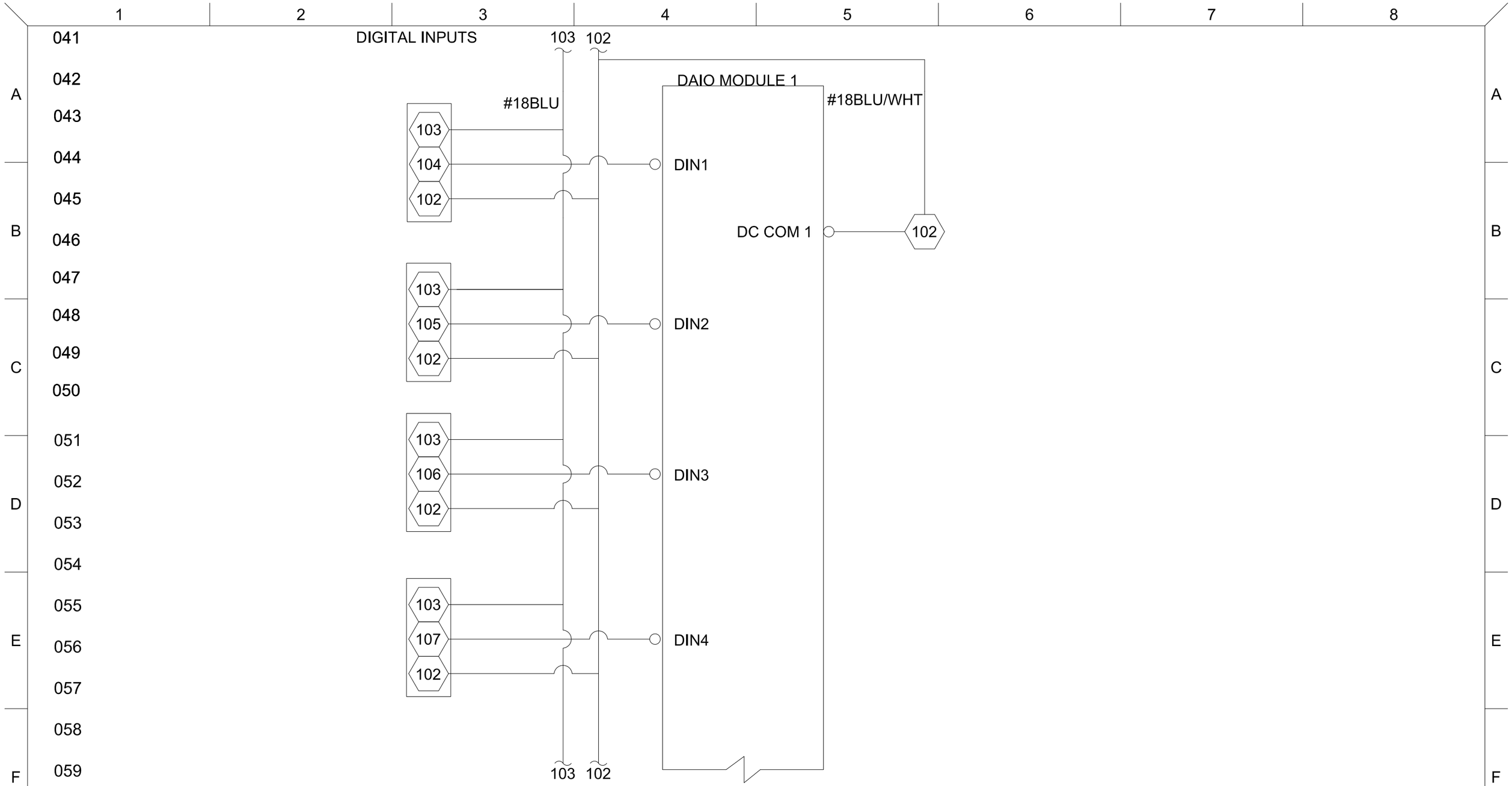
PAX Water Technologies
A UGSI SOLUTIONS COMPANY

DRAWN BY: T.YOUNG	DATE: 11/22/2021
CHECKED BY: B. FRITZ	DATE: 11/22/2021
SCALE: NONE	SIZE: D

PROJECT:
PAX WATER TECHNOLOGIES INC.
STANDARD DRAWING

SUBJECT:
SINGLE PUMP SKID MODBUS CONTROLLER
SMC1001-A
ELECTRICAL SCHEMATIC

DWG #: 1101-7489-01 | SHEET 3 OF 7 | REV. A



REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
A	11/22/2021	TY	INITIAL RELEASE				

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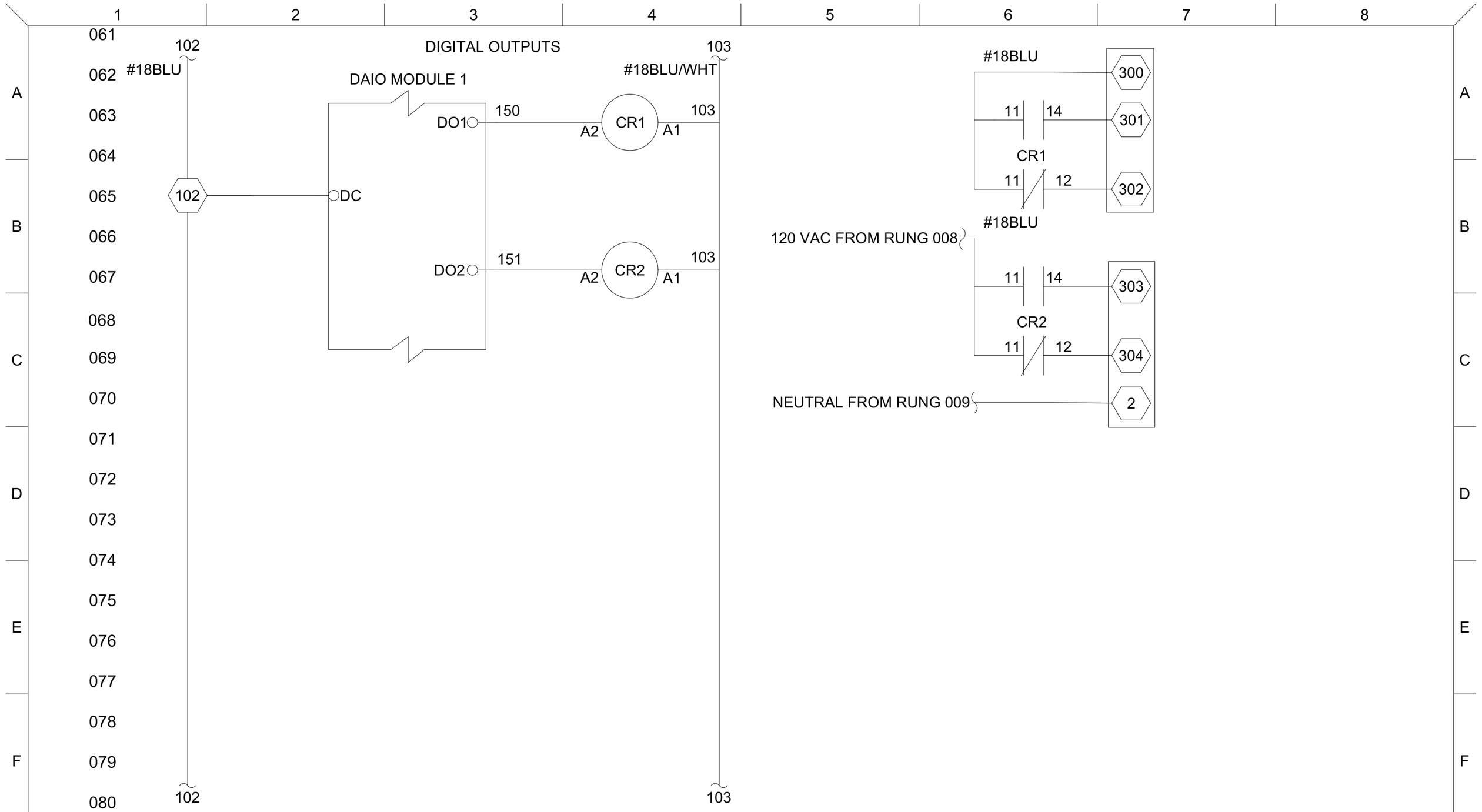
PAX Water Technologies
A UGSI SOLUTIONS COMPANY

DRAWN BY: T.YOUNG	DATE: 11/22/2021
CHECKED BY: B. FRITZ	DATE: 11/22/2021
SCALE: NONE	SIZE: D

PROJECT:
PAX WATER TECHNOLOGIES INC.
STANDARD DRAWING

SUBJECT:
SINGLE PUMP SKID MODBUS CONTROLLER
SMC1001-A
DIGITAL INPUT

DWG #: 1101-7489-01 | SHEET 4 OF 7 | REV. A



REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
A	11/22/2021	TY	INITIAL RELEASE	△			
△				△			
△				△			
△				△			

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PAX Water Technologies
A UGSI SOLUTIONS COMPANY

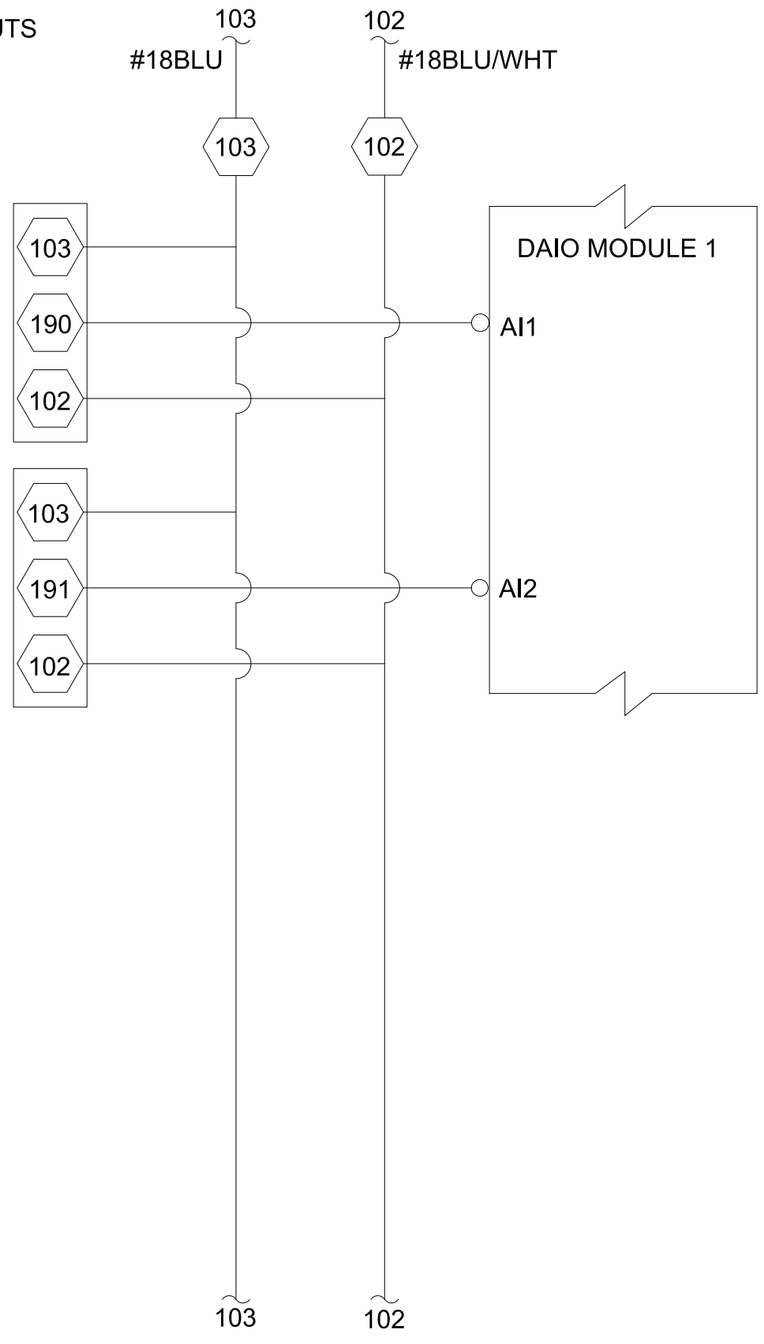
DRAWN BY: T.YOUNG	DATE: 11/22/2021
CHECKED BY: B. FRITZ	DATE: 11/22/2021
SCALE: NONE	SIZE: D

PROJECT:
PAX WATER TECHNOLOGIES INC.
STANDARD DRAWING

SUBJECT:
SINGLE PUMP SKID MODBUS CONTROLLER
SMC1001-A
DIGITAL OUTPUT

DWG #: 1101-7489-01 | SHEET 5 OF 7 | REV. A

ANALOG INPUTS



REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
A	11/22/2021	TY	INITIAL RELEASE				

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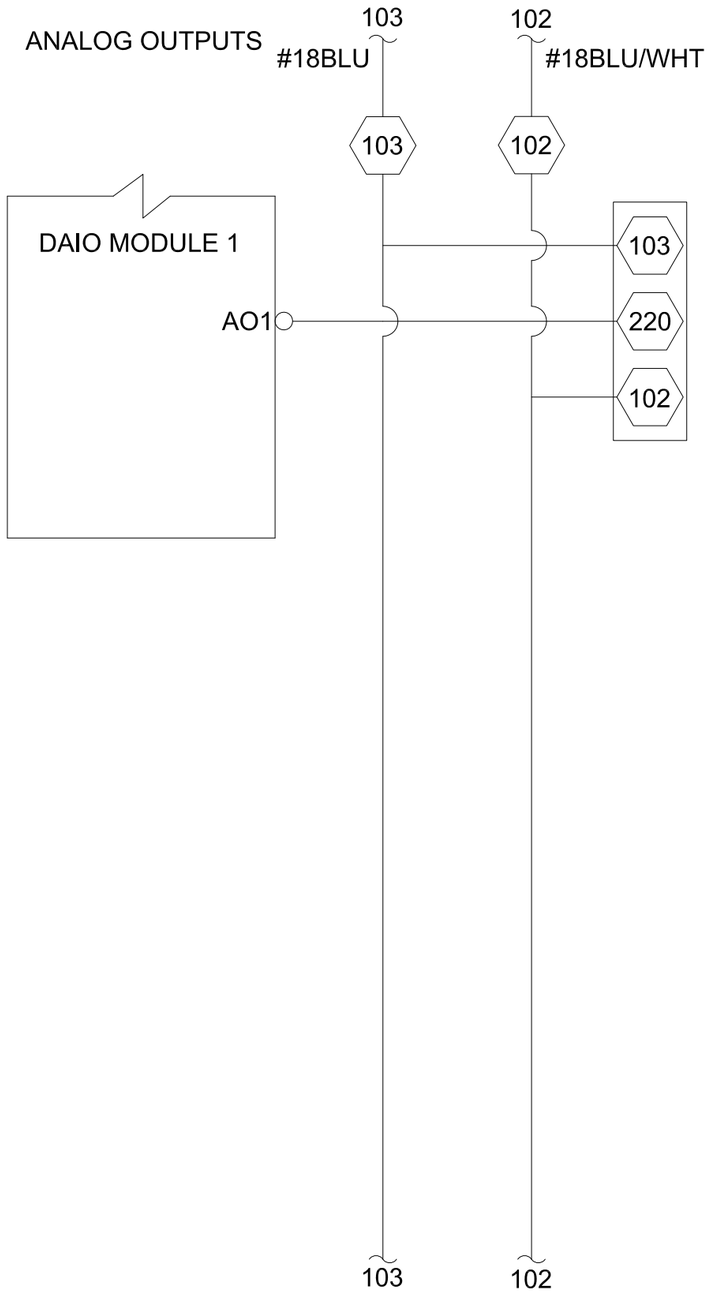
PAX Water Technologies
A UGSI SOLUTIONS COMPANY

DRAWN BY: T.YOUNG	DATE: 11/22/2021
CHECKED BY: B. FRITZ	DATE: 11/22/2021
SCALE: NONE	SIZE: D

PROJECT:
PAX WATER TECHNOLOGIES INC.
STANDARD DRAWING

SUBJECT:
SINGLE PUMP SKID MODBUS CONTROLLER
SMC1001-A
ANALOG INPUT

DWG #: 1101-7489-01 | SHEET 6 OF 7 | REV. A



REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
A	11/22/2021	TY	INITIAL RELEASE				

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PAX Water Technologies
A UGSI SOLUTIONS COMPANY

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CHECKED BY:	B. FRITZ	DATE: 11/22/2021
SCALE:		SIZE: D

PROJECT:
PAX WATER TECHNOLOGIES INC.
STANDARD DRAWING

SUBJECT:
SINGLE PUMP SKID MODBUS CONTROLLER
SMC1001-A
ANALOG OUTPUT

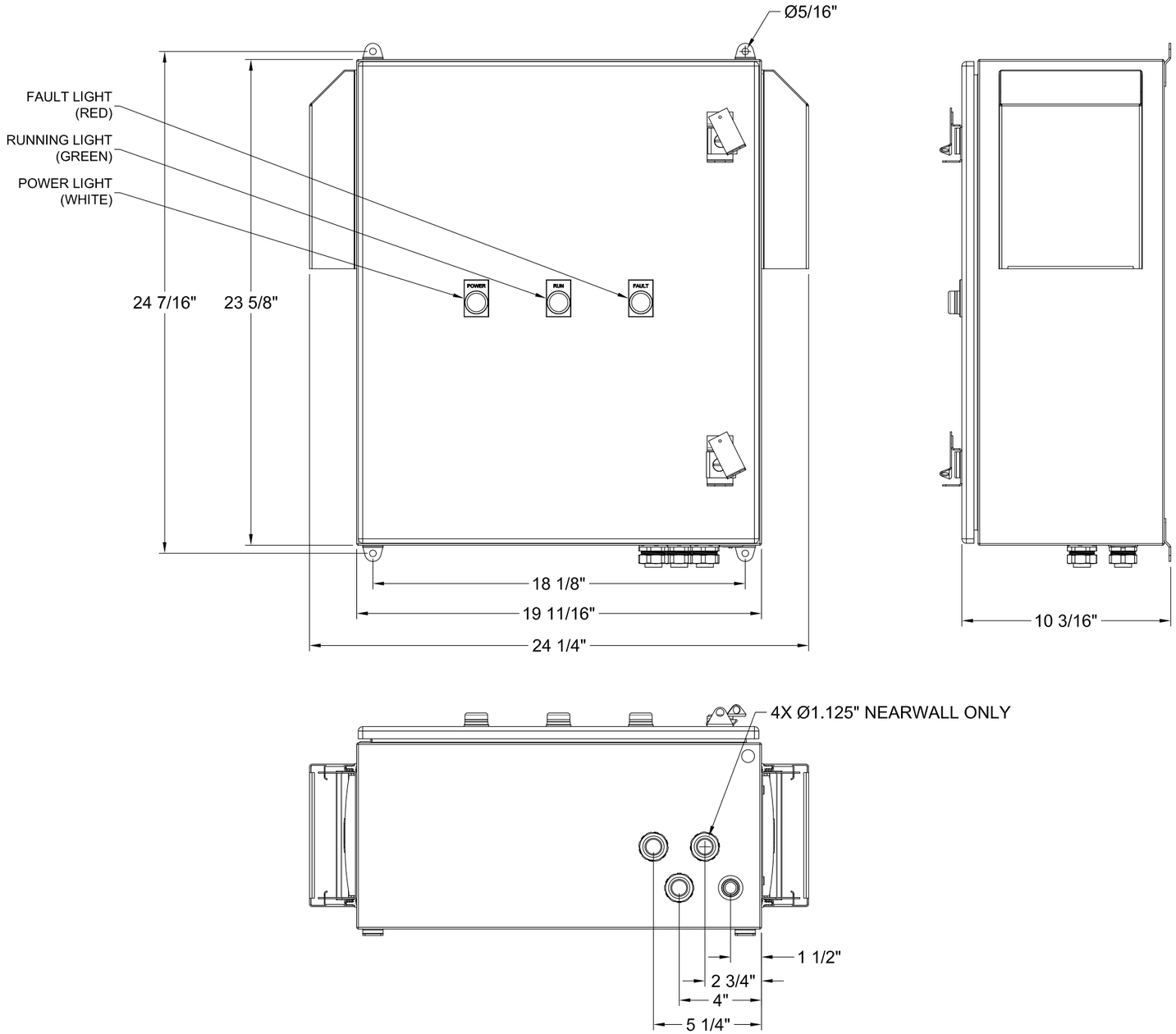
DWG #: 1101-7489-01 | SHEET 7 OF 7 | REV. A

SECTION 9.3

MIXER CONTROL PANEL

9.3.1 Mixer Control Panel Drawings

9.3.2 Mixer Control Panel Component Data Sheets



REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
A	03/26/2020	RC	DRAWING CREATED				
B	01/17/2022	TY	ENCLOSURE LAYOUT & BACK PLATE LAYOUT ADDED				

This drawing represents an investment by PSI WATER TECHNOLOGIES, INC. of substantial sums, including our engineering skills and experience. It is, therefore, loaned without consideration other than the agreement and condition that it is not to be used in whole or in part to assist in making or to furnish any information to others for the making of drawings, print apparatus, or parts thereof. The acceptance of this drawing will be construed as an acceptance of the forgoing conditions and as an admission of the exclusive ownership in and to the drawings of PSI WATER TECHNOLOGIES, INC.

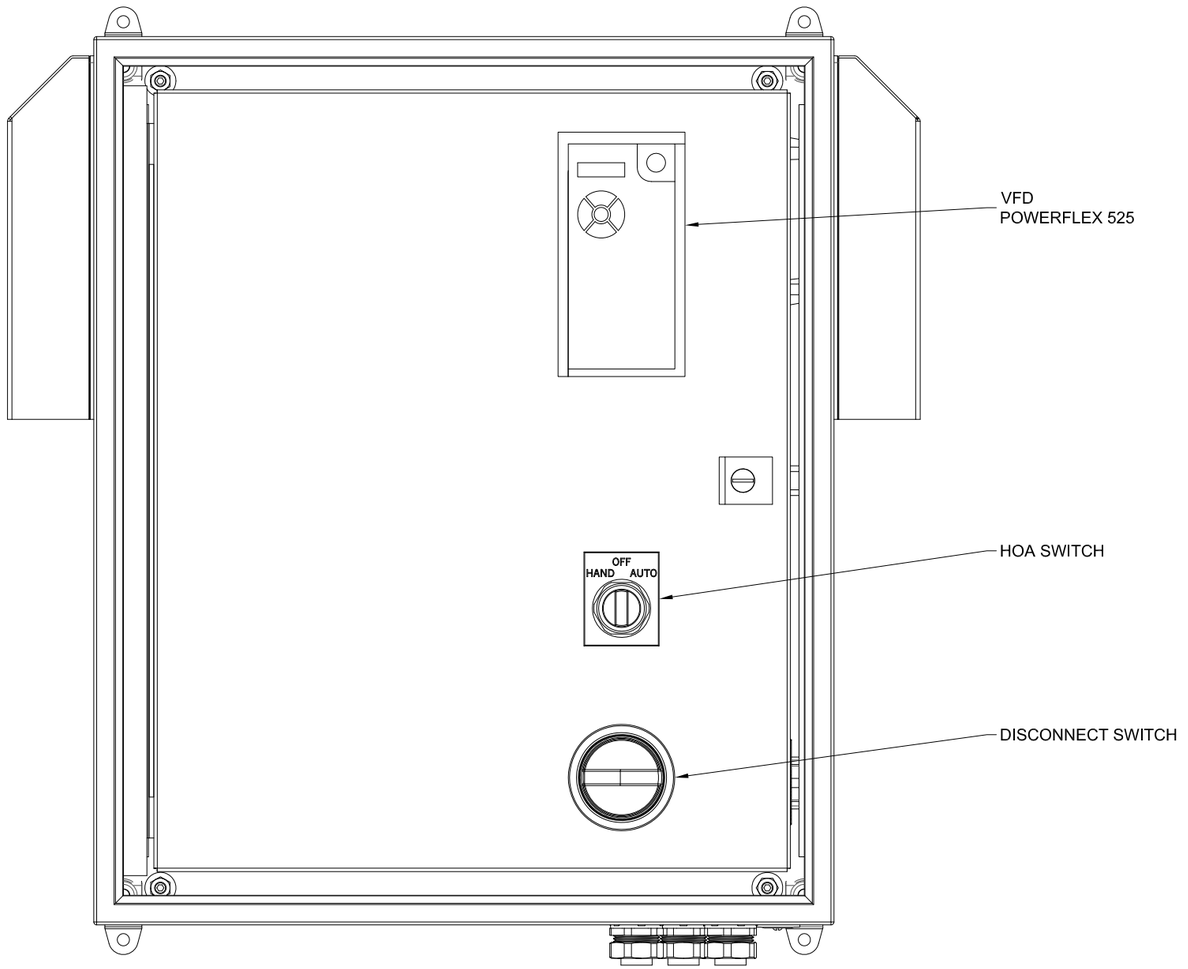
PAX Water Technologies
A UGSI SOLUTIONS COMPANY

DRAWN BY:	T. YOUNG	DATE: 01/17/2022
CHECKED BY:	B. FRITZ	DATE: 01/17/2022
SCALE:	NONE	SIZE: D

PROJECT:
PAX WATER TECHNOLOGIES INC.
STANDARD DRAWING

SUBJECT:
PAX MIXER CONTROL CENTER
PCC255 240VAC 3HP V3.0
ENCLOSURE LAYOUT

DWG #: 1101-7432-01 | SHEET 1 OF 4 | REV. B



REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
A	03/26/2020	RC	DRAWING CREATED				
B	01/17/2022	TY	ENCLOSURE LAYOUT & BACK PLATE LAYOUT ADDED				

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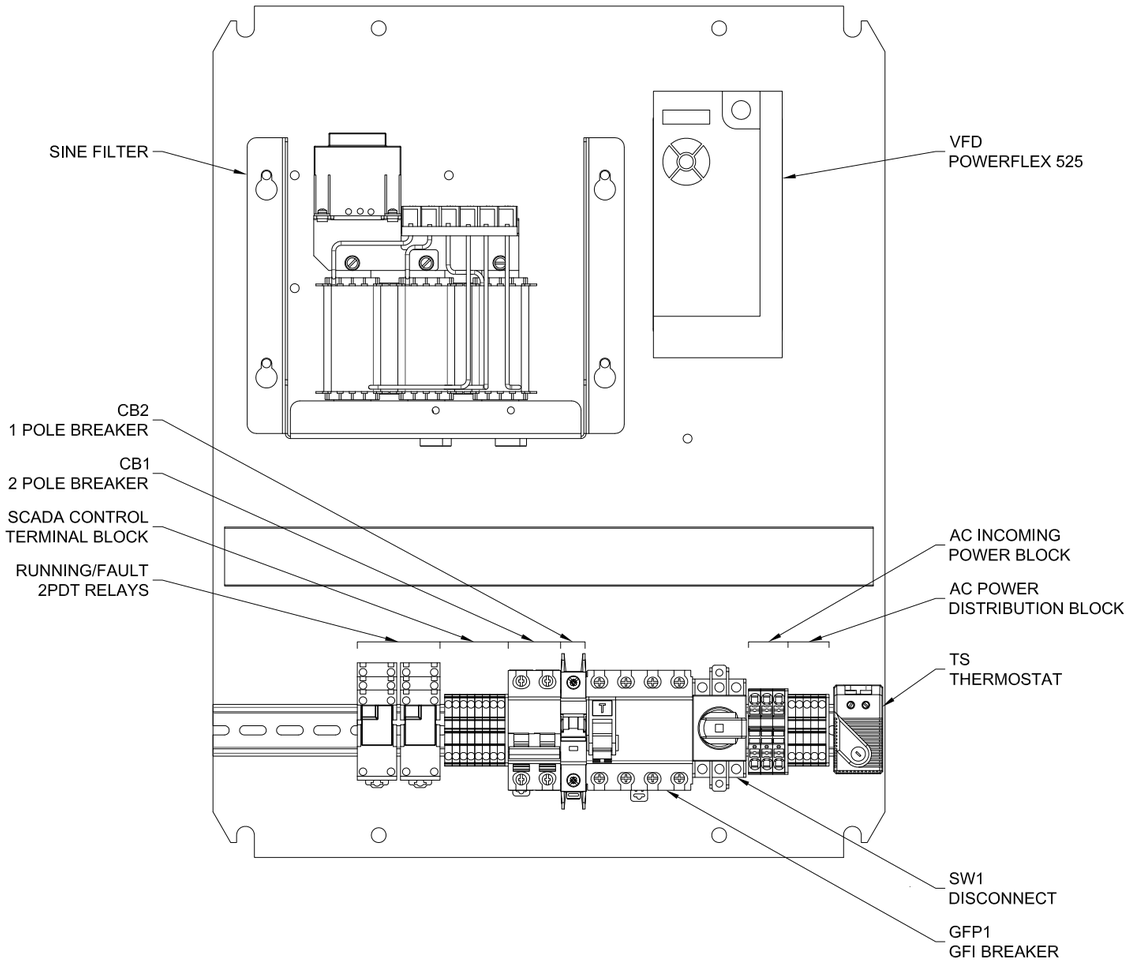
PAX Water Technologies
A UGSI SOLUTIONS COMPANY

DRAWN BY:	T. YOUNG	DATE: 01/17/2022
CHECKED BY:	B. FRITZ	DATE: 01/17/2022
SCALE:	NONE	SIZE: D

PROJECT:
PAX WATER TECHNOLOGIES INC.
STANDARD DRAWING

SUBJECT:
PAX MIXER CONTROL CENTER
PCC255 240VAC 3HP V3.0
DEAD PANEL LAYOUT

DWG #: 1101-7432-01 | SHEET 2 OF 4 | REV. B

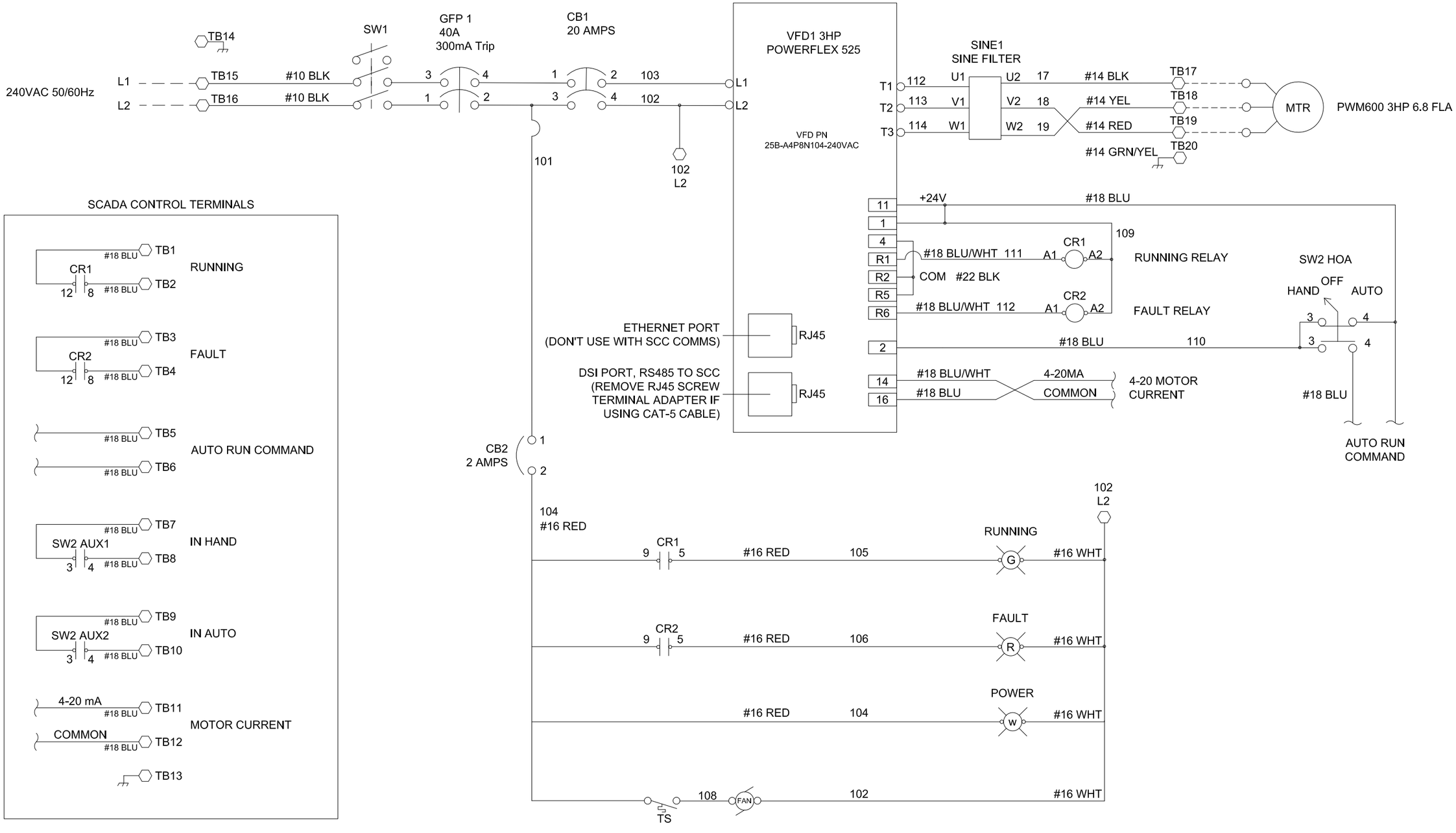


REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
A	03/26/2020	RC	DRAWING CREATED				
B	01/17/2022	TY	ENCLOSURE LAYOUT & BACK PLATE LAYOUT ADDED				

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PAX Water Technologies
A UGSI SOLUTIONS COMPANY

DRAWN BY: T. YOUNG	DATE: 01/17/2022	PROJECT: PAX WATER TECHNOLOGIES INC. STANDARD DRAWING
CHECKED BY: B. FRITZ	DATE: 01/17/2022	SUBJECT: PAX MIXER CONTROL CENTER PCC255 240VAC 3HP V3.0 BACK PANEL LAYOUT
SCALE: NONE	SIZE: D	DWG #: 1101-7432-01 | SHEET 3 OF 4 | REV. B



REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
A	03/26/2020	RC	DRAWING CREATED				
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A UGSI SOLUTIONS COMPANY

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CHECKED BY: B. FRITZ	DATE: 01/17/2022	SUBJECT: PAX MIXER CONTROL CENTER PCC255 240VAC 3HP V3.0 ELECTRICAL SCHEMATIC
SCALE: NONE	SIZE: D	DWG #: 1101-7432-01 | SHEET 4 OF 4 | REV. B

Rittal – The System.

Faster – better – everywhere.

Wallmounted enclosure Stainless steel - 8018205

Date : Jan 21 , 2021

ENCLOSURES POWER DISTRIBUTION CLIMATE CONTROL IT INFRASTRUCTURE SOFTWARE & SERVICES

FRIEDHELM LOH GROUP

Wallmounted enclosure Stainless steel - 8018205

created: 01.21.2021 build on https://www.rittal.us/



Product Description

Material	Door: Stainless steel all-round foamed-in PU seal Housing and door: Stainless steel 1.4301 (AISI 304) Mounting plate: Carbon steel zinc-plated
Surface finish	Brushed
Protection category IP to IEC 60 529	IP 66
Protection category NEMA:	NEMA 4X
Supply includes	Mounting plate Housing with door(s) Left hand hinge Wall mounting blind-nuts
Dimensions	Height: 609 mm (24 ") Width: 508 mm (20 ") Depth: 254 mm (10 ")
Material thickness	Housing: 1.5 mm (0.06 ") Door: 1.5 mm (0.06 ") Mounting plate: 1.5 mm (0.06 ")
Mounting plate	Height: 475 mm (19 ") Width: 354 mm (14 ")
Lock version	Quarter turn
Packaging unit	1 pc(s).
Weight/packaging unit	20.4 kg (45.3 lb.)

Rittal – The System.

Faster – better – everywhere.

Hose-proof hood for a higher protection category - 3238080

Date : Apr 27 , 2021

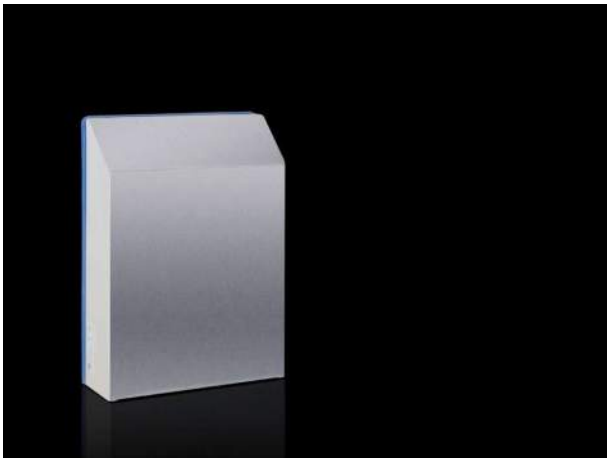
ENCLOSURES POWER DISTRIBUTION CLIMATE CONTROL IT INFRASTRUCTURE SOFTWARE & SERVICES

FRIEDHELM LOH GROUP

Hose-proof hood for a higher protection category - 3238080

created: 04.27.2021 build on https://www.rittal.us/





Product Description

Material	Stainless steel Silicone
Dimensions	Height: 245 mm (9.6 ") Width: 176 mm (6.9 ") Depth: 55 mm (2.2 ")
Protection category IP to IEC 60 529	IP 56 when fitted over fan-and-filter unit/outlet filter with filter mat
Protection category NEMA:	NEMA 4 NEMA 4X NEMA 12 NEMA 1 NEMA 3
Weight/packaging unit	1.52 kg (3.4 lb.)
Suitable for Part No.	3238....
Packaging unit	1 pc(s).
EAN	4028177651685
Customs tariff number	73269098
Product description (long)	SK hose-proof hood for SK 3238… WHD: 176 x 245 x 55 mm

TopTherm Filter Fan Units – SK 3238.100

: 24.05.2019 build on www.rittal.com/ca-en



Product description

Color:	RAL 7035
Protection category IP to IEC 60 529:	IP 54 with standard filter and additional fine filter mat: IP 54 with standard filter and hose-proof hood: IP 56
Protection category NEMA:	with standard filter: Type 12 with standard filter and additional fine filter mat: Type 12 with standard filter and hose-proof hood: Type 3, 3R, 4, 4X
Supply includes:	Complete unit ready for connection, including filter mat
Note:	Electrical connection of the filter fans 3237.XXX is by means of 2 individual wires at the device, for all other filter fans, by means of a spring-type terminal.

Product features

Air throughput (unimpeded air flow):	At 50 Hz: 55 m³/h (32.4 cfm) At 60 Hz: 66 m³/h (38.8 cfm)
Air throughput with outlet filter, including standard filter mat (quantity x order number, throughput 50/60 Hz):	1 x 3238200: 43/50 m³/h 2 x 3238200: 46/56 m³/h
Rated operating voltage:	230 V, 1~, 50 Hz/60 Hz
Dimensions:	Height: 148.5 mm (5.8 ″) Width: 148.5 mm (5.8 ″)

© Rittal 2019

Required mounting cut-out:	Height: 124 mm (4.9 ″) Width: 124 mm (4.9 ″)
Build depth:	16 mm (0.63 ″)
Installation depth:	58.5 mm (2.3 ″)
Temperature range:	Storage: -30°C...+70°C Operation (environment): -10°C...+55°C
Rated power Pel:	At 50 Hz: 19 W At 60 Hz: 18 W
Rated current (max.):	At 50 Hz: 0.12 A At 60 Hz: 0.11 A
Miniature circuit-breaker/fuse:	2 A
Noise pressure level:	At 50 Hz: 46 dB(A) At 60 Hz: 49 dB(A)
Diagonal fan:	Diagonal, self-starting shaded pole motor
Packaging unit:	1 pc(s).
Weight/packaging unit:	0.8 kg (1.8 lb.)
EAN:	4028177651692
Customs tariff number:	84145915
ETIM 6.0:	EC000320
ETIM 5.0:	EC000320
eCl@ss 8.0/8.1:	27180716
eCl@ss 7.0/7.1:	27180716
eCl@ss 6.0/6.1:	27180716
eCl@ss 5.1/5.1.4:	27180705
Product description:	SK fan and filter units TopTherm, 55/66 m³/h, 230 V, 1~, 50/60 Hz, WHD: 148.5 x 148.5 x 16 mm

Approvals

Approvals:	Approval overview CSA UL + C-UL - FTTA UR + C-UR
Certificates:	EAC
Declarations:	Declaration of conformity

Outlet filter Standard – SK 3238.200

created: 11.02.2019 on www.rittal.com/com-en



Product description

Description:	For ventilation by convection, an outlet filter can be installed in the upper and lower sections of the enclosure.
Material:	ABS Material resistance to UL 94-5VA
Colour:	RAL 7035
Protection category IP to IEC 60 529:	IP 54 including filter mat
Protection category NEMA:	with standard filter: NEMA 12
Supply includes:	Outlet filter Filter mat

Product features

Dimensions:	Width: 148.5 mm Height: 148.5 mm Depth: 24 mm
Required mounting cut-out:	Width: 124 mm Height: 124 mm
Packs of:	1 pc(s).
Weight/pack:	0.18 kg
EAN:	4028177651739

Customs tariff number:	39269097
ETIM 6.0:	EC002513
ETIM 5.0:	EC002513
eCl@ss 8.0/8.1:	27180706
eCl@ss 7.0/7.1:	27180706
eCl@ss 6.0/6.1:	27180706
eCl@ss 5.1/5.1.4:	27180706
Product description:	SK outlet filter, Standard, WHD: 148.5 x 148.5 x 24 mm

Approvals

Approvals:	CSA UL + C-UL - FTTA UR + C-UR

Product data sheet
Characteristics

VLSH2H5B
TeSys VLS - rot. handle - holefixing - red - shaft 5 mm - 65x65 mm

Product availability: Stock - Normally stocked in distribution facility

Price*: 23.97 USD

Main

Range	TeSys
Device short name	VLSH
Product or component type	Rotary handle
Range compatibility	TeSys VARIO LS VLS3P
Handle colour	Red
Handle front plate colour	Yellow
Rotary handle padlocking	1 to 3 padlocks, with diameter 4...8 mm
Marking	0 - 1

Complementary

Fixing mode	Hole, with diameter 22.5 mm
Tightening torque	20.35 lbf.in (2.3 N.m)
Base dimension	65 x 65 mm
Height	2.56 in (65 mm)
Width	2.56 in (65 mm)
Depth	2.85 in (72.5 mm)
Product weight	0.16 lb(US) (0.074 kg)
Compatibility code	VLS

Environment

IP degree of protection	IP65
NEMA degree of protection	NEMA 2 for use with device conforming to UL 508 NEMA 3R for use with device conforming to UL 508 NEMA 4 for use with device conforming to UL 508 NEMA 4X for use with device conforming to UL 508 NEMA 12 for use with device conforming to UL 508 NEMA 12K for use with device conforming to UL 508 NEMA 1

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein.
This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications.
It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof.
Neither Schneider Electric Industries SAS nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. *Prices are indicative

Ordering and shipping details

Category	21734 - TESYS VLS DISCONNECT SWITCHES
Discount Schedule	CP1
GTIN	00785901576891
Nbr. of units in pkg.	1
Package weight(Lbs)	0.14999999999999999
Returnability	Y
Country of origin	IT

Offer Sustainability

RoHS (date code: YYWW)	Compliant - since 1441 - Schneider Electric declaration of conformity Schneider-Electric declaration of conformity
California proposition 65	WARNING: This product can expose you to chemicals including:
- - - - - - - Substance 1	Antimony oxide & Antimony trioxide, which is known to the State of California to cause-cancer.
- - - - - - - More information	For more information go to www.p65warnings.ca.gov

Product Life Status : Commercialized

Product data sheet
Characteristics

VLS3P025R1
TeSys VLS - Body switch disconnector - 3 poles - 25 A - on DIN rail

Product availability : Stock - Normally stocked in distribution facility

Price* : 38.30 USD



Main

Range	TeSys
Product name	TeSys VARIO LS
Device short name	VLS3P
Product or component type	Switch body
Performance level	High performance
Poles description	3P
Contacts type and composition	3 NO
Network type	AC
Network frequency	50/60 Hz
Control type	Rotary handle
Rotary handle mounting style	Direct
Handle colour	Black
Handle front plate colour	Grey
Suitability for isolation	Yes

Complementary

Rotary handle padlocking	1 padlock 4 mm
Marking	0 - 1
Mounting support	Back mounting on DIN rail
Fixing mode	By clips back
System Voltage	690 V AC 50/60 Hz
[Uimp] rated impulse withstand voltage	8 kV
[Ithe] conventional enclosed thermal current	25 A
[Ie] rated operational current	25 A (AC-21A) at 400 V
Rated operational power in W	22 kW at 690 V (AC-23A)
Intermittent duty class	Class 120 - 60 %
Making capacity (I Rms)	37.5 A at 690 V (AC-21A)
[Icm] rated short-circuit making capacity	1128 A at 690 V

Disclaimer: This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications

[Icw] rated short-time withstand Rms current	800 A at 690 V during 1 s
Rated conditional short-circuit current	50 kA at 400 V - associated fuse 25 A gG
Breaking capacity	37.5 A at 690 V AC-21A
Device composition	Handle Switch
Mechanical durability	100000 cycles
Electrical durability	100000 cycles AC-21A
Connections - terminals	Power circuit: screw clamp terminals cable 0.02 in² (10 mm²) - cable stiffness: solid
Tightening torque	Power circuit : 1.8...2 N.m - on screw clamp terminals
Height	2.95 in (75 mm)
Width	1.42 in (36 mm)
Depth	3.07 in (78 mm)
Product weight	0.3 lb(US) (0.135 kg)
Colour	Grey

Environment

Standards	IEC 60947-3 UL 508 CSA C22.2 No 14
Product certifications	GL
IP degree of protection	IP20 conforming to IEC 60529
Mechanical robustness	Vibrations 2...100 Hz Fc 0.7 g IEC 60068-2-6
Ambient air temperature for operation	-13...131 °F (-25...55 °C)
Fire resistance	1760 °F (960 °C) conforming to IEC 60695-2-11

Ordering and shipping details

Category	21734 - TESYS VLS DISCONNECT SWITCHES
Discount Schedule	CP1
GTIN	00785901560425
Nbr. of units in pkg.	1
Package weight(Lbs)	0.39000000000000001
Returnability	Y
Country of origin	IT

Offer Sustainability

RoHS (date code: YYWW)	Compliant - since 1441 - Schneider Electric declaration of conformity Schneider Electric declaration of conformity

Product data sheet
Characteristics

VLSS1505
TeSys VLS - shaft extension - 150 mm - 5 x 5 mm²

Product availability : Stock - Normally stocked in distribution facility

Price* : 6.70 USD



Main

Range	TeSys
Device short name	VLSS
Product or component type	Shaft extension
Range compatibility	TeSys VARIO LS VLSH

Complementary

Cross-section height	0.2 in (5 mm)
Cross-section width	0.2 in (5 mm)
Shaft length	5.91 in (150 mm)
Product weight	1.13 oz (32 g)

Ordering and shipping details

Category	21734 - TESYS VLS DISCONNECT SWITCHES
Discount Schedule	CP1
GTIN	00785901578277
Nbr. of units in pkg.	1
Package weight(Lbs)	7.00000000000000007E-2
Returnability	Y
Country of origin	IT

Offer Sustainability

RoHS (date code: YYWW)	Compliant - since 1441 - Schneider Electric declaration of conformity Schneider Electric declaration of conformity

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Non-Illuminated Selector Switches (Assembled)







Assembled Selector Switches

A S D 2 ( ) ( ) 11 N – ( )

Function

S: Selector Switch

Series Designation

D: TWTD Series

Number of Positions

2: 2-Position
3: 3-Position

Spring Return Action

Blank: Maintained
1: Spring return from Right
2: Spring return from Left
3: 2-Way spring return from Left and Right

Circuit Number

(See Circuit # column of Selector Switch Contact Arrangement Chart on beginning on page 739.)

Contact Arrangement Code

10: 1NO	01: 1NC
20: 2NO	02: 2NC
40: 4NO	04: 4NC
11: 1NO-1NC	22: 2NO-2NC

Operator Style Code

Blank: Knob Operator
L: Lever Operator
K: Key Operator

1. Use only when interpreting part numbers. Do not use for developing part numbers.
2. Custom key removal codes available. Please contact IDEC for details.

Non-Illuminated Selector Switches (Assembled)

Non-Illuminated 2-Position Selector Switches

Style					Part Number		
Contact	Mounting	Operator Position L	Operator Position R		Maintained	Spring Return from Right	Spring Return from Left
1NO	1	0	X	Knob	ASD210N	ASD2110N	ASD2210N
	2	0	0	Lever	ASD2L10N	ASD21L10N	ASD22L10N
				Key	ASD2K10N	ASD21K10N	ASD22K10N
1NC	1	X	0	Knob	ASD201N-116	ASD2101N-116	ASD2201N-116
	2	0	0	Lever	ASD2L01N-116	ASD21L01N-116	ASD22L01N-116
				Key	ASD2K01N-116	ASD21K01N-116	ASD22K01N-116
1NO 1NC	1	0	X	Knob	ASD211N	ASD2111N	ASD2211N
	2	X	0	Lever	ASD2L11N	ASD21L11N	ASD22L11N
				Key	ASD2K11N	ASD21K11N	ASD22K11N
2NO	1	0	X	Knob	ASD220N	ASD2120N	ASD2220N
	2	0	X	Lever	ASD2L20N	ASD21L20N	ASD22L20N
				Key	ASD2K20N	ASD21K20N	ASD22K20N
2NC	1	X	0	Knob	ASD202N-104	ASD2102N-104	ASD2202N-104
	2	X	0	Lever	ASD2L02N-104	ASD21L02N-104	ASD22L02N-104
				Key	ASD2K02N-104	ASD21K02N-104	ASD22K02N-104
2NO 2NC	1	0	X	Knob	ASD222N	ASD2122N	ASD2222N
	2	X	0	Lever	ASD2L22N	ASD21L22N	ASD22L22N
	3	0	X	Key	ASD2K22N	ASD21K22N	ASD22K22N
	4	X	0				
2NO 2NC	1	0	X	Knob	ASD222N-111	ASD2122N-111	ASD2222N-111
	2	0	X	Lever	ASD2L22N-111	ASD21L22N-111	ASD22L22N-111
	3	X	0	Key	ASD2K22N-111	ASD21K22N-111	ASD22K22N-111
	4	X	0				

1. The truth table indicates the operating position of contact block when the operator is switched to that position.
   X = On (closed contacts) O = Off (open contacts)
   X—X = Overlapping Contacts: Remain on (closed contacts) when switch is moved between these two positions.
2. All knob and lever selector switches come in black. Other colors are available by ordering the knob or lever separately.
3. Custom contact arrangements available, see page 739.

Non-Illuminated 3-Position Selector Switches

Style						Part Number			
Contact	Mounting	Operator Position L	Operator Position C	Operator Position R		Maintained	Spring Return from Right	Spring Return from Left	Spring Return Two-Way
2NO	1	X	0	0	Knob	ASD320N	ASD3120N	ASD3220N	ASD3320N
	2	0	0	X	Lever	ASD3L20N	ASD31L20N	ASD32L20N	ASD33L20N
					Key	ASD3K20N	ASD31K20N	ASD32K20N	ASD33K20N
2NC	1	0	X—X		Knob	ASD302N	ASD3102N	ASD3202N	ASD3302N
	2	X—X		0	Lever	ASD3L02N	ASD31L02N	ASD32L02N	ASD33L02N
					Key	ASD3K02N	ASD31K02N	ASD32K02N	ASD33K02N
2NO 2NC	1	X	0	0	Knob	ASD322N	ASD3122N	ASD3222N	ASD3322N
	2	0	0	X	Lever	ASD3L22N	ASD31L22N	ASD32L22N	ASD33L22N
	3	0	X—X		Key	ASD3K22N	ASD31K22N	ASD32K22N	ASD33K22N
	4	X—X		0					
2NO 2NC	1	X	0	X	Knob	ASD322N-309	ASD3122N-309	ASD3222N-309	ASD3322N-309
	2	X—X		0	Lever	ASD3L22N-309	ASD31L22N-309	ASD32L22N-309	ASD33L22N-309
	3	0	X	0	Key	ASD3K22N-309	ASD31K22N-309	ASD32K22N-309	ASD33K22N-309
	4	0	0	X					
2NO 2NC	1	0	X	0	Knob	ASD322N-310	ASD3122N-310	ASD3222N-310	ASD3322N-310
	2	0	0	X	Lever	ASD3L22N-310	ASD31L22N-310	ASD32L22N-310	ASD33L22N-310
	3	0	X	0	Key	ASD3K22N-310	ASD31K22N-310	ASD32K22N-310	ASD33K22N-310
	4	0	0	X					
4NO	1	X	0	0	Knob	ASD340N	ASD3140N	ASD3240N	ASD3340N
	2	0	0	X	Lever	ASD3L40N	ASD31L40N	ASD32L40N	ASD33L40N
	3	X	0	0	Key	ASD3K40N	ASD31K40N	ASD32K40N	ASD33K40N
	4	0	0	X					
4NC	1	0	X—X		Knob	ASD304N	ASD3104N	ASD3204N	ASD3304N
	2	X—X		0	Lever	ASD3L04N	ASD31L04N	ASD32L04N	ASD33L04N
	3	0	X—X		Key	ASD3K04N	ASD31K04N	ASD32K04N	ASD33K04N
	4	X—X		0					

Pilot Lights (Assembled)





		Round Flush		Dome	
		Plastic Bezel	Metal Bezel	Plastic Bezel	Metal Bezel
Operator Only		*HW1P-1FQ0-②*	*HW4P-1FQ0-②*	*HW1P-2FQ0-②*	*HW4P-2FQ0-②*
Full Voltage		HW1P-1FQD-②-③	HW4P-1FQD-②-③	HW1P-2FQD-②-③	HW4P-2FQD-②-③
Transformer	120V AC	HW1P-1FH2D-②	HW4P-1FH2D-②	HW1P-2FH2D-②	HW4P-2FH2D-②
	240V AC	HW1P-1FM4D-②	HW4P-1FM4D-②	HW1P-2FM4D-②	HW4P-2FM4D-②
	480V AC	HW1P-1FT8D-②	HW4P-1FT8D-②	HW1P-2FT8D-②	HW4P-2FT8D-②
DC-DC Converter*	110V DC	HW1P-1D2D-②	–	HW1P-2D2D-②	–



		Square Flush
		Plastic Bezel
Operator Only		*HW2P-1FQ0-②*
Full Voltage		HW2P-1FQD-②-③
Transformer	120V AC	HW2P-1FH2D-②
	240V AC	HW2P-1FM4D-②
	480V AC	HW2P-1FT8D-②
DC-DC Converter*	110V DC	HW2P-1D2D-②

* DC-DC converter voltage input from 90-140V DC.

② Lens/LED Color Code

Color	Code
Amber	A
Green	G
Red	R
Blue	S
White	W
Yellow	Y

③ LED Full Voltage Code

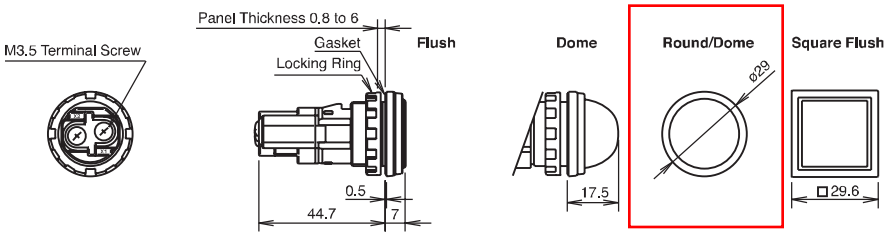
Voltage	Code
6VAC/DC	6V
12VAC/DC	12V
24VAC/DC	24V
120V AC	120V
240V AC	240V

1. In place of ②, specify the Lens/LED Color Code from table below.
2. In place of ③specify the Full Voltage Code from table below.
3. For nameplates and accessories, see page 680 and 683.
4. For dimensions, see page 685.
5. **Pilot lights do not come with anti-rotation ring.**
6. Operator models come with operator and lens.
7. **Yellow pilot light comes with white LED.**

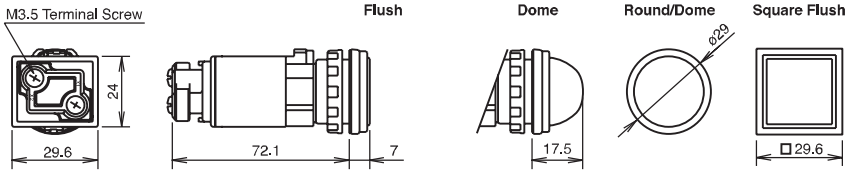
Pilot Lights

Dimensions (mm)

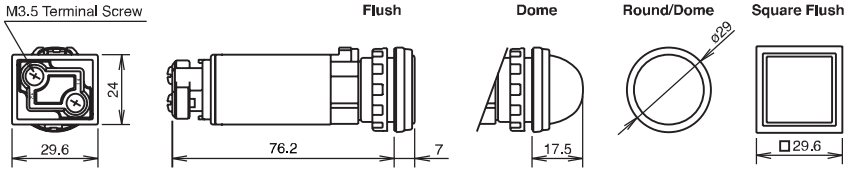
Full Voltage



Transformer

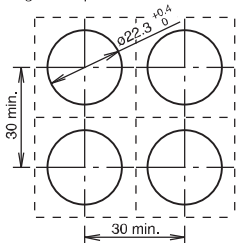


DC-DC Converter



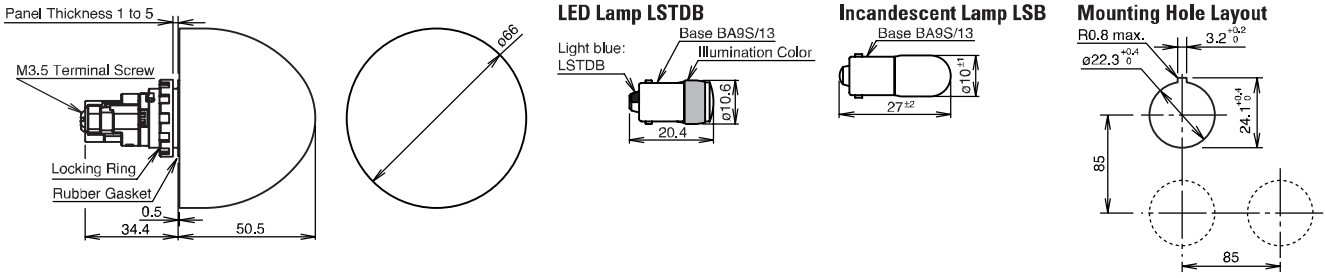
Mounting Hole Layout

Close mounting on 30mm centers
Degree of protection: IP65



When mounting transformer or DC-DC converter type units on 30mm centers vertically and horizontally, keep the ambient temperature below 40°C.

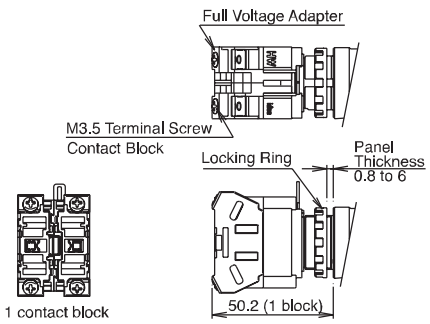
Jumbo Dome Pilot Lights



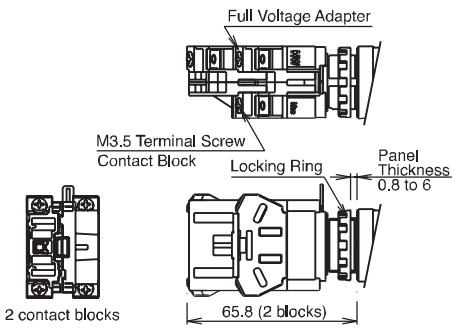
Illuminated Pushbuttons

Full Voltage Models

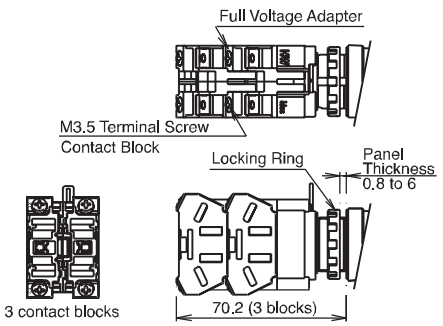
1 Contact Block



2 Contact Blocks



3 Contact Blocks



Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com

Product data sheet
Characteristics

60954
ground fault protector GFP - 2 poles - 40A - 120..240V - 300mA SIE

Product availability : Non-Stock - Not normally stocked in distribution facility

Price* : 467.00 USD



Main

Range	Multi 9
Product name	Multi 9 GFP
Product or component type	Residual current circuit breaker (RCCB)
Device short name	GFP
Poles description	2P
Neutral position	Left
[In] rated current	40 A 104 °F (40 °C)
Network type	AC
Earth-leakage sensitivity	300 mA
Earth-leakage protection time delay	Instantaneous
Earth-leakage protection class	Type AC-SIE
Rated conditional short-circuit current	10 kA
Utilisation category	AC-23A

Complementary

Network frequency	50/60 Hz
System Voltage	230/240 V AC 50 Hz 120/240 V AC 60 Hz
[Uimp] rated impulse withstand voltage	6 kV
Control type	Toggle
Local signalling	Fault indication
Mounting support	DIN rail
Connection pitch	0.71 in (18 mm) : Between phases
9 mm pitches	4
Height	3.19 in (81 mm)
Width	1.42 in (36 mm)

Disclaimer: This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications

Depth	2.95 in (75 mm)
Product weight	7.76 oz (220 g)
Colour	Grey
Mechanical durability	20000 cycles
Provision for padlocking	Padlockable
Locking options description	Padlocking in OFF position
Connections - terminals	Tunnel type terminals 0...0.05 in² (2.5...35 mm²) flexible Tunnel type terminals 0...0.05 in² (2.5...35 mm²) rigid
Tightening torque	30.97 lbf.in (3.5 N.m)

Environment

Standards	IEC 61008 UL 1053
IP degree of protection	IPxx B conforming to IEC 60529 IP20 conforming to IEC 60529 IP40 conforming to IEC 60529
Tropicalisation	2
Relative humidity	95 % (131 °F (55 °C))
Ambient air temperature for operation	-13...140 °F (-25...60 °C)
Ambient air temperature for storage	-40...158 °F (-40...70 °C)

Ordering and shipping details

Category	00908 - C60N SUPPLEMENTARY PROTECTORS
Discount Schedule	DE2
GTIN	00785901576624
Nbr. of units in pkg.	54
Package weight(Lbs)	0.46000000000000002
Returnability	N
Country of origin	ES

Offer Sustainability

Sustainable offer status	Green Premium product
RoHS (date code: YYWW)	Compliant - since 0844 - Schneider Electric declaration of conformity Schneider Electric declaration of conformity
REACh	Reference not containing SVHC above the threshold Reference not containing SVHC above the threshold
Product environmental profile	Available
Product end of life instructions	Need no specific recycling operations

Contractual warranty

Warranty period	18 months

Product data sheet
Characteristics

M9F42102
Multi 9 - C60BP - MCB - 1P - 2 A - C Curve - 277 V - 10 kA - UL 489

Green Premium

Product availability: Stock - Normally stocked in distribution facility

Price*: 125.00 USD

Main

Range of product	Multi 9
Range	Multi 9
Product name	Multi 9 C60
Product or component type	Miniature circuit-breaker
Device short name	C60BP
Device application	Distribution
Poles description	1P
Number of protected poles	1
[In] rated current	2 A at 77 °F (25 °C) conforming to EN/IEC 60947-2
Network type	DC AC
Trip unit technology	Thermal-magnetic
Curve code	C
Breaking capacity	Icu 3 kA at 415 V AC conforming to EN/IEC 60947-2 Icu 10 kA at 240 V AC conforming to EN/IEC 60947-2 Icu 20 kA at 60 V DC conforming to EN/IEC 60947-2 Icu 3 kA at 415 V AC conforming to GB 14048.2 Icu 10 kA at 240 V AC conforming to GB 14048.2 Icu 20 kA at 60 V DC conforming to GB 14048.2 AIR 10 kA at 277 V AC conforming to UL 489 AIR 14 kA at 240 V AC conforming to UL 489 AIR 14 kA at 120 V AC conforming to UL 489 AIR 10 kA at 60 V DC conforming to UL 489 AIR 10 kA at 277 V AC conforming to CSA C22.2 No 5 AIR 14 kA at 240 V AC conforming to CSA C22.2 No 5 AIR 14 kA at 120 V AC conforming to CSA C22.2 No 5 AIR 10 kA at 60 V DC conforming to CSA C22.2 No 5
Suitability for isolation	Yes conforming to EN/IEC 60947-2

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein.
This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications.
It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof.
Neither Schneider Electric Industries SAS nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. *Prices are indicative

Standards	UL 489 CSA C22.2 No 5 GB 14048.2 EN/IEC 60947-2
Product certifications	UL CSA CCC IEC

Complementary

System Voltage	240 V AC 50/60 Hz 415 V AC 50/60 Hz 60 V DC
Magnetic tripping limit	8.5 x In +/- 20% AC 12 x In +/- 20% DC
[Ics] rated service breaking capacity	2.25 kA 75 % x Icu at 415 V AC conforming to EN/IEC 60947-2 7.5 kA 75 % x Icu at 240 V AC conforming to EN/IEC 60947-2 2.25 kA 75 % x Icu at 415 V AC conforming to GB 14048.2 7.5 kA 75 % x Icu at 240 V AC conforming to GB 14048.2 15 kA 75 % x Icu at 60 V DC conforming to GB 14048.2 15 kA 75 % x Icu at 60 V DC conforming to EN/IEC 60947-2
[Ui] rated insulation voltage	500 V ACconforming to EN/IEC 60947-2
[Uimp] rated impulse withstand voltage	6 kV conforming to EN/IEC 60947-2
Contact position indicator	Yes
Control type	Toggle
Local signalling	ON/OFF indication
Mounting mode	Clip-on
Mounting support	DIN rail
Connection pitch	0.71 in (18 mm) Between devices
9 mm pitches	2
Height	4.06 in (103 mm)
Width	0.71 in (18 mm)
Depth	2.83 in (72 mm)
Colour	Grey
Mechanical durability	20000 cycles
Electrical durability	10000 cycles
Provision for padlocking	Padlockable
Connections - terminals	Tunnel type terminal, top or bottom flexible with ferrule wire(s) 0...0.02 in² (1...16 m-m²) max (AWG 18...AWG 8) Tunnel type terminal, top or bottom rigid wire(s) 0...0.04 in² (1...25 m-m²) max (AWG 18...AWG 8) Tunnel type terminal, top or bottom flexible wire(s) 0...0.02 in² (1...16 m-m²) max (AWG 18...AWG 8)
Wire stripping length	0.55 in (14 mm) (top or bottom)
Tightening torque	22.12 lbf.in (2.5 N.m) (top or bottom)
Earth-leakage protection	Without

Environment

IP degree of protection	IP40 modular enclosure conforming to IEC 60529 IP20 conforming to IEC 60529
Pollution degree	3 conforming to EN/IEC 60947-2
Tropicalisation	2 conforming to IEC 60068-1
Relative humidity	95 % (131 °F (55 °C))
Operating altitude	0...6561.68 ft (0...2000 m)
Ambient air temperature for operation	-22...158 °F (-30...70 °C)
Ambient air temperature for storage	-40...176 °F (-40...80 °C)

Ordering and shipping details

Category	00949 - M9 GEN 2 CB UL489
Discount Schedule	DE2
GTIN	00785901669746
Nbr. of units in pkg.	1
Package weight(Lbs)	0.27000000000000002
Returnability	Y
Country of origin	FR

Offer Sustainability

Sustainable offer status	Green Premium product
RoHS (date code: YYWW)	Compliant - since 1719 - Schneider Electric declaration of conformity Schneider-Electric declaration of conformity
REACh	Reference not containing SVHC above the threshold
Product environmental profile	Available
Product end of life instructions	Need no specific recycling operations

Product Life Status : Commercialised

Product data sheet
Characteristics

M9F42120
Multi 9 - C60BP - MCB - 1P - 20 A - C Curve - 277 V - 10 kA - UL 489



Main

Range	Multi 9
Product name	Multi 9 C60
Product or component type	Miniature circuit-breaker
Device short name	C60BP
Device application	Distribution
Poles description	1P
Number of protected poles	1
[In] rated current	20 A at 25 °C conforming to EN/IEC 60947-2
Network type	AC DC
Trip unit technology	Thermal-magnetic
Curve code	C
Breaking capacity	Icu 3 kA at 415 V AC conforming to EN/IEC 60947-2 Icu 10 kA at 240 V AC conforming to EN/IEC 60947-2 Icu 20 kA at 60 V DC conforming to EN/IEC 60947-2 Icu 3 kA at 415 V AC conforming to GB 14048.2 Icu 10 kA at 240 V AC conforming to GB 14048.2 Icu 20 kA at 60 V DC conforming to GB 14048.2 AIR 10 kA at 277 V AC conforming to UL 489 AIR 14 kA at 240 V AC conforming to UL 489 AIR 14 kA at 120 V AC conforming to UL 489 AIR 10 kA at 60 V DC conforming to UL 489 AIR 10 kA at 277 V AC conforming to CSA C22.2 No 5 AIR 14 kA at 240 V AC conforming to CSA C22.2 No 5 AIR 14 kA at 120 V AC conforming to CSA C22.2 No 5 AIR 10 kA at 60 V DC conforming to CSA C22.2 No 5
Suitability for isolation	Yes conforming to EN/IEC 60947-2
Standards	UL 489 CSA C22.2 No 5 GB 14048.2 EN/IEC 60947-2
Product certifications	UL CSA

Disclaimer: This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications

	CCC IEC

Complementary

[Ue] rated operational voltage	240 V AC 50/60 Hz 415 V AC 50/60 Hz 60 V DC
Magnetic tripping limit	8.5 x In +/- 20% AC 12 x In +/- 20% DC
[Ics] rated service breaking capacity	2.25 kA 75 % x Icu at 415 V AC conforming to EN/IEC 60947-2 7.5 kA 75 % x Icu at 240 V AC conforming to EN/IEC 60947-2 2.25 kA 75 % x Icu at 415 V AC conforming to GB 14048.2 7.5 kA 75 % x Icu at 240 V AC conforming to GB 14048.2 15 kA 75 % x Icu at 60 V DC conforming to GB 14048.2 15 kA 75 % x Icu at 60 V DC conforming to EN/IEC 60947-2
[Ui] rated insulation voltage	500 V AC conforming to EN/IEC 60947-2
[Uimp] rated impulse withstand voltage	6 kV conforming to EN/IEC 60947-2
Contact position indicator	Yes
Control type	Toggle
Local signalling	ON/OFF indication
Mounting mode	Clip-on
Mounting support	DIN rail
9 mm pitches	2
Height	103 mm
Width	18 mm
Depth	72 mm
Colour	Grey
Mechanical durability	20000 cycles
Electrical durability	10000 cycles
Provision for padlocking	Padlockable
Connections - terminals	Tunnel type terminal, top or bottom flexible with ferrule wire(s) 1...16 mm² max (AWG 18...AWG 8) Tunnel type terminal, top or bottom rigid wire(s) 1...25 mm² max (AWG 18...AWG 8) Tunnel type terminal, top or bottom flexible wire(s) 1...16 mm² max (AWG 18...AWG 8)
Wire stripping length	14 mm (top or bottom)
Tightening torque	2.5 N.m (top or bottom)
Earth-leakage protection	Without

Environment

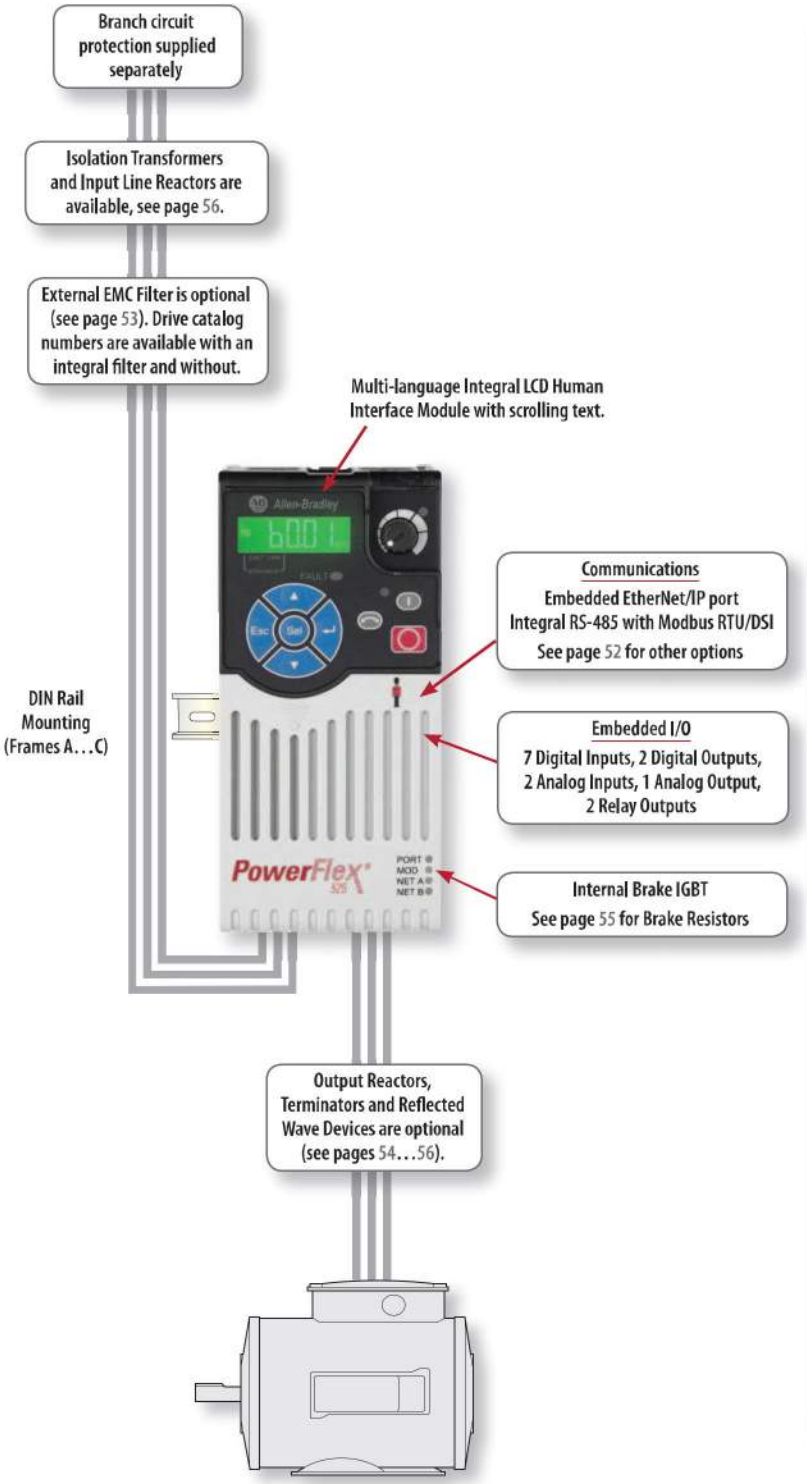
IP degree of protection	IP40 for modular enclosure conforming to IEC 60529 IP20 conforming to IEC 60529
Pollution degree	3 conforming to EN/IEC 60947-2
Tropicalisation	2 conforming to IEC 60068-1
Relative humidity	95 % (55 °C)
Operating altitude	0...2000 m
Ambient air temperature for operation	-30...70 °C
Ambient air temperature for storage	-40...80 °C

Offer Sustainability

Sustainable offer status	Green Premium product
RoHS (date code: YYWW)	Compliant - since 1719 - Schneider Electric declaration of conformity Schneider Electric declaration of conformity
REACh	Reference not containing SVHC above the threshold Reference not containing SVHC above the threshold
Product environmental profile	Available
Product end of life instructions	Need no specific recycling operations

PowerFlex 525 AC Drive

PowerFlex 525 AC drives feature an innovative, modular design offering fast and easy installation and configuration. These cost-effective compact drives come with embedded EtherNet/IP™ communications, safety, USB configuration and a high ambient operating temperature capability. PowerFlex 525 AC drives also provide a variety of motor control algorithms including volts per hertz, sensorless vector control and closed loop velocity vector control, making these drives ideal for a vast array of applications.



PowerFlex 525 AC Drive at a glance

Ratings	
100...120V:	0.4...1.1 kW / 0.5...1.5 Hp / 2.5...6 A
200...240V:	0.4...15 kW / 0.5...20 Hp / 2.5...62.1 A
380...480V:	0.4...22 kW / 0.5...30 Hp / 1.4...43 A
525...600V::	0.4...22 kW / 0.5...30 Hp / 0.9...32 A
Motor Control	• V/Hz Control • Sensorless Vector Control • Closed Loop Velocity Vector Control • Permanent Magnet Motor Control ♣
Enclosures	• IP20, NEMA/UL Type Open • IP30, NEMA/UL Type 1 (with optional kit)
Safety	Safe Torque-Off PLd/SIL2 Cat 3 (meets ISO 13849-1)
Additional Features	• Modular design eases installation • Operating temperatures from -20 °C (-4 °F) up to 50 °C (122 °F). Up to 70 °C (158 °F) with current derating and optional control module fan kit. • Embedded EtherNet/IP port • Option for dual port EtherNet/IP adapter which supports DLR functionality. DeviceNet and PROFIBUS DP adapters also available. • Embedded Safe Torque-Off PLd/SIL2 Cat 3 • LCD HIM with multi-language support • MainsFree™ Programming via USB • Configure using Connected Components Workbench Software • Add-on Profiles for Studio 5000™ Logix Designer Software • Automatic Device Configuration • Economizer motor control for energy savings • Application specific parameter groups • Simple positioning control with optional encoder card • Conformal coating to IEC 60721 3C2 standards
Certifications	• ACS 156 • ATEX • C-Tick • c-UL, UL • CE • EPRI/SEMI F47 • GOST-R • KCC • Lloyd's Register • RoHS • TÜV FS ISO/EN13849-1 (EN954-1)
Options	See pages 52... 56

♣ Permanent magnet motor control is scheduled for a future firmware release.

Additional Information

PowerFlex 520-Series Technical Data, publication 520-TD001
PowerFlex 520-Series User Manual, publication 520-UM001

Catalog Number Explanation

25B –	D	6P0	N	1	1	4
	Voltage Rating	Rating	Enclosure		Internal EMC Filter 0 = No 1 = Yes	

Product Selection

100…120V AC, Single-Phase Input, Three-Phase Output Drives, 50/60 Hz

Drive Ratings						No Filter	with Integral EMC Filter
Normal Duty		Heavy Duty		Output Current			
kW	Hp	kW	Hp	A	Frame Size	Cat. No.	Cat. No.
0.4	0.5	0.4	0.5	2.5	A	25B-V2P5N104	–
0.75	1	0.75	1	4.8	B	25B-V4P8N104	–
1.1	1.5	1.1	1.5	6	B	25B-V6P0N104	–

200…240V AC, Single-Phase Input, Three-Phase Output Drives, 50/60 Hz

Drive Ratings						No Filter	with Integral EMC Filter ‡
Normal Duty		Heavy Duty		Output Current			
kW	Hp	kW	Hp	A	Frame Size	Cat. No.	Cat. No.
0.4	0.5	0.4	0.5	2.5	A	25B-A2P5N104	25B-A2P5N114
0.75	1	0.75	1	4.8	A	25B-A4P8N104	25B-A4P8N114
1.5	2	1.5	2	8	B	25B-A8P0N104	25B-A8P0N114
2.2	3	2.2	3	11	B	25B-A011N104	25B-A011N114

‡ This filter is suitable for use with cable lengths up to 10 meters (32.8 feet) for C2 spec and 20 meters (65.6 feet) for C3 spec.

200…240V AC, Three-Phase, 50/60 Hz

Drive Ratings						No Filter	with Integral EMC Filter
Normal Duty		Heavy Duty		Output Current			
kW	Hp	kW	Hp	A	Frame Size	Cat. No.	Cat. No.
0.4	0.5	0.4	0.5	2.5	A	25B-B2P5N104	–
0.75	1	0.75	1	5	A	25B-B5P0N104	–
1.5	2	1.5	2	8	A	25B-B8P0N104	–
2.2	3	2.2	3	11	A	25B-B011N104	–
4	5	4	5	17.5	B	25B-B017N104	–
5.5	7.5	5.5	7.5	24	C	25B-B024N104	–
7.5	10	7.5	10	32.2	D	25B-B032N104	–
11	15	11	15	48.3	E	25B-B048N104	–
15	20	11	15	62.1	E	25B-B062N104	–

Small Adjustable Thermostats



011409-00, 011469-00, 011420-00, and 011570-00



011419-00, 011479-00 and 011580-00

Applications

Normally Closed (N.C.)

Normally Closed adjustable thermostats have a red adjustment dial and contacts that open when the air temperature rises above the setpoint. Uses may include regulating heaters or switching signal devices when temperature falls below the setpoint value.

Normally Open (N.O.)

Normally Open adjustable thermostats have a blue adjustment dial and contacts that close when the air temperature rises above the setpoint. Uses may include regulating cooling devices (heat exchangers, filter fans vortex coolers, etc), or switching signal devices when temperature rises above the setpoint value.

Features

- Compact design
- Wide adjustment range
- Color coded temperature dials
- DIN rail mounting

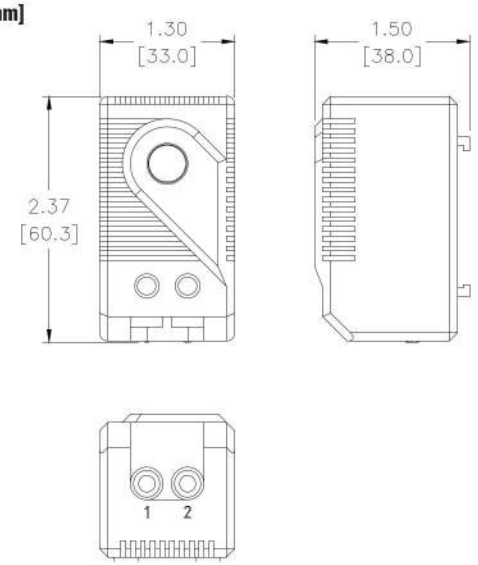
Small Adjustable Thermostats	
Switching Difference	12.6°F [7K]
Switching Tolerance	±7°F [±4K]
Sensor Element	Thermostatic bimetal
Contact Type	Snap-action contact
Contact Resistance	<10 mΩ
Service Life	>100,000 cycles
Max. Switching Capacity	15A resistive / 2A inductive @ 120VAC 10A resistive / 2A inductive @ 250VAC DC 30W (24-72 VDC)
Max. Inrush Current	AC 16A for 10 sec.
Minimum Load	20 mA (all voltages)
Connection	2-pole terminal, 0.5 Nm max. clamping torque 14 AWG [2.5 mm^2] max. solid wire 16 AWG [1.5 mm^2] max. stranded wire with wire end ferrule
Housing	Plastic, UL 94V-0, light gray
Mounting	Clip for 35mm DIN rail, EN 60715
Mounting Position	Vertical
Operating / StorageTemperature	-49 to 176°F [-45 to 80°C]
Weight	0.09 lb [40 g]
Protection Type	IP20
Approvals	CE, CSA, VDE, EAC, UL Recognized File No. E164102, RoHS 2 compliant

Small Adjustable Thermostats			
Part Number	***Price***	***Contact***	***Setting Range***
011409-00	$15.50	N.C.	32 to 140°F
011469-00	$15.50		0 to 60°C
011420-00	$15.50		-10 to 50°C
011570-00	$15.50		-15 to 45°C
011419-00	$15.50		32 to 140°F
011479-00	$15.50	N.O.	0 to 60°C
011580-00	$15.50		20 to 80°C

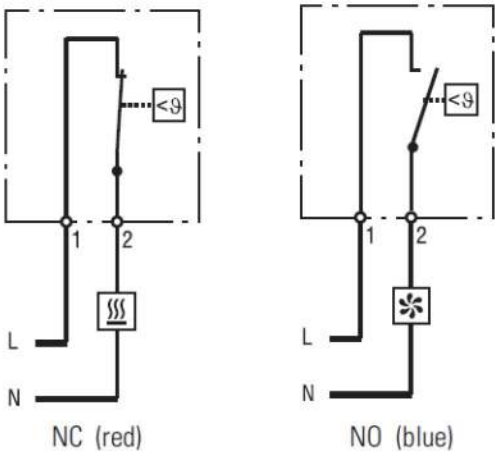
Small Adjustable Thermostats

Dimensions

Inches [mm]



Wiring Diagrams



Please see our website www.AutomationDirect.com for complete engineering drawings.

Product data sheet
Characteristics

RXM2AB2BD
Miniature Plug-in relay - Zelio RXM 2 C/O 24 V DC 12 A with LED

Product availability : Stock - Normally stocked in distribution facility

Price* : 7.56 USD



Main

Range of product	Zelio Relay
Series name	Miniature
Product or component type	Plug-in relay
Device short name	RXM
Contacts type and composition	2 C/O
[Uc] control circuit voltage	24 V DC
[Ithe] conventional enclosed thermal current	12 A at -40...131 °F (-40...55 °C)
Status LED	With
Control type	Lockable test button
Utilisation coefficient	20 %

Complementary

Shape of pin	Flat
[Ui] rated insulation voltage	250 V conforming to IEC 300 V conforming to UL 300 V conforming to CSA
[Uimp] rated impulse withstand voltage	4 kV 1.2/50 µs
Contacts material	AgNi
[Ie] rated operational current	12 A at 28 V DC (NO) conforming to IEC 12 A at 250 V AC (NO) conforming to IEC 6 A at 28 V DC (NC) conforming to IEC 6 A at 250 V AC (NC) conforming to IEC 12 A at 28 V DC conforming to UL 12 A at 277 V AC conforming to UL
Maximum switching voltage	250 V conforming to IEC
Resistive rated load	12 A at 250 V AC 12 A at 28 V DC

Disclaimer: This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications

Maximum switching capacity	3000 VA/336 W
Minimum switching capacity	170 mW at 10 mA, 17 V
Operating rate	<= 18000 cycles/hour no-load <= 1200 cycles/hour under load
Mechanical durability	10000000 cycles
Electrical durability	100000 cycles resistive load
Average coil consumption in W	0.9 W
Drop-out voltage threshold	>= 0.1 Uc
Operate time	20 ms
Release time	20 ms
Average coil resistance	650 Ohm at 20 °C +/- 10 %
Rated operational voltage limits	19.2...26.4 V DC
Safety reliability data	B10d = 100000
Protection category	RT I
Operating position	Any position
Product weight	0.21 lb(US) (0.096 kg)
Device presentation	Complete product

Environment

Dielectric strength	1300 V AC between contacts with micro disconnection insulation 2000 V AC between coil and contact with reinforced insulation 2000 V AC between poles with basic insulation
Product certifications	CE CSA GOST RoHS UL REACH Lloyd's
Standards	EN/IEC 61810-1 UL 508 CSA C22.2 No 14
Ambient air temperature for storage	-40...185 °F (-40...85 °C)
Ambient air temperature for operation	-40...131 °F (-40...55 °C)
Vibration resistance	3 gn (f = 10...150 Hz), amplitude +/- 1 mm (on 5 cycles in operation) 5 gn (f = 10...150 Hz), amplitude +/- 1 mm (on 5 cycles not operating)
IP degree of protection	IP40 conforming to EN/IEC 60529
Shock resistance	10 gn in operation 30 gn not operating
Pollution degree	3

Ordering and shipping details

Category	21127 - ZELIO ICE CUBE RELAYS
Discount Schedule	CP2
GTIN	00785901582250
Nbr. of units in pkg.	10
Package weight(Lbs)	8.0000000000000002E-2
Returnability	Y
Country of origin	CN

Offer Sustainability

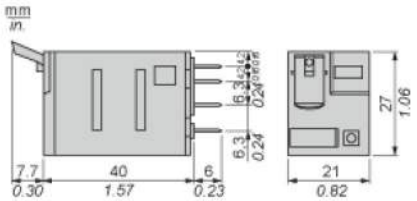
Sustainable offer status	Green Premium product
RoHS (date code: YYWW)	Compliant - since 0801 - Schneider Electric declaration of conformity Schneider Electric declaration of conformity
REACh	Reference not containing SVHC above the threshold

	Reference not containing SVHC above the threshold
Product environmental profile	Available
Product end of life instructions	Need no specific recycling operations
California proposition 65	WARNING: This product can expose you to chemicals including:
- - - - - - - Substance 1	Nickel compounds, which is known to the State of California to cause cancer, and
- - - - - - - Substance 2	Di-isodecyl phthalate (DIDP), which is known to the State of California to cause birth defects or other reproductive harm.
- - - - - - - More information	For more information go to www.p65warnings.ca.gov

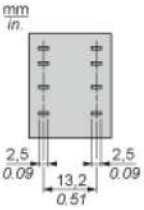
Contractual warranty

Warranty period	18 months

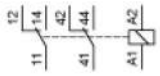
Dimensions

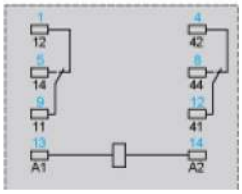


Pin Side View



Wiring Diagram



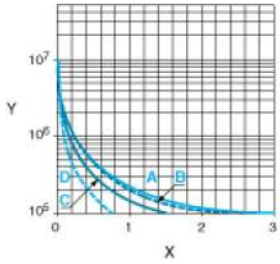


Symbols shown in blue correspond to Nema marking.

Electrical Durability of Contacts

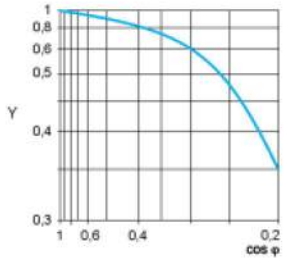
Durability (inductive load) = durability (resistive load) x reduction coefficient.

Resistive AC load



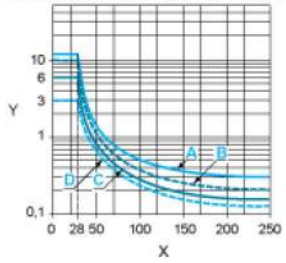
X Switching capacity (kVA)
Y Durability (Number of operating cycles)
A RXM2AB•••
B RXM3AB•••
C RXM4AB•••
D RXM4GB•••

Reduction coefficient for inductive AC load (depending on power factor cos ϕ)



Y Reduction coefficient (A)

Maximum switching capacity on resistive DC load



X Voltage DC
Y Current DC
A RXM2AB•••
B RXM3AB•••
C RXM4AB•••
D RXM4GB•••

Note : These are typical curves, actual durability depends on load, environment, duty cycle, etc.

Product data sheet
Characteristics

RXZE2S108M
socket RXZ - separate contact - 12 A - < 250 V - connector - for relay RXM2..

Product availability: Stock - Normally stocked in distribution facility

Price*: 6.10 USD

Main

Range of product	Zelio Relay
Product or component type	Socket
Contact terminal arrangement	Separate
Product compatibility	Plug-in relay RXM (2 C/O) Plug-in relay REXL (2 C/O)
Shape of pin	Flat
Device short name	RXZ
Sale per indivisible quantity	10

Complementary

[Ith] conventional free air thermal current	5 A , with bus jumper 12 A
System Voltage	< 250 V
Tightening torque	< 1 N.m (M3 screw(s))
Fixing mode	By screw panel Clip-on 35 mm symmetrical DIN rail
Marking	CE
Width	1.06 in (27 mm)
Product weight	0.13 lb(US) (0.058 kg)
Group of product	RXM_2_C/O_CON_SEP_FLAT
Compatibility code	RXZ

Environment

Connections - terminals	Connector, solid cable without cable end 2 x 0.5...2 x 1.5 mm² / AWG 20...AWG 16 Connector, flexible cable with cable end 1 x 0.25...1 x 2.5 mm² / AWG 22...AWG 17 Connector, flexible cable with cable end 1 x 0.5...1 x 2.5 mm² / AWG 22...AWG 14 Connector, solid cable without cable end 2 x 0.25...2 x 1 mm² / AWG 20...AWG 14
Standards	IEC 61984
Product certifications	CSA UL Lloyd's
Ambient air temperature for storage	-40...185 °F (-40...85 °C)
Ambient air temperature for operation	-40...131 °F (-40...55 °C)

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein.
This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications.
It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof.
Neither Schneider Electric Industries SAS nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. *Prices are indicative

IP degree of protection	IP20 conforming to EN/IEC 60529
Dielectric strength	2500 V

Ordering and shipping details

Category	21128 - ZELIO ICE CUBE RELAY ACCESSORIES
Discount Schedule	CP2
GTIN	00785901437871
Nbr. of units in pkg.	10
Package weight(Lbs)	0.10000000000000001
Returnability	Y
Country of origin	CN

Offer Sustainability

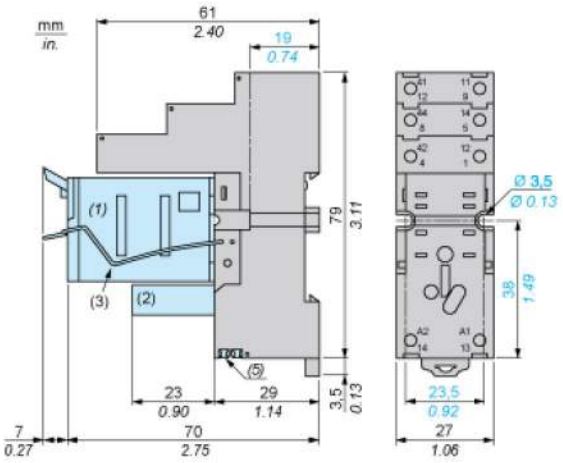
California proposition 65	WARNING: This product can expose you to chemicals including:
- - - - - - - Substance 1	Nickel compounds, which is known to the State of California to cause cancer, and
- - - - - - - Substance 2	Di-isodecyl phthalate (DIDP), which is known to the State of California to cause-birth defects or other reproductive harm.
- - - - - - - More information	For more information go to www.p65warnings.ca.gov

Contractual warranty

Warranty period	18 months

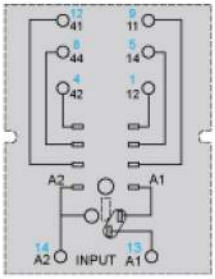
RXZE2S108M

Dimensions



(1) Relays
(2) Protection module
(3) Maintaining clamp
(4) 2 elongated holes Ø 3.5 mm x 6.5 mm / Ø 0.13 in. x 0.25 in.
(5) 2 bus jumpers

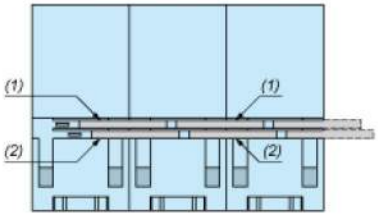
Wiring Diagram



Symbols shown in blue correspond to Nema marking.

Bus Jumpers Mounting on Sockets with Separate Contacts

Example of RXZS2 bus jumper mounting on sockets (view from below)



(1) 2 bus jumpers (polarity A2)
(2) 2 bus jumpers (polarity A1)

Product Life Status :	Commercialised

schaffner
shaping electrical power

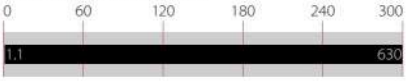
LC Sine Wave Filter for Motor Drives



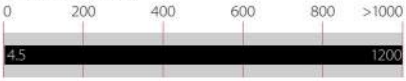
- Smooth sine wave without voltage peaks
- Perfect motor protection
- Reduce bearing currents
- Motor frequency up to 200 Hz
- Extended motor cable length capability

Performance indicators

Typical motor power [kW]



Rated current [A]



Approvals

UL 61800-5-1 up to 750 A for FN 5040, 480 A for FN 5045. For use with AC or DC drives (power conversion equipment) only

Features and benefits

- Converts the rectangular PWM output voltage of motor drives into a smooth sine wave with low residual ripple
- Elimination of premature motor damage caused by high dv/dt, overvoltages, cable ringing, motor overheating, and eddy current losses
- Improves bearing life time because of bearing currents caused by circulating currents
- Complies with IEC 60034-17* and NEMA-MG1 requirements for general purpose motors
- Optional with NEMA 1 protective cover

Technical specifications

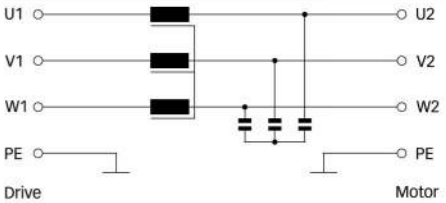
Nominal operating voltage	3x480 VAC
Rated operating voltage	3x525 VAC
Motor frequency	0...70 Hz (up to 200Hz with derating (see graph))
Switching frequency	See filter selection table
Rated currents	4.5 to 1200 A @ 45°C
Motor cable length	Up to 2,000 m (see graph)
Impedance (uk)	8 to 10% @ 400 V, 50 Hz and rated current
Residual ripple voltage	<5%
High potential test voltage	P –> E 3000 VAC, 1 minute P –> P 2500 VAC, 1 minute
Protection category	IP 00 (FN 5040) IP 20 (FN 5045)
Overload capability	1.5x rated current for 1 minute, once per hour
Ambient temperature range	-25°C to +45°C fully operation +45°C to 70°C derated operation* -25°C to +85°C transport and storage
Insulation class	EIS 200
Flammability corresponding to	UL 94 V-2
Design corresponding to	Chokes: EN 61558-2-20 or EN 60076-6 Filter: UL 61800-5-1, EN 61800-5-1
MTBF	>100,000 hours

* $I_{derated} = I_{nominal}*\sqrt{((T_{max}-T_{amb})/(T_{max}-T_{nominal}))} = I_{nom}*\sqrt{((70°C-T_{amb})/25°C)}$

Typical applications

- HVAC applications
- Pumps
- Ventilators
- Conveyors
- Compressors
- Elevators
- Cranes
- Medium voltage applications, deployed in front of the step-up transformer
- Retrofit installations with motor drives
- Motor drive with long motor cable
- Motor drive with multiple motors in parallel

Typical electrical schematic

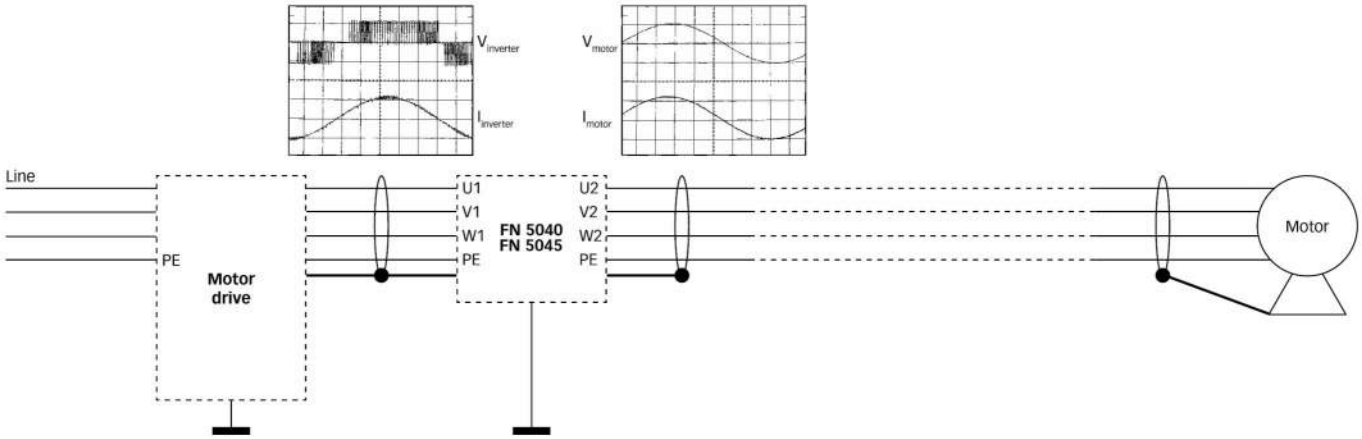


Filter selection table

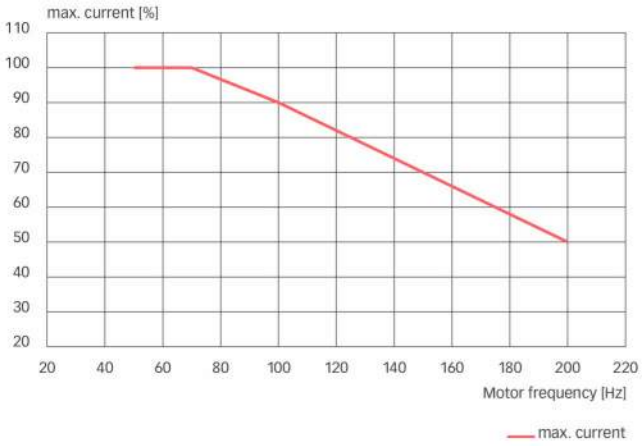
Filter	Rated current @ 45°C/ 50Hz	Rated current @ 45°C/ 100Hz	Typical motor drive power rating @ 400 V*	Typical motor drive power rating @ 480 V**	Nominal inductance	Nominal inductance	Capacitance connection	Min. switching frequency	Typical power loss***	Input/Output connections		Weight
	[A]	[A]	[kW]	[kW]	[mH]	[µF]		[kHz]	[W]			[kg]
FN 5040-4.5-82	4.5	4.05	1.1/1.5	1.3/1.8	13	2.2	Y	4	65	-82		3.3
FN 5040-8-82	8	7.2	2.2/3	2.64/3.6	6.9	4.7	Y	4	80	-82		4.6
FN 5040-10-83	10	9	4	4.8	5.2	6.8	Y	4	90	-83		6.1
FN 5040-17-83	17	15.3	5.5/7.5	6.6/9.0	3.1	10	Y	4	115	-83		7.8
FN 5040-24-84	24	21.6	11	13.2	2.4	10	Y	4	150	-84		14.4
FN 5040-38-84	38	34.2	15/18.5	18/22.2	1.6	10	Y	4	170	-84		25.0
FN 5040-48-85	48	43.2	22	26.4	1.1	14.7	Y	4	260	-85		33.0
FN 5040-62-86	62	55.8	30	36	0.85	30	Y	3	280	-86		36.0
FN 5040-75-87	75	67.5	37	44.4	0.75	30	Y	3	330	-87		42.0
FN 5040-115-87	115	103.5	45/55	52.8/66	0.5	20	Δ	3	500	-87		68.0
FN 5040-180-99	180	162	75/90	90/108	0.3	33	Δ	3	680		-99	86.0
FN 5040-260-99	260	234	110/132	132/158.4	0.2	47	Δ	3	880		-99	125.0
FN 5040-410-99	410	369	160/200	192/240	0.13	66	Δ	3	1100		-99	184.0
FN 5040-480-99	480	432	250	300	0.11	94	Δ	3	1350		-99	235.0
FN 5040-660-99	660	594	315/355	378/426	0.14	141	Δ	2	2000		-99	310.0
FN 5040-750-99	750	675	400	480	0.12	165	Δ	2	2800		-99	470.0
FN 5040-880-99	880	792	400/500	480/600	0.11	188	Δ	2	3400		-99	640.0
FN 5040-1200-99	1200	1080	560/630	672/756	0.075	282	Δ	2	3800		-99	680.0
FN 5045-4.5-44	4.5	4.05	1.1/1.5	1.3/1.8	13	2.2	Y	4	65	-44		4.1
FN 5045-8-44	8	7.2	2.2/3	2.64/3.6	6.9	4.7	Y	4	80	-44		5.4
FN 5045-10-44	10	9	4	4.8	5.2	6.8	Y	4	90	-44		6.9
FN 5045-17-33	17	15.3	5.5/7.5	6.6/9.0	3.1	10	Y	4	115	-33		9.0
FN 5045-24-33	24	21.6	11	13.2	2.4	10	Y	4	150	-33		15.6
FN 5045-38-33	38	34.2	15/18.5	18/22.2	1.6	10	Y	4	170	-33		18.9
FN 5045-48-34	48	43.2	22	26.4	1.1	14.7	Y	4	260	-34		35.8
FN 5045-62-34	62	55.8	30	36	0.85	30	Y	3	280	-34		37.8
FN 5045-75-35	75	67.5	37	44.4	0.75	30	Y	3	330	-35		60.0
FN 5045-115-35	115	103.5	45/55	52.8/66	0.5	20	Δ	3	500	-35		70.0
FN 5045-180-99	180	162	75/90	90/108	0.3	33	Δ	3	680		-99	92.0
FN 5045-260-99	260	234	110/132	132/158.4	0.2	47	Δ	3	880		-99	131.0
FN 5045-410-99	410	369	160/200	192/240	0.13	66	Δ	3	1100		-99	198.0
FN 5045-480-99	480	432	250	300	0.11	94	Δ	3	1350		-99	243.0
FN 5045-660-99	660	594	315/355	378/426	0.14	141	Δ	2	2000		-99	425.0
FN 5045-750-99	750	675	400	480	0.12	165	Δ	2	2800		-99	482.0
FN 5045-880-99	880	792	400/500	480/600	0.11	188	Δ	2	3400		-99	652.0
FN 5045-1200-99	1200	1080	560/630	672/756	0.075	282	Δ	2	3800		-99	692.0

* General purpose four-pole (1500 r/min) AC induction motor rated 400 V/50 Hz.
** General purpose four-pole (1500 r/min) AC induction motor rated 480 V/50 Hz.
*** Exact value depends on the motor cable length and type, switching frequency and further stray parameters of the system.

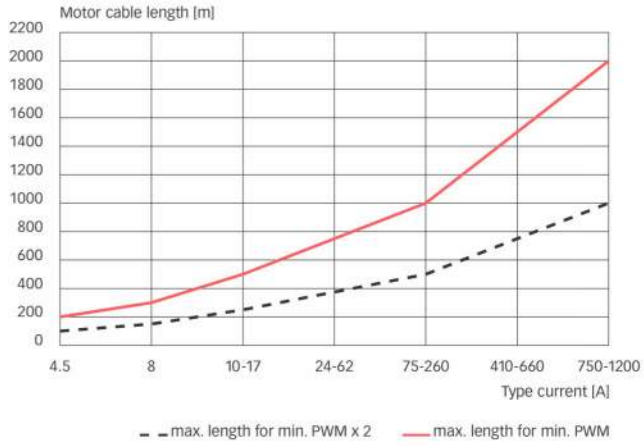
Typical block schematic



Motor frequency derating

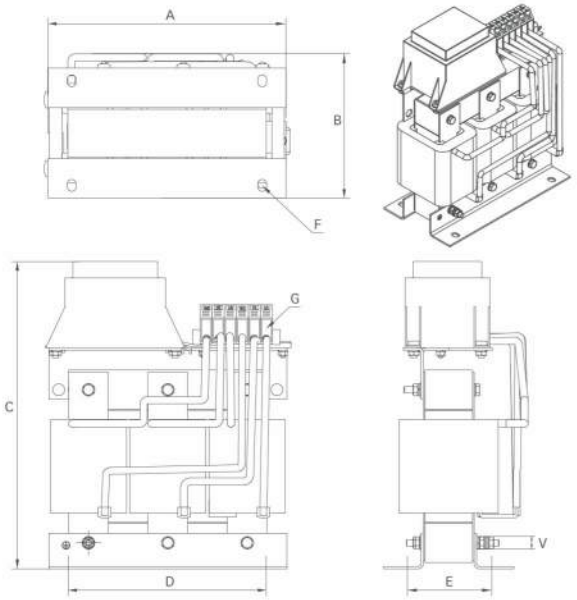


Max. motor cable length

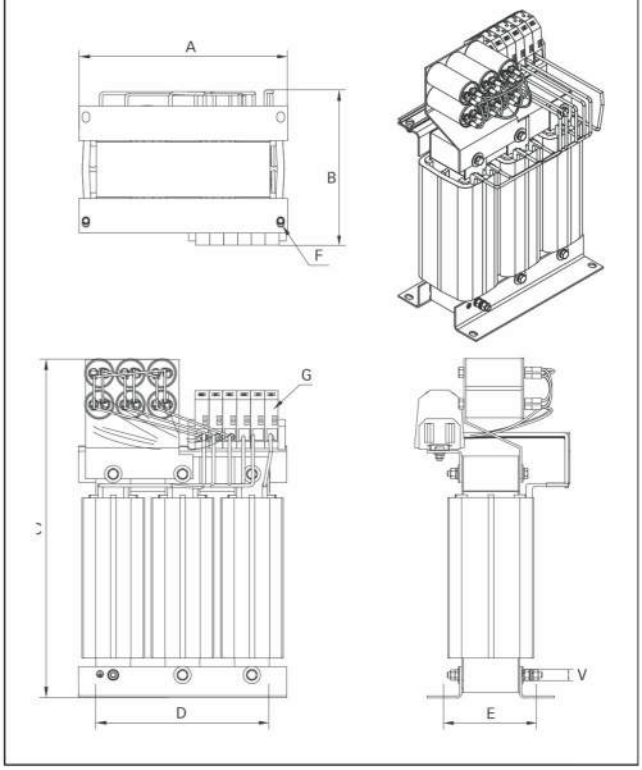


Mechanical data FN 5040

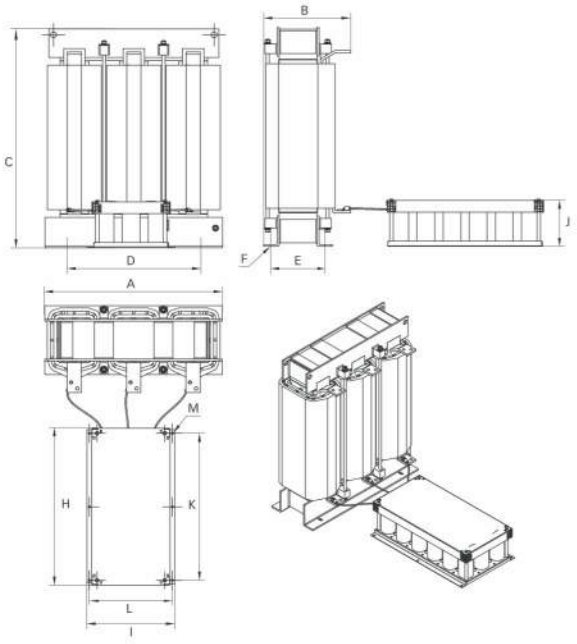
4.5 to 75 A types



115 A types



180 to 1200 A types*



Cable length of capacitor box:
180 to 410 A = 1000 mm
480 A to 1200 A = 1500 mm

Dimensions FN 5040

	4.5 A	8 A	10 A	17 A	24 A	38 A	48 A	62 A	75 A	115 A
A	125	155	155	190	190	230	300	320	305	305
B	77	84	94	115	116	151	171	190	240	236
C	171	212	208	224	224	275	355	395	395	495
D	100	130	123	170	170	180	240	240	240	280
E	55	56	71.5	57.5	77.5	122	137	132	162	151
F	5x8	8x12	8x12	8x12	8x12	8x12	11x15	11x15	11x15	11x15
G	2.5 mm^2	2.5 mm^2	4 mm^2	4 mm^2	10 mm^2	10 mm^2	16 mm^2	35 mm^2	50 mm^2	50 mm^2
V	M3	M4	M4	M6	M6	M8	M8	M8	M8	M8

	180 A	260 A	410 A	480 A	660 A	750 A	880 A	1200 A
A	450	453	490	510	645	665	660	750
B	260	255	355	355	410	468	450	375
C	385	485	600	618	732	670	885	925
D	400	370	430	430	570	570	570	570
E	130	150	194	195	210	220	220	220
F	9x13	11x15	10.5x18.5	13x27	13x27	13x26	13x26	13x26
H	328	328	328	328	463	555	463	665
I	170	170	170	270	370	375	370	375
J	200	220	240	220	220	200	220	220
K	300 (150)	300 (150)	300 (150)	300 (150)	400 (200)	510 (255)		620 (310)
L	150	150	150	250	350	350	350	350
M	9	9	9	9	9	9	9	9
V	M10	M10	M10	M10	M10	M10	M10	M10
W	25	25	40	40	40	40	50	60
X	13/15	13/15	13/16	13/20	20	20	14	17
Y	21	20	25	23	40	40	22	26
Z	10.3	10.3	10.3	10.3	14	14	14	14

All dimensions in mm; 1 inch = 25.4 mm
Tolerances according: ISO 2768-m / EN 22768-m

SECTION 9.4

PIPING AND INSTRUMENTATION DIAGRAM

9.4 Piping and Instrumentation Diagram

1MG K.E. WHITE WATER TOWER
ELIZABETH CITY, NC

MONOCLOR® RCS
CHLORAMINE MANAGEMENT SYSTEM
HYPOCHLORITE & LAS DOSING WITH WQS & PWM250 MIXER

PIPING & INSTRUMENTATION DIAGRAM

REV. △	DATE	BY	DESCRIPTION	REV. △	DATE	BY	DESCRIPTION
A	04/12/25	WE	CREATED				

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PSI Water Technologies
A UGSI SOLUTIONS COMPANY

DRAWN BY: W. ENGDAHL	DATE: 04/12/2025
CHECKED BY:	DATE:
SCALE: N/A	SIZE: D

PROJECT:
1MG K.E. WHITE WATER TOWER
ELIZABETH CITY, NC

SUBJECT:
MONOCLOR RCS
HYPOCHLORITE & LAS DOSING WITH WQS & PWM250 MIXER
PIPING & INSTRUMENTATION DIAGRAM

DWG #: 425004-MN003-PI | SHEET 1 OF 7 | REV. A

LINE TYPES

- ELECTRICAL (AC, SINGLE PHASE)
- ELECTRICAL (AC, THREE PHASE)
- ELECTRICAL (DC)
- FUTURE
- LIMITS
- LIQUID & GAS FLOW
- NETWORK
- SIGNAL WIRING

TAGS

- [CHEMICAL] [INLET/OUTLET] — LINE CONTINUATION TAG (EXTERNAL)
- [X] [#] — LINE CONTINUATION TAG (INTERNAL)
- [#]" [MATERIAL] — LINE IDENTIFICATION TAG
- [XXX] [###] — LOCAL INSTRUMENTATION TAG
- [DESC.] [A/D][I/O] [###] [XXX] — PLC INSTRUMENTATION TAG
- [OBJECT] POWER [###] VAC, [#]ϕ, [##]A SERVICE [(OPTION [#])] — POWER SOURCE TAG
- VFD-[###] [#] HP — VFD TAG

ISA INSTRUMENT LETTER ID

LETTER	PROCESS VARIABLE	MODIFIER	READOUT/OUTPUT FUNCTION	MODIFIER
A	ANALYZER		ALARM	
B	BURNER		USER'S CHOICE	USER'S CHOICE
C	USER'S CHOICE	CONTROL	CONTROL	CLOSE
D	USER'S CHOICE	DIFFERENTIAL		
E	VOLTAGE		PRIMARY ELEMENT	
F	FLOW	RATIO		
G	USER'S CHOICE		GLASS	
H	HAND			HIGH
I	CURRENT		INDICATE	
J	POWER	SCAN		
K	TIME		CONTROL SITUATION	
L	LEVEL		LIGHT	LOW
M	USER'S CHOICE	MOMENTARY		INTERMEDIATE
N	USER'S CHOICE		USER'S CHOICE	USER'S CHOICE
O	USER'S CHOICE		ORIFICE	OPEN
P	PRESSURE		POINT (TEST CONNECTION)	
Q	QUANTITY	INTEGRATE, TOTALIZE		
R	RADIATION	RELIEF	RECORD	
S	SPEED	SAFETY	SWITCH	
T	TEMPERATURE		TRANSMIT	
U	MULTI-VARIABLE		MULTI-FUNCTION	MULTI-FUNCTION
V	VIBRATION		VALVE, DAMPER	
W	WEIGHT, FORCE		WELL	
X	UNCLASSIFIED	X-AXIS	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE	Y-AXIS	RELAY, COMPUTE	
Z	POSITION	Z-AXIS	DRIVER, ACTUATOR, UNCL. F.C.E.	

VALVES

- ACTUATED VALVE (2-WAY)
- ACTUATED VALVE (3-WAY)
- BALL VALVE
- BALL VALVE (3-WAY)
- BUTTERFLY VALVE
- CHECK VALVE
- CONTROL VALVE
- GLOBE VALVE
- LOCKING DRAIN VALVE
- NEEDLE VALVE (2-WAY)
- NEEDLE VALVE (3-WAY)
- PRESSURE REGULATING VALVE
- PRESSURE RELIEF VALVE (2-WAY)
- PRESSURE RELIEF VALVE (3-WAY)
- SOLENOID VALVE (2-WAY)
- SOLENOID VALVE (3-WAY)

EQUIPMENT

- BLOWER
- CALIBRATION COLUMN
- ELECTROLYTIC CELL
- FILTER
- FLOWMETER (MAGNETIC)
- FLOWMETER (PADDLE-WHEEL)
- FLOWMETER (ROTAMETER)
- GROUNDING TARGET
- ION EXCHANGE BOTTLE
- MIXER STEM (CHEMICAL) [2 MAX]
- MIXER STEM (SAMPLE) [1 MAX]
- PULSATION DAMPENER
- PUMP (CENTRIFUGAL)
- PUMP (POSITIVE DISPL., SIMPLEX)
- PUMP (POSITIVE DISPL., DUPLEX)
- PUMP (SUBMERSIBLE)

FITTINGS

- AIR GAP
- BULKHEAD CONNECTION
- CAP
- DRAIN CONNECTION
- FLANGE CONNECTION
- FLEX CONNECTION
- GAUGE ISOLATOR
- HOSE BARB CONNECTION
- HOSE BIBB / SPIGOT
- QUICK COUPLING
- REDUCER
- UNION CONNECTION
- VENTURI INJECTOR
- Y-STRAINER

- MIXER, IMPELLER/LILY (VARIABLE-ANGLE)
- MIXER, IMPELLER/LILY (VERTICAL)
- MIXER, JET
- MIXER, TANK SHARK (CIRCULAR/FOLDING)
- MIXER, TANK SHARK (SUSPENDED)
- SPRAY AERATOR
- SURFACE AERATOR
- TRANSFORMER/RECTIFIER
- WATER SOFTENER

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PSI Water Technologies — A UGSI SOLUTIONS COMPANY

DRAWN BY: W. ENGDAHL	DATE: 04/12/2025
CHECKED BY:	DATE:
SCALE: N/A	SIZE: D

PROJECT:
1MG K.E. WHITE WATER TOWER
ELIZABETH CITY, NC

SUBJECT:
MONOCLOR RCS
HYPOCHLORITE & LAS DOSING WITH WQS & PWM250 MIXER
PIPING & INSTRUMENTATION DIAGRAM

DWG #: 425004-MN003-PI | SHEET 2 OF 7 | REV. A

NOTES

1. IF USING A SUBMERSIBLE LEVEL TRANSMITTER, IT IS RECOMMENDED TO TERMINATE THE LEVEL SIGNAL AT THE SMART CONTROL CENTER. LEVEL SIGNALS CAN BE TERMINATED AT THE DOSING SKID USING AN ANALOG INPUT BUT SPECIAL CONNECTORS WILL NEED TO BE ORDERED FROM PSI.
2. SAMPLE LINE FOR WQS MUST ORIGINATE FROM BELOW WATER LINE IN A WELL MIXED AREA IN TANK.
3. WQS CAN FLOW 10-14 GALLONS, 30 PSI MAX.
4. CHEMICAL STORAGE TANKS DO NOT IDENTIFY ALL NOZZLES OR FITTINGS. SEE PROJECT SPECIFIC TANKS.
5. Sample Pump piping flow configuration with return line is recommended to be inside tank over high water level where it can be accessed by opening hatch without entering tank.

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ELIZABETH CITY, NC

SUBJECT:
MONOCLOR RCS
HYPOCHLORITE & LAS DOSING WITH WQS & PWM250 MIXER
PIPING & INSTRUMENTATION DIAGRAM

DWG #: 425004-MN003-PI | SHEET 3 OF 7 | REV. A

SMART CONTROLLER

SMART CONTROL. POWER
120 VAC, 1ϕ, 15A SERVICE

2 AI LT

4-20 mA

LT 201

5

T-201
HYPO. STORAGE TANK
DOUBLE WALL HDLPE
120 GALLON
34"D x 51"H

MODBUS RS-485

LEAK DETECT
6 DI LS

24 VDC

REMOTE I/O PANEL

2 AI LT

REMOTE PANEL POWER
120 VAC, 1ϕ, 15A SERVICE

RUN CMD | SPEED | RUN STAT | FAULT
DO | AO | DI | DI
SC

24 VDC | 4-20 mA | 24 VDC | 24 VDC

AI LT

4-20 mA

3/8" OD x 1/4" ID PE TUBE

PIT 301

P-301
HYPO. METERING PUMP
WATSON MARLOW Q DOS
7.93GPH @ 100PSI

1/2" PVC SCH80

7/16" OD x 1/4" ID PVC HOSE

A 7

LS 301

HYPO. PUMP SKID
12 GAL
24"D x 36"W x 38"H

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ELIZABETH CITY, NC

SUBJECT:
MONOCLOR RCS
HYPOCHLORITE & LAS DOSING WITH WQS & PWM250 MIXER
PIPING & INSTRUMENTATION DIAGRAM

DWG #: 425004-MN003-PI | SHEET 4 OF 7 | REV. A

SMART CONTROLLER

2 AI LT

4-20 mA

LT 401

5

T-401
LAS STORAGE TANK
DOUBLE WALL HDLPE
60 GALLON
26"D x 41"H

MODBUS RS-485

LEAK DETECT
6 DI LS

24 VDC

REMOTE I/O PANEL

AI 2 LT

RUN CMD | SPEED | RUN STAT | FAULT
DO | AO | DI | DI
SC

AI LT

24 VDC | 4-20 mA | 24 VDC | 24 VDC | 4-20 mA

REMOTE PANEL POWER
120 VAC, 1ϕ, 15A SERVICE

3/8" OD x 1/4" ID PE TUBE (NATURAL)

PIT 501

P-301
HYPO. METERING PUMP
WATSON MARLOW Q DOS
7.93GPH @ 100PSI

1/2" PVC SCH80

3/8" OD x 1/4" ID PE TUBE (NATURAL)

B 7

LS 501

LAS SKID
12 GAL
24"D x 29"W x 38"H

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HYPOCHLORITE & LAS DOSING WITH WQS & PWM250 MIXER
PIPING & INSTRUMENTATION DIAGRAM

DWG #: 425004-MN003-PI | SHEET 5 OF 7 | REV. A

SMART CONTROLLER

MODBUS RS-485

WQS POWER
120 VAC, 1ϕ, 15A SERVICE

WATER QUALITY STATION
WQS1000

4

Cl_2/TEMP Cl_2 pH ORP

C
7

1" PVC PIPE SCH 80

1" 1" PS 701 1" PS 702 1"x1/4"

1/4"x1/4"x1/4" 1/4" 1/4"

T-STRAINER

1/4"

TT 701 AT 701 AT 702 AT 703 AT 704

FT 701

1/4" P 1/4"

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SCALE: N/A	SIZE: D

PROJECT:
1MG K.E. WHITE WATER TOWER
ELIZABETH CITY, NC

SUBJECT:
MONOCLOR RCS
HYPOCHLORITE & LAS DOSING WITH WQS & PWM250 MIXER
PIPING & INSTRUMENTATION DIAGRAM

DWG #: 425004-MN003-PI | SHEET 6 OF 7 | REV. A

SMART CONTROLLER

MODBUS RS-485

1-1/2" PVC SCH40 SECONDARY CONTAINMENT

3/8" OD x 1/4" ID PE TUBE (NATURAL)

B
5

1-1/2" PVC SCH40 SECONDARY CONTAINMENT

1" PE TUBE (BLACK)

C
6

A
4

7/16" OD x 1/4" ID PVC HOSE

VFD POWER
230 VAC, 1ϕ, 30A SERVICE

VFD-601
3 HP

SAMPLE PUMP POWER
115 VAC, 1ϕ

1-1/2"

1-1/2"

TANK/RESERVOIR

7/16" OD x 1/4" ID PVC HOSE

3/8" OD x 1/4" ID PE TUBE (NATURAL)

JM-601
JET MIXER
HYPO & LAS STEMS
PWM250
2 HP

1-1/4"
DISCHARGE

3

P-601
SAMPLE PUMP
1/2 HP
7 GPM

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ELIZABETH CITY, NC

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HYPOCHLORITE & LAS DOSING WITH WQS & PWM250 MIXER
PIPING & INSTRUMENTATION DIAGRAM

DWG #: 425004-MN003-PI | SHEET 7 OF 7 | REV. A

SECTION 10.0

SHIPPING, HANDLING, STORAGE, AND INSTALLATION

10.1 General
10.2 Delivery of Equipment and Receiving Inspection
10.3 Prior to Installation
10.4 General Handling Recommendations
10.5 Installation Instructions

10.1 GENERAL

These instructions are provided as guidelines to assist the contractor in the handling and installation of the Smartboost® Residual Control System. Handling and installation instructions are suggestions only, and do not relieve the purchaser of full responsibility for safe and proper handling during installation. The purchaser also accepts liability for damage caused by improper handling or installation.

10.2 DELIVERY OF EQUIPMENT AND RECEIVING INSPECTION

Delivery of Equipment

THE CRATES ARE NOT DESIGNED FOR LIFTING USING A SLING OR CHAINS. IF A CRANE IS TO BE USED FOR MOVING THE CRATES, A FORKLIFT ATTACHMENT MUST BE ATTACHED.

All components shall be delivered by a freight company using an enclosed freight truck. Most of the new Smartboost® RCS components will be delivered on a set of pallets or in a crate. The pallets shall vary in weight and sizing and will need handling equipment such as pallet truck or forklift to move from the delivery truck to the site or storage location.

Receiving Inspection

Each crate will be shipped with a detailed packing list. Each shipment is complete and free of damage when it leaves the factory. **For each shipment, open all packages immediately and inspect for contents and damage. Any damage must be reported within 48 hours of receipt, in writing, to the freight carrier and to PSI Water Technologies, Inc.**

10.3 PRIOR TO INSTALLATION

Equipment in storage should not be exposed to temperatures below 32 °F or above 120 °F. Consult PSI Water Technologies, Inc. for additional instructions for any special situations.

Before beginning any portion of the installation, verify the following:

1) INCOMING POWER HAS BEEN SHUT OFF.
2) The conduit for the line power and the conduit for the incoming and outgoing water sampling lines have been properly sized.
3) The incoming electrical power to the subpanel and/or a gang box are located within 6’ (1.8m) of the components (if not, a safety disconnect is required).
4) The mounting location is secure from vandalism or removal, preferably inside a locked building or gated facility.
5) The mounting location will accept the panels mounting hardware, such as a stud in a wall mount, a pole mount or a beam mount. A wall mount is preferable as it is most secure.
6) The mounting location should allow access to the internal components andopening clearance for the panels.

10.4 GENERAL HANDLING RECOMMENDATIONS

The following general recommendations are offered regarding handling, movement, and storage of the equipment.

- Handle all equipment with care. Shipments contain fragile and factory-aligned components.
- Operators of hoist equipment should follow proper rigging procedures at all times. Care should be taken to prevent the components from swinging out of control.
- Lift and move the equipment using an appropriately sized nylon strap with a spreader bar attached to the hoist cable. The angle between the lifting lines and top of equipment must always be 60° or greater. Appropriately sized forklifts may also be used for installation. The forks must extend completely under the equipment to prevent accidental damage. Forks should be spaced widely enough to safely balance the equipment.
- Always lift, never drag, or roll equipment.
- When moving a component, do not subject it to sharp impact. Even though there may be no external sign of damage, sharp impact may cause damage to fragile interior components.
- Never let tools strike against or drop onto the equipment.
- Workmen entering reservoirs and tanks should wear soft-soled shoes.

10.5 INSTALLATION INSTRUCTIONS

Preliminary Notes

- The residual control system has been factory-assembled and wired to the maximum extent possible. Installation for at the site requires mounting of equipment, attachment of hose inside containment conduit chemical supply, attachment of tubing for sample supply, and electrical connections and wiring between the Smart Control Center, Water Quality Station, chemical feed skid remote I/O panel, PAX Control Center, tank mixer, remote-located instrumentation, and customer SCADA system. These installation instructions only provide a general overview of the installation requirements. The Operation and Maintenance Manual for each component should be consulted for comprehensive installation instructions. Project-specific details, including connection types and sizes, can be found on the piping and instrumentation diagram in Section 9.4 of this submittal.

Mechanical Installation

- **Determine installation locations** for wall-mounted components, including the Smart Control Center, Water Quality Station, and PAX control center. Confirm mounting locations are able to support the component operating weights. Mounting locations shall have sufficient space to provide operators proper clearance andcomply with the NEC.
- **Set chemical feed skids (provided by others)** on level horizontal surface. The weight of the skidsis sufficient to secure it in place. Installation location shall have adequate clearanceto provide operators with a working area.
- **Install the mixer** in the tank. If not already done, **attach rubber foot** to the mixer tripod

Liquid Connections

- **Determine hose, tubing, and containment conduit sizes** from piping and instrumentation diagram in this submittal.
- **Attach chemical feed hose** from storage tank to feed skid.
- **Connect vent tube** from feed skid to storage tank.
- **Install containment conduit** from feed skid to tank penetrations. **Pull hose** through containment conduit and attach to feed skid.
- **Install sample supply tubing** between tank, Water Quality Station, and floor drain.

Electrical Connections

- It is left to the facility electrician to **determine appropriate wire and conduit sizing and runs**, grounding, and other aspects of the electrical installation, including disconnect switch requirements, as needed to be consistent with local electrical codes and regulations. All components provided are pre-wired at the factory in accordance with U.S. electrical codes.
- **Run power to the Smart Control Center, Water Quality Station, chemical feed skid remote I/O panel, and PAX control center**. Refer to the piping and instrumentation diagram in this submittal for service requirement details for each component.
- **Connect power from the PAX control center to the PAX mixer.** Route mixer motor wires through tank penetration and into PAX Control Center. Refer to electrical schematic to determine proper terminals to land wires at. Depending on distance from mixer to PAX control center, a junction box may be needed to transition from the mixer motor cable to wire installed inside conduit.
- **Enable communication between the Smart Control Center and the Water Quality Station** by installing a twisted-shielded pair of wires.
- **Enable communication between the Smart Control Center and the chemical feed skid remote I/O panel** by installing Ethernet cable.
- **Install the chemical level sensor** provided in the chemical storage tank. **Connect the sensor cable** to the Smart Control Center. Note the sensor cable lengths may constrain where the Smart Control Center is located relative to the storage tank.

DO NOT FILL OR OPERATE THE RESIDUAL CONTROL SYSTEM UNTIL A PSI WATER TECHNOLOGIES SERVICE TECHNICIAN HAS INSPECTED THE INSTALLATION.

DO NOT INSTALL SENSORS (CHLORINE, PH, ORP) UNTIL A PSI WATER TECHNOLOGIES SERVICE TECHNICIAN HAS INSPECTED THE INSTALLATION AND SYSTEM IS READY FOR STARTUP. FAILURE TO CONTINUOUSLY OPERATE WATER QUALITY STATION AFTER SENSOR INSTALLATION MAY DAMAGE SENSORS.

SECTION 11.0

WARRANTY STATEMENT

PSI WATER TECHNOLOGIES

A cleanwater1 Company

WARRANTY STATEMENT

System: **MONOCLOR® RESIDUAL CONTROL SYSTEM**

Shipping Date: **TBD**

Owner: **CITY OF ELIZABETH, NC**
Buyer: **CITY OF ELIZABETH, NC**

If the RCS System being supplied includes a Microclor® system, the principal components of the Microclor® system(s) are warranted as set forth in the applicable Warranty Attachment(s). Seller warrants that all other Products will be free from defects in material and workmanship for 12 months from initial operation or 18 months from shipment, whichever is earlier (the "Warranty Period"). Seller's warranties are conditioned on (i) the Product being stored, installed, started-up, operated and maintained in accordance with Seller's instructions; (ii) no repairs, modifications or alterations being made to the Product other than by Seller or its authorized representatives; (iii) Buyer providing prompt written notice of any warranty claims within the Warranty Period; (iv) Seller's verification of the claimed breach of warranty; and (v) at Seller's discretion, Buyer either removing and shipping the Product or non-conforming part thereof to Seller, at Buyer's expense, or Buyer granting Seller access to the Product at all reasonable times and locations to assess the warranty claims. Seller's warranties do not apply to software and do not cover ordinary wear and tear.

If the claimed breach of warranty is verified by Seller, then, as the sole and exclusive remedy of Buyer or the initial end user of the Product, Seller will, at Seller's sole option (a) repair the applicable Product or component free of charge, or (b) replace the applicable Product or component free of charge F.O.B. Buyer's facility. The warranty on repaired or replaced Products or component parts is limited to the remainder of the original Warranty Period. Buyer shall be responsible for (x) any labor required to gain access to the Product or component or so that Seller can assess the available remedies; and (y) all costs of installation of repaired or replacement Products or components.

THE WARRANTIES SET FORTH IN THIS STATEMENT AND IN THE WARRANTY ATTACHMENT(S) ARE INTENDED TO BE SELLER'S SOLE AND EXCLUSIVE WARRANTIES WITH RESPECT TO THE PRODUCTS AND SELLER'S WARRANTIES ARE SUBJECT TO THE LIMITATION OF LIABILITY STATEMENT OF THE PROPOSAL. SELLER MAKES NO OTHER WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH RESPECT TO THE PRODUCTS, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE, OR ANY WARRANTIES THAT MIGHT ARISE FROM COURSE OF DEALING OR USAGE OF TRADE. NOTWITHSTANDING THE FOREGOING, IF IT IS ALLEGED OR DETERMINED THAT SELLER HAS MADE ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BY COURSE OF DEALING OR USAGE OF TRADE, SUCH OTHER WARRANTIES SHALL BE SUBJECT TO ALL THE CONDITIONS, LIMITATIONS AND PROCEDURES SET FORTH IN THIS STATEMENT, THE WARRANTY ATTACHMENT(S), AND THE LIMITATION OF LIABILITY STATEMENT.

PSI WATER TECHNOLOGIES

A cleanwater1 Company

WARRANTY ATTACHMENT
FOR
PAX MIXERS

I. Incorporation and Definitions. This Warranty Attachment is incorporated into, and made a part of, the PSI Water Technologies, Inc. Terms and Conditions (the "Terms and Conditions"). All capitalized terms used in this Warranty Attachment have the meanings assigned to them in the Terms and Conditions. This Warranty Attachment sets forth Seller's warranty with respect to each PAX Mixer, including its associated controller (collectively, the "PAX Mixer"), included in a Trihalomethane Removal system supplied by Seller (the "System"). All other components of or accessories to the System are covered by the warranty set forth in Section 9 of the Terms and Conditions.

II. Warranty Statement. Seller warrants to Buyer and the initial end-user of the PAX Mixer (collectively, the "Owner") for the PAX Mixer Warranty Period (as defined below) that each PAX Mixer is free from defects in material and workmanship and conforms to Seller's specifications applicable to the PAX Mixer. Seller's warranty is conditioned on (i) Seller's verification of the alleged breach; (ii) the PAX Mixer being stored, handled, installed, started-up, operated and maintained in accordance with Seller's instructions, (iii) no repairs, modifications or alterations being made to the PAX Mixer other than by Seller or its authorized representatives, (iv) Owner providing prompt written notice of any warranty claims within the PAX Mixer Warranty Period, and (v) at Seller's discretion, Owner either removing and shipping the PAX Mixer or non-conforming part thereof to Seller, such freight cost to be paid by Seller, or Owner granting Seller access to the PAX Mixer at all reasonable times and locations to assess the warranty claims. Seller's warranty does not cover damage due to (x) acts of nature or third parties, or (y) ordinary wear and tear. The "PAX Mixer Warranty Period" applicable to each PAX Mixer begins on the date of installation or three (3) months after shipment, whichever comes first, and continues for the period of 60 months thereafter.

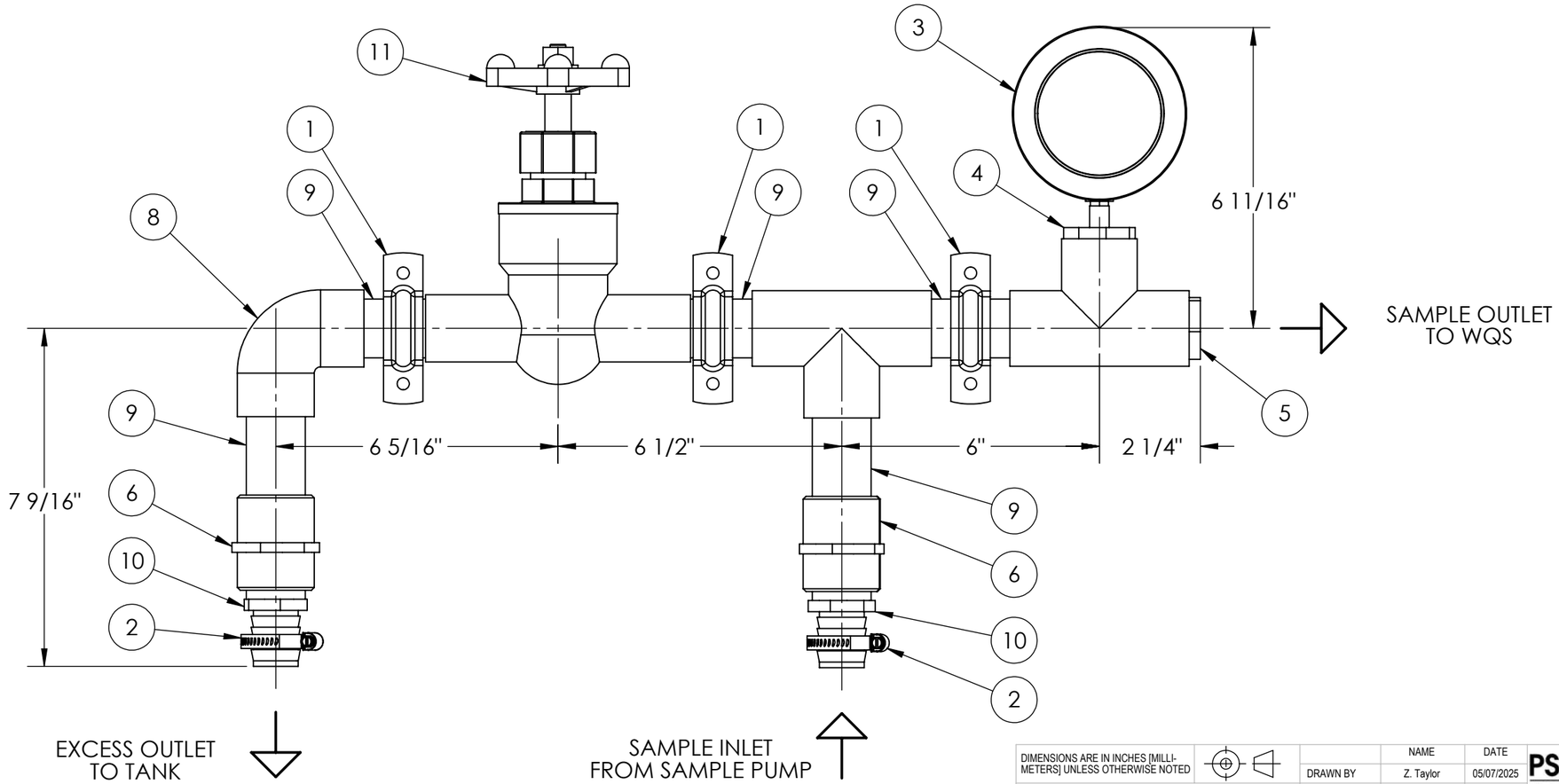
III. Warranty Remedy. The sole remedy for any breach of Seller's warranty above is limited to Seller's choice of repair or replacement of the PAX Mixer, or non-conforming parts thereof, F.O.B. jobsite, or refund of the purchase price for the subject PAX Mixer or part. Seller reserves the right to provide new or reconditioned replacement PAX Mixers or parts (collectively, "Replacement Items"). The warranty on Replacement Items is limited to the remainder of the original PAX Mixer Warranty Period and otherwise subject to the terms of this warranty. This warranty includes labor to install Replacement Items, subject to the following conditions: (a) Seller will reimburse Owner's reasonable, documented labor costs to install the Replacement Items up to an aggregate maximum of $2,500 over the Warranty Period; and (b) Seller may elect, but is not obligated, to install the Replacement Items itself, in which case (i) Seller will bear all of its costs of installation; and (ii) Seller's obligations to pay for or provide labor under this warranty will be discharged in full. In any event, labor costs of divers and labor costs required to drain the storage tank or reservoir are excluded from this warranty. If Seller determines that any alleged damage is not covered by this warranty, Seller will charge, and Buyer will pay, Seller's normal rates for any inspection or repair performed by Seller, and for any materials provided or used in connection therewith.

OF TRADE, SUCH OTHER WARRANTIES SHALL BE SUBJECT TO ALL THE CONDITIONS, LIMITATIONS AND PROCEDURES SET FORTH IN THIS WARRANTY STATEMENT, THE WARRANTY ATTACHMENT(S) HERETO, AND THE LIMITATION OF LIABILITY STATEMENT IN THE EXECUTED BID PROPOSAL.

NOTES:

- ATTACH 1" O.D. PE TUBING TO BARB FITTINGS (ITEM 10) AND SECURE WITH HOSE CLAMP (ITEM 2). TUBING FROM SAMPLE PUMP ATTACHES AT INLET. LOOSE LENGTH (APROX. 2' LENGTH) OF TUBING ATTACHES AFTER GLOBE VALVE (ITEM 11) BACK INTO TANK.
- MOUNT PLUMBING ASSEMBLY TO TANK HATCH WITH PIPE CLAMPS (ITEM 1).
- CONTINUE PLUMBING ROUTE WITH 3/4" SCH80 PIPE TO WQS AS REQUIRED FROM REDUCER BUSHING (ITEM 5).
- USE GLOBE VALVE (ITEM 11) TO CONTROL RETURN FLOW AND REDUCE LINE PRESSURE TO WQS DURING OPERATION.

BILL OF MATERIAL			
ITEM	STOCK NUMBER	DESCRIPTION	QTY
1	20-00177	CLAMP, 1" PIPE, 2 HOLE, SS304	3
2	20-00752	CLAMP, HOSE, WORM DRIVE, 5/16" BAND, 5/16" TO 1-1/2", 316SS	2
3	60-00179	GAUGE, PRESSURE, 0-100 PSI, 3 1/2" DIAL, 1/4" MNPT, LIQUID FILLED, SS (ASHCROFT)	1
4	70-00194	BUSHING, REDUCER, 1"X1/4", SPGXFNPT, PVC, SCH 80	1
5	70-00349	BUSHING, REDUCER, 1" X 3/4", SPIG X SOC, SCH 80, PVC	1
6	70-00414	ADAPTER, 1", SXFNPT, PVC, SCH80	2
7	70-00453	TEE, 1", SXSXS, PVC, SCH 80	2
8	70-00465	ELBOW, 90, 1", SXS, PVC, SCH 80	1
9	70-00575	PIPE, 1", SCH80, PVC, 4" LG	5
10	70-00653	ADAPTER, 1", MNPTXBARB, PVC, SCH80	2
11	70-01491	VALVE, GLOBE, Z-BODY, 1" SOC, PCV/EPDM, 150 PSI (ASAHI)	1



REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
A	PRODUCTION RELEASE	05/07/2025	ZT

DIMENSIONS ARE IN INCHES [MILLIMETERS] UNLESS OTHERWISE NOTED

TOLERANCES UNLESS OTHERWISE NOTED

INCHES
.XX ±.03
.XXX ±.005

DIAMETERS CONCENTRIC WITHIN Ø.005
HOLES ±.005
ANGLES ± 1°

MILLIMETERS
.X ±.50
.XX ±.13

DIAMETERS CONCENTRIC WITHIN Ø.13
HOLES ±.13
ANGLES ± 1°

MACHINED SURFACES TO BE 63 RMS EXCEPT AS NOTED

INTERPRET DIMS/TOLERANCES PER ANSI/ASME Y14.5-1994
DO NOT SCALE DRAWING

	NAME	DATE
DRAWN BY	Z. Taylor	05/07/2025
CHECKED BY		

This drawing represents an investment by PSI WATER TECHNOLOGIES, INC. of substantial sums, including our engineering skills and experience. It is, therefore, loaned without consideration other than the agreement and condition that it is not to be used in whole or in part to assist in making or to furnish any information to others for the making of drawings, print apparatus, or parts thereof. The acceptance of this drawing will be construed as an acceptance of the forgoing conditions and as an admission of the exclusive ownership in and to the drawings of PSI WATER TECHNOLOGIES, INC.

PSI WATER TECHNOLOGIES
A cleanwater1 Company

TITLE:
WQS SAMPLE PUMP, PLUMBING, UPPER

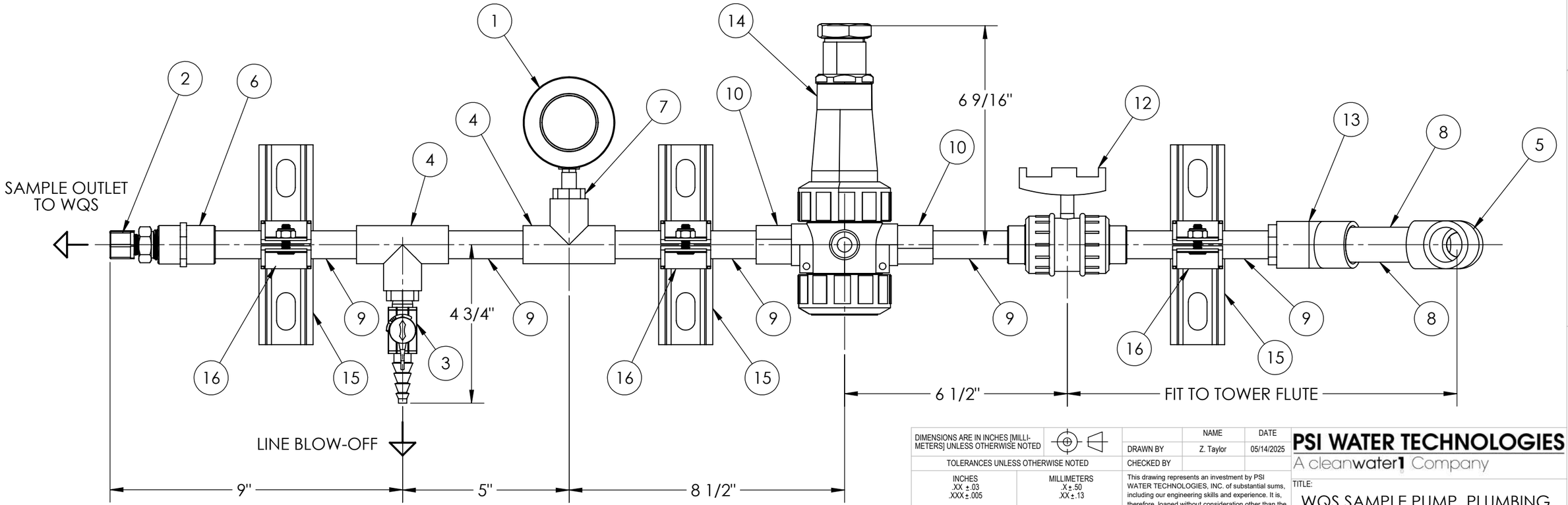
SIZE B | DWG. NO. 425004-MN0001-AB | REV. A
SCALE 1:3 | SHEET 1 OF 1

NOTES:

- MOUNT THE PLUMBING ASSEMBLY WITH STRUT (ITEM 15) AND PIPE CLAMP (ITEM 16) TO CONCRETE WALL.
- ADJUST INLET SIDE ELBOWS (ITEMS 5 AND 13) PIPE LENGTHS TO FIT AGAINST TOWER FLUTE.
- ATTACH 3/8" O.D. TUBING TO COMPRESSION FITTING (ITEM 2) AND ROUTE INTO WQS.
- USE LABCOCK (ITEM 3) FOR LINE BLOW OFF DURING SYSTEM START-UP.

BILL OF MATERIAL

ITEM	STOCK NUMBER	DESCRIPTION	QTY
1	60-00057	GAUGE, PRESSURE, 0-30 PSI, 1/4" MNPT, 2.5" DIAL, GLYCERINE, SS, NSF 61 (ASHCROFT)	1
2	70-00015	CONNECTOR, 1/2" MNPT X 3/8" COMP, PP	1
3	70-00334	VALVE, LABCOCK, 1/4", MPT X HOSE, PVC/EPDM	1
4	70-00451	TEE, 1/2", SXSXS, PVC, SCH 80	2
5	70-00464	ELBOW, 90, 3/4", SOC, SCH 80, PVC	1
6	70-00478	ADAPTER, 1/2", FNPT X SOC, PVC, SCH 80	1
7	70-00540	BUSHING, REDUCER, 1/2"X1/4", SPGXFNPT, PVC, SCH 80	2
8	70-00574	PIPE, 3/4", SCH80, PVC, 12" LG	1
9	70-00595	PIPE, 1/2", SCH80, PVC, 6" LG	5
10	70-01638	ADAPTER, 1/2", SXMNPT, PVC, SCH80	2
11	70-02112	BUSHING, REDUCER, 3/4"X1/2", SPGXS, PVC, SCH 80	1
12	70-05668	VALVE, BALL, TU, 1/2", SXFNPT, PVC/FKM (GF)	1
13	70-06279	ELBOW, 22-1/2, 3/4", SXS, PVC, SCH 80 (SPEARS)	1
14	80-00352	VALVE, PRESSURE REGULATOR, 1/2" FNPT, 5-125 PSI, PVC/FKM (PLASTOMATIC)	1
15	80-00510	CHANNEL, STRUT, 1-5/8" X 1-5/8", 316SS, 6" LG	3
16	80-00517	PIPE CLAMP, STRUT, 1/2", 316 SSTL W/VIBRATION DAMPENER	3



REVISIONS

REV.	DESCRIPTION	DATE	APPROVED
A	PRODUCTION RELEASE	05/14/25	ZT

DIMENSIONS ARE IN INCHES [MILLIMETERS] UNLESS OTHERWISE NOTED

TOLERANCES UNLESS OTHERWISE NOTED

INCHES
.XX ±.03
.XXX ±.005

DIAMETERS CONCENTRIC WITHIN Ø.005
HOLES ±.005
ANGLES ± 1°

MILLIMETERS
.X ±.50
.XX ±.13

DIAMETERS CONCENTRIC WITHIN Ø.13
HOLES ±.13
ANGLES ± 1°

MACHINED SURFACES TO BE 63 RMS EXCEPT AS NOTED

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PSI WATER TECHNOLOGIES
A cleanwater1 Company

TITLE:
WQS SAMPLE PUMP, PLUMBING, LOWER

SIZE B | DWG. NO. 425004-MN0002-AB | REV A
SCALE 1:3 | SHEET 1 OF 1