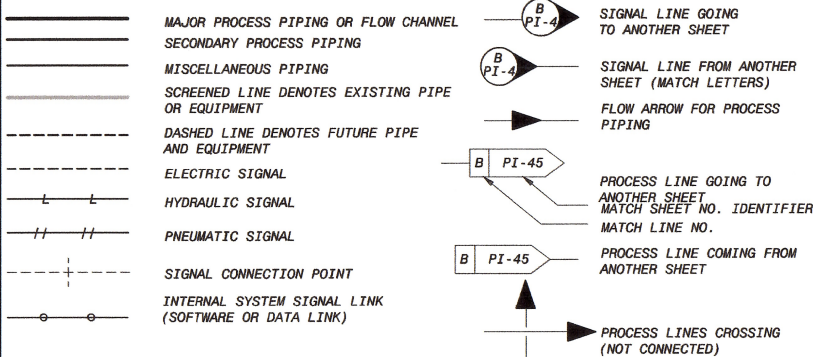
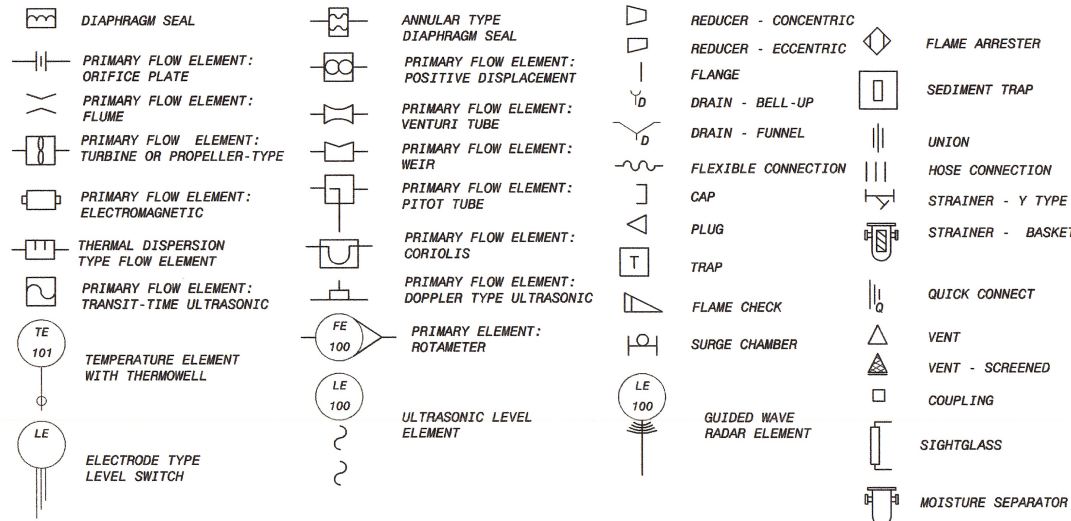


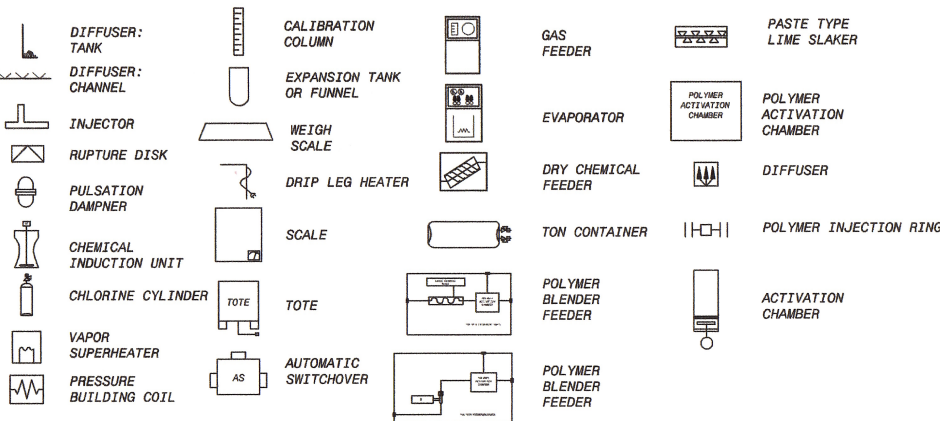
LINE SYMBOLS



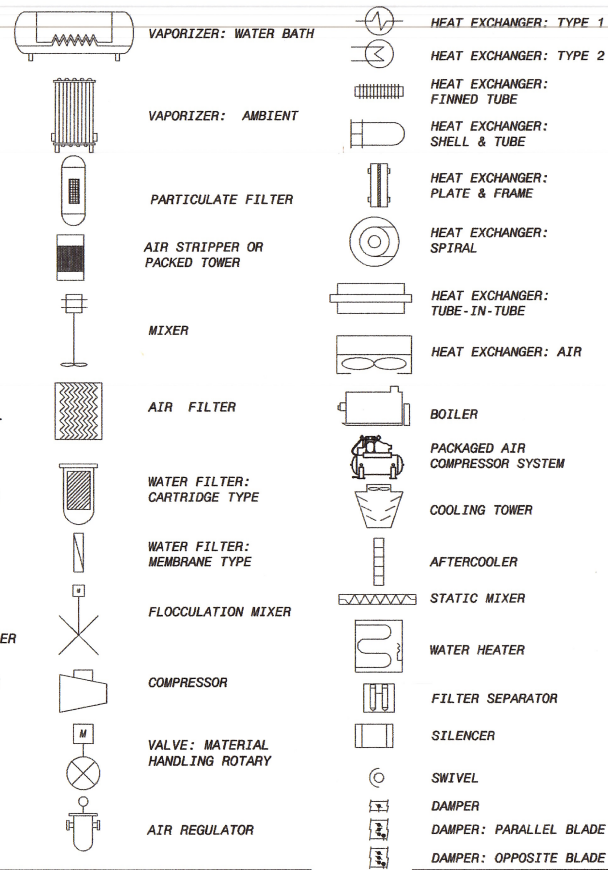
PRIMARY ELEMENT & FITTING SYMBOLS



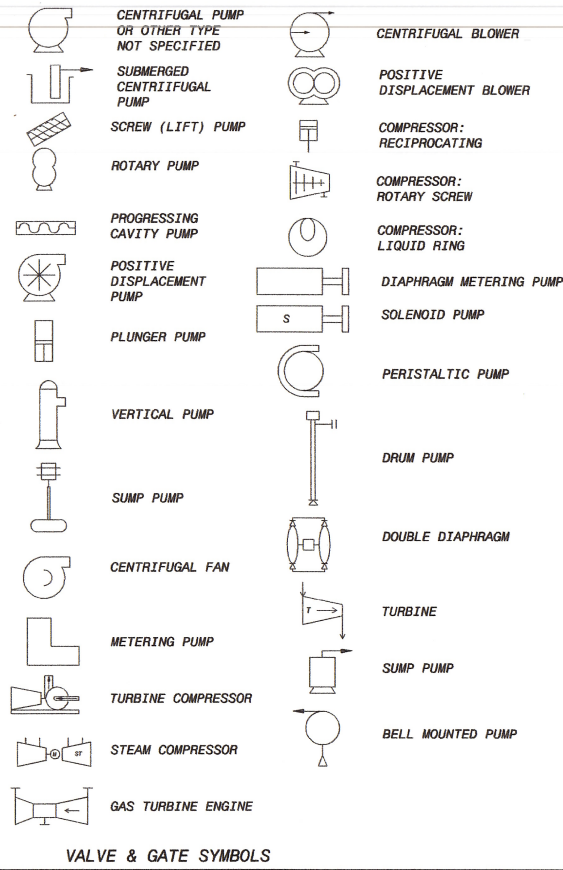
CHEMICAL FEED EQUIPMENT SYMBOLS



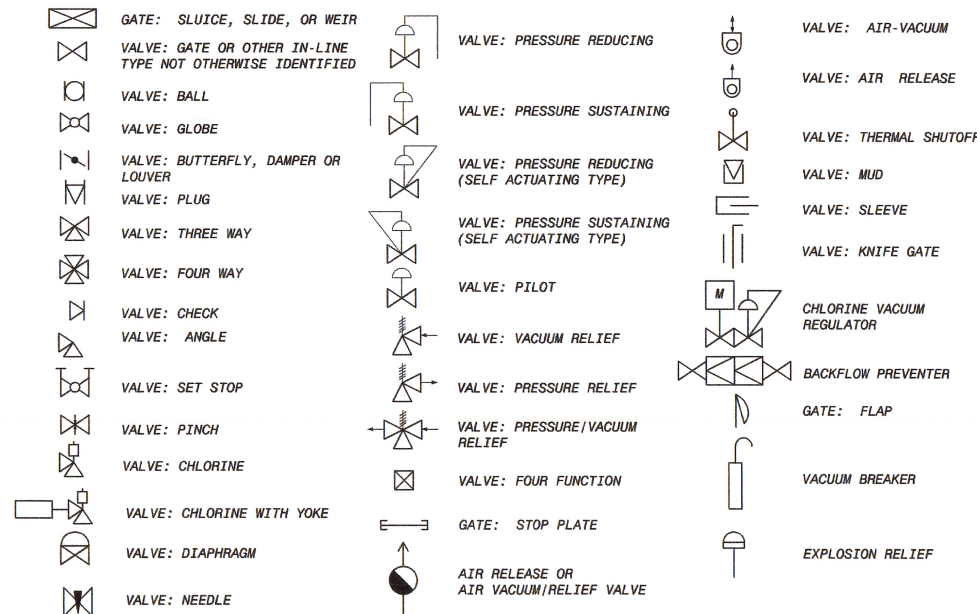
MECHANICAL EQUIPMENT SYMBOLS



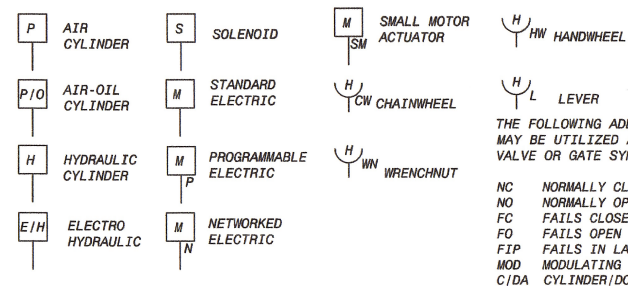
PUMP & BLOWER SYMBOLS



VALVE & GATE SYMBOLS



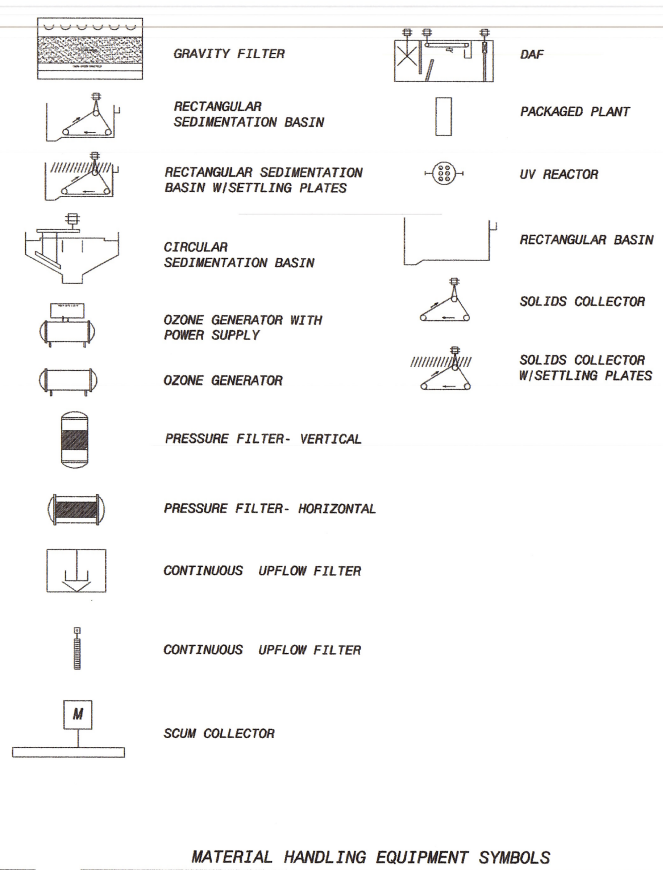
VALVE AND GATE ACTUATOR SYMBOLS



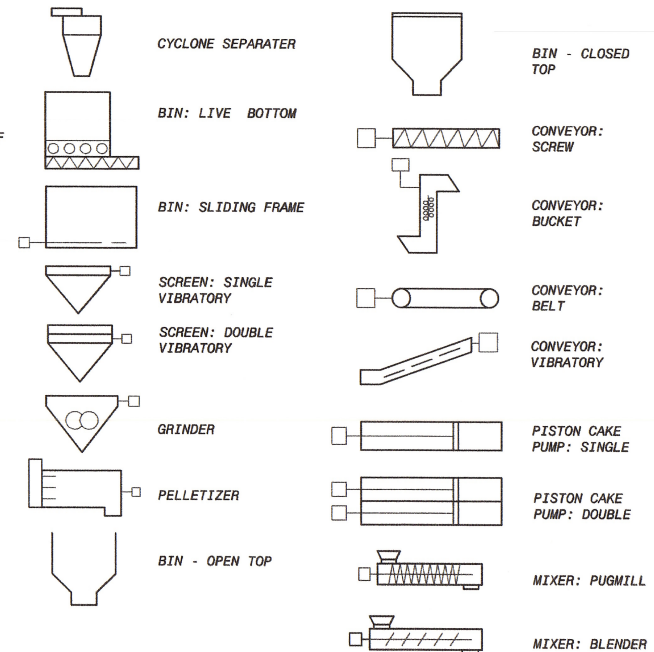
THE FOLLOWING ADDITIONAL DESIGNATIONS MAY BE UTILIZED ADJACENT TO SOME VALVE OR GATE SYMBOLS.

NC NORMALLY CLOSED
NO NORMALLY OPEN
FC FAILS CLOSED
FO FAILS OPEN
FIP FAILS IN LAST POSITION
MOD MODULATING
C/D CYLINDER/DOUBLE ACTING

WATER PROCESS SYMBOLS



MATERIAL HANDLING EQUIPMENT SYMBOLS



GENERAL NOTES

- IN GENERAL, THE P & ID SYMBOLS AND DEVICE IDENTIFICATIONS ARE BASED ON INTERNATIONAL SOCIETY OF AUTOMATION, STANDARD PRACTICE ISA-S5.1 (2009). SOME MODIFICATIONS, ADDITIONS, AND ALTERATIONS HAVE BEEN MADE AS NEEDED TO ACCOMMODATE THE PROJECT REQUIREMENTS.
- SOME CONTROL AND INTERLOCK REQUIREMENTS WHICH CAN BE MORE CLEARLY ILLUSTRATED ON SCHEMATIC DRAWINGS HAVE BEEN OMITTED FROM THE P & ID DRAWINGS.
- THIS IS A GENERAL LEGEND SHEET. SOME SYMBOLS AND ABBREVIATIONS MAY NOT BE UTILIZED ON THIS SPECIFIC PROJECT.
- PIPING AND EQUIPMENT LEGEND APPLIES TO P & ID SHEETS ONLY AND MAY DIFFER FROM LEGENDS FOR OTHER SHEETS.

ISSUED FOR CONSTRUCTION

DESIGNED: []
CHECKED: []
APPROVED: []
DATE: DECEMBER 2014

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IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO. 182262

I-00-001
SHEET OF

LEGEND AND ABBREVIATIONS - SHEET 1 OF 3

INSTRUMENTATION

BLACK & VEATCH
Building a world of difference.
Black & Veatch Corporation
Virginia Beach, VA

BEDFORD REGIONAL WATER AUTHORITY
SMITH MOUNTAIN LAKE WTP &
RAW WATER PUMPING STATION / INTAKE

INSTRUMENT TAG NUMBERS
MEANINGS OF IDENTIFICATION LETTERS

LETTER	FIRST LETTER		SUCCEEDING LETTERS		
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM		
B	BURNER, COMBUSTION		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
C	CONDUCTIVITY (ELECTRICAL)			CONTROL	CLOSED
D	DENSITY (MASS) OR SPECIFIC GRAVITY	DIFFERENTIAL			
E	VOLTAGE (EMF)		PRIMARY ELEMENT		
F	FLOW RATE	RATIO (FRACTION)			
G	USER'S CHOICE		GLASS		
H	HAND (MANUALLY INITIATED)				HIGH
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER	SCAN			
K	TIME OR TIME-SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT (PILOT)		LOW
M	MOISTURE OR HUMIDITY	MOMENTARY			MIDDLE OR INTER-MEDIATE
N	INTRUSION		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
O	USER'S CHOICE		ORIFICE (RESTRICTION)		OPEN
P	PRESSURE OR VACUUM		POINT (TEST CONNECTION)		
Q	QUANTITY	INTEGRATE OR TOTALIZE	INTEGRATE OR TOTALIZE		
R	RADIATION		RECORD OR PRINT		
S	SPEED OR FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VIBRATION			VALVE, DAMPER, OR LOUVER	
W	WEIGHT OR FORCE		WELL		
X	UNCLASSIFIED		UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE, OR PRESENCE			RELAY OR COMPUTE	
Z	POSITION, DIMENSION			DRIVE, ACTUATOR OR UNCLASSIFIED FINAL CONTROL ELEMENT	

GENERAL NOTES

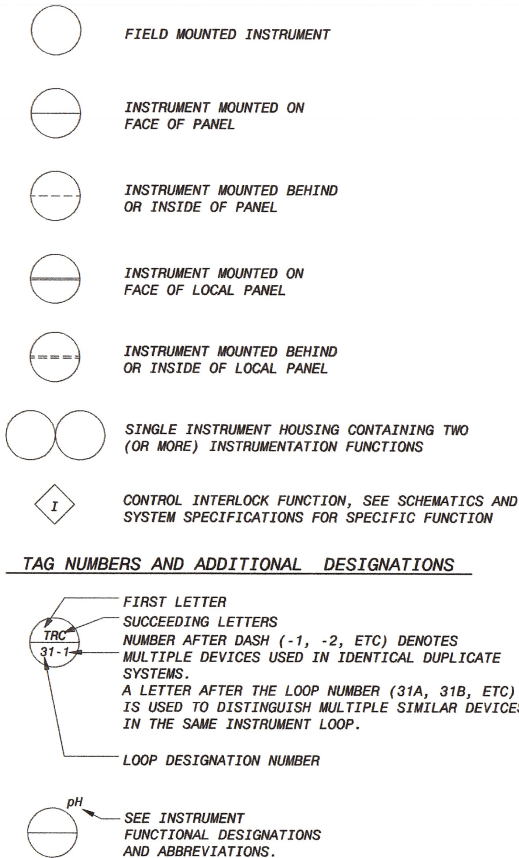
1. IN GENERAL, THE P&ID SYMBOLS AND DEVICE IDENTIFICATIONS ARE BASED ON INTERNATIONAL SOCIETY OF AUTOMATION, STANDARD PRACTICE ISA-S5.1 (2009). SOME MODIFICATIONS, ADDITIONS, AND ALTERATIONS HAVE BEEN MADE AS NEEDED TO ACCOMMODATE THE PROJECT REQUIREMENTS.
2. SOME CONTROL AND INTERLOCK REQUIREMENTS WHICH CAN BE MORE CLEARLY ILLUSTRATED ON SCHEMATIC DRAWINGS HAVE BEEN OMITTED FROM P&ID DRAWINGS.
3. THIS IS A GENERAL LEGEND SHEET. SOME SYMBOLS AND ABBREVIATIONS MAY NOT BE UTILIZED ON THIS SPECIFIC PROJECT.
4. PIPING AND EQUIPMENT LEGEND APPLIES TO P&ID SHEETS ONLY AND MAY DIFFER FROM LEGENDS FOR OTHER SHEETS.

PIPELINE MATERIAL CODE ABBREVIATIONS

PCCP	SECTION 02612, PRESTRESSED CONCRETE CYLINDER PIPE
CBWS	SECTION 02614, CONCRETE BAR-WRAPPED, STEEL CYLINDER PIPE
LHCPP	SECTION 02616, LOW HEAD CONCRETE PRESSURE PIPE
RCP	SECTION 02618, CONCRETE PIPE
PVC	SECTION 15061, POLYVINYL CHLORIDE PIPE
DIP	SECTION 15061, DUCTILE IRON PIPE
SP	SECTION 15062, STEEL PIPE
LWS-XX	SECTION 15063, LIGHT WALL STEEL PIPE
SS-XX1	SECTION 15064, STAINLESS STEEL PIPE, TUBING, AND ACCESSORIES
CSG-XX	SECTION 15065, MISCELLANEOUS STEEL PIPE, TUBING, AND ACCESSORIES
CS-XX	SECTION 15065, MISCELLANEOUS STEEL PIPE, TUBING, AND ACCESSORIES
FRPE-XX	SECTION 15066, FIBERGLASS REINFORCED PLASTIC PIPE (EXHAUST AIR SERVICE)
FRP-XX	SECTION 15067, MISCELLANEOUS PLASTIC PIPE, TUBING, AND ACCESSORIES
PVC-XX	SECTION 15067, MISCELLANEOUS PLASTIC PIPE, TUBING, AND ACCESSORIES
CPVC-XX	SECTION 15067, MISCELLANEOUS PLASTIC PIPE, TUBING, AND ACCESSORIES
PE-XX	SECTION 15067, MISCELLANEOUS PLASTIC PIPE, TUBING, AND ACCESSORIES
PP-XX	SECTION 15067, MISCELLANEOUS PLASTIC PIPE, TUBING, AND ACCESSORIES
PVDF-XX	SECTION 15067, MISCELLANEOUS PLASTIC PIPE, TUBING, AND ACCESSORIES
RPT-XX	SECTION 15067, MISCELLANEOUS PLASTIC PIPE, TUBING, AND ACCESSORIES
SS	SECTION 15068, AWWA STAINLESS STEEL PIPE
CI-XX	SECTION 15069, CAST IRON SOIL PIPE AND ACCESSORIES
CU-XX	SECTION 15070, COPPER TUBING AND ACCESSORIES
BR-XX	SECTION 15060, MISCELLANEOUS PIPING AND PIPE ASSEMBLY
HS-XX	SECTION 15060, MISCELLANEOUS PIPING AND PIPE ASSEMBLY
TG-XX	SECTION 15060, MISCELLANEOUS PIPING AND PIPE ASSEMBLY
CRP-XX	SECTION 15060, MISCELLANEOUS PIPING AND PIPE ASSEMBLY

1. XX= numbers 01-20

GENERAL INSTRUMENT SYMBOLS



FUNCTION DESIGNATIONS AND ABBREVIATIONS

INSTRUMENT DESIGNATIONS

K	GAIN OR ATTENUATE (INPUT:OUTPUT)
	GAIN AND REVERSE
-K	
Σ	ADD OR SUM (ADD AND SUBTRACT)
Δ	SUBTRACT (DIFFERENCE)
√	EXTRACT SQUARE ROOT
÷	DIVIDE
F(X)	CHARACTERIZE SIGNAL
>	HIGH-SELECT
<	LOW-SELECT
X	MULTIPLY
I	INTEGRATE (TIME INTEGRAL)
CH4	METHANE
CL2	CHLORINE RESIDUAL
CO2	CARBON DIOXIDE
DO	DISSOLVED OXYGEN
LEL	LOWER EXPLOSIVE LIMIT
MCC	MOTOR CONTROL CENTER
MLSS	MIXED LIQUOR SUSPENDED SOLIDS
O2	OXYGEN (PURITY)
pH	pH CELL
TURB	TURBIDITY
COMB	COMBUSTIBLE GAS
UVI	UV INTENSITY

HAND SWITCH DESIGNATIONS

HOA	HAND-OFF-AUTO
LR	LOCAL-REMOTE
OC	OPEN-CLOSE
OO	ON-OFF
LOR	LOCAL-OFF-REMOTE
MOC	MEMBRANE-OFF-CENTRIFUGE
OOA	ON-OFF-AUTO
OCR	OPEN-CLOSE-REMOTE
OOR	ON-OFF-REMOTE
FR	FORWARD-REVERSE
ESTOP	EMERGENCY STOP
ST	START
STP	STOP
HOR	HAND-OFF-REMOTE
OPN	OPEN
CLS	CLOSED
OR	OFF-REMOTE

TRANSDUCER & CONVERTER DESIGNATION

E	VOLTAGE
FSK	FREQUENCY SHIFT KEYING
H	HYDRAULIC
I	CURRENT
P	PNEUMATIC PULSE
PD	PULSE DURATION
PF	PULSE FREQUENCY
R	RESISTANCE (ELECTRICAL)

EXAMPLE: I/P = CURRENT TO PNEUMATIC TRANSDUCER

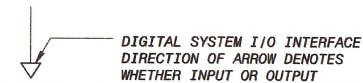
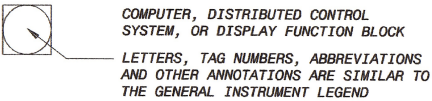
POWER SUPPLY ABBREVIATIONS

AS	AIR SUPPLY
ES	ELECTRIC SUPPLY
GS	GAS SUPPLY
HS	HYDRAULIC SUPPLY
NS	NITROGEN SUPPLY
SS	STEAM SUPPLY
WS	WATER SUPPLY

AS POWER SUPPLY SOURCE LABEL. USED ONLY WHERE NECESSARY TO HELP CLARIFY AN INSTRUMENT OR SYSTEM FUNCTION.

DIGITAL SYSTEMS INTERFACE SYMBOLS

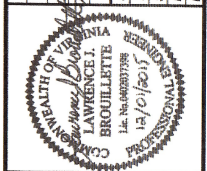
NOTE: REFER TO DETAILED SYSTEM SPECIFICATIONS FOR FUNCTIONAL DESCRIPTION. ALSO SEE I/O SCHEDULES FOR COMPLETE INPUT AND OUTPUT LISTINGS.



▽ DISCRETE I/O

▲ ANALOG I/O

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INSTRUMENTATION
LEGEND AND ABBREVIATIONS - SHEET 2 OF 3

DESIGNED:	
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PROJECT NO. 182262	
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SYSTEM CODE ABBREVIATIONS											
ACETIC ACID	ACE	FLOCCULATION	FLC	RESIDUALS	RES						
ACETYLENE	ACT	GASEOUS OXYGEN	GOX	RETURN ACTIVATED SLUDGE	RAS						
ACTIVATED CARBON - GRANULAR	GAC	GASOLINE	GSL	REVERSE OSMOSIS	ROS						
AERATION AIR/PROCESS AIR	ATR	GREASE	GRS	SAMPLE	SAMP						
AERATION SYSTEM	AER	GRIT	GRT	SCREENINGS	SCR						
AIR WASH/BLOWERS	ARW	HELIUM	HEL	SCREEN, FINE	FSC						
ALUMINUM SULFATE	ALS	HYDRAULIC FLUID	HFL	SECONDARY CLARIFICATION	SCL						
AMMONIUM SULFATE	NS04	HYDROCHLORIC ACID	HCL	SECONDARY SCUM	SSC						
ANHYDROUS AMMONIA	NH3	HYDROFLUOSILIC ACID (FLUORIDE)	HFS	SEPTAGE	SEP						
ANTI-SEALANT	AS	HYDROGEN	HYD	SETTLED WATER	SET						
AQUA AMMONIA	NH0H	HYDROGEN PEROXIDE	PER	SEWAGE	SEW						
ARGON	ARG	INCINERATION	INC	SODA ASH	NAC						
ASH	ASH	INFLUENT PUMPING	INFP	SODIUM ACETATE	NAA						
BACKWASH - MEMBRANE/FILTER	BWV	INTAKE	INT	SODIUM ALUMINATE	NAL						
BALLASTED FLOCCULATION	BAL	LAGOON STORAGE	LAG								
BIOSOLIDS	BIO	LAND APPLICATION	LAP	SODIUM BICARBONATE	NBC						
BIOTOWER	BIT	LIME - HYDRATED	CAH	SODIUM BISULFITE	NHS						
BLENDED SLUDGE	BLS	LIME - QUICKLIME	CAO	SODIUM CHLORIDE	NCL						
BNR	BNR	LIME STABILIZATION	LTM	SODIUM CHLORITE	NCL2						
BRINE	BRN	LIQUID OXYGEN	LOX	SODIUM FLUORIDE	NAF						
CALCIUM HYPOCHLORITE	CACL	LP GAS OR PROPANE GAS	LPG	SODIUM HEXAMETAPHOSPHATE	NAX						
CALCIUM THIOSULFATE	CATS	MAGNESIUM HYDROXIDE	MGOH	SODIUM HYDROXIDE	NAOH						
CARBON DIOXIDE	CO2	MEMBRANE	MEM	SODIUM HYPOCHLORITE	NOCL						
CARBON SLURRY	CAS	MEMBRANE FEED	MF	SODIUM SILICOFLUORIDE	NASF						
CARBONIC ACID	HCO3	MEMBRANE BIOREACTOR	MBR	STEAM	STM						
CENTRATE	CEN	METHANE GAS	MEG	STORM SEWER	STS						
CHEMICAL ENHANCED BACKWASH - MEMBRANE	CEB	METHANOL	MTH	STORM WATER	STW						
CHLORINE	CL2	MIXED LIQUOR	MXL	SULFUR DIOXIDE	SO2						
CHLORINE DIOXIDE	CLO2	NATURAL GAS	NG	SULFURIC ACID	HSO4						
CITRIC ACID	CA	NITROGEN	NIT	SURFACE WASH	SW						
CLEAN IN PLACE	CIP	NITROUS OXIDE	NIO	TERTIARY TREATMENT	TERT						
COAGULATION	COA	ODOR CONTROL	ODC	THICKENED PRIMARY SLUDGE	TPRS						
COMPRESSED AIR - INSTRUMENT	CAT	OIL	OIL	THICKENED WASTE ACTIVATED SLUDGE	TWAS						
COMPRESSED AIR - SERVICE/VALVES	CMS	OIL - FUEL	FO	THICKENING	THCK						
COPPER SULFATE	CUS	OZONE	OZN	TREATED WATER	TW						
CORROSION INHIBITOR	CI	OZONE DESTRUCT	OZD	TRICKLING FILTER	TF						
DECHLORINATION	DCL	PHOSPHATE	PPP	ULTRAVIOLET	UV						
DETERGENT	DET	PHOSPHORIC ACID	PO4	VACUUM	VAC						
DEWATERING	DWT	POLYALUMINUM CHLORIDE	PCL	WASH WATER	WW						
DIESEL FUEL	FUE	POLYMER	POLF	WASTE ACTIVATED SLUDGE	WAS						
DIGESTER GAS	DGG	POTASSIUM PERMANGANATE	KMN	WASTE WASH WATER	WWW						
DIGESTER GAS MIXING	DGM	POWDERED ACTIVATED CARBON	PAC	WATER - CONDENSATE	CDW						
DIGESTER SLUDGE	DGS	PRE-AERATION	PAR	WATER - COOLING	COLW						
DIGESTION - AEROBIC	DGA	PRESEDIMENTATION	PSD	WATER - DISTILLED WATER	DW						
DIGESTION - ANAEROBIC	DIG	PRIMARY CLARIFICATION	PRC	WATER - FILTERED	FILW						
DISINFECTION CONTACT BASIN	DCB	PRIMARY SCUM	PSC	WATER - FINISHED	FW						
DISSOLVED AIR FLOTATION	DAF	PRIMARY SLUDGE	PRS	WATER - IRRIGATION	IRW						
DRAIN	DRN	RAW WASTEWATER PUMPING	WWP	WATER - OZONATED	OZW						
EFFLUENT PUMPING	EPF	RAW WATER PUMPING	RWP	WATER - SEAL	SWT						
ENGINE EXHAUST	EXH	RAW WATER STORAGE	RWS	WATER - WATER HEATING	HW						
ENGINE GENERATOR	EG	RECIRCULATED SLUDGE	RCS	WATER DEIONIZED	DEIW						
EQUALIZATION BASIN	EQB	RECLAIMED WATER	RCW	WATER NON-POTABLE	NPW						
FERRIC CHLORIDE	FEC	RECORDER	REC	WATER PLANT EFFLUENT	PEW						
FERRIC SULFATE	FES	REFRIGERANT	REF	WATER POTABLE	PW						
FERROUS CHLORIDE	FRC										
FERROUS SULFATE	FRS										
FILTRATION	FLT										

FUNCTION CODE ABBREVIATIONS											
ACTIVATION CHAMBER	AC	DIGESTER COVER, GAS HOLDER	DCG	MEMBRANE	MFH	SCRUBBER	SCU	VALVE, KNIFE GATE	VKG		
ADJUSTABLE FREQUENCY DRIVE	AFD	DIGESTER COVER, MEMBRANE	DCM	MEMBRANE, MICROFILTRATION	MBMF	SCUM COLLECTOR	SMC	VALVE, MATERIAL HANDLING ROTARY	VMR		
AERATOR, COARSE BUBBLE DIFFUSED	ACD	DIGESTER, AEROBIC	DGE	MEMBRANE, NANOFILTRATION	MBNF	SCUM WEIR - ROTATING	SCW	VALVE, MUD	VMD		
AERATOR, FINE PORE DIFFUSED	AEFD	DIGESTER, ANAEROBIC PRIMARY	DGAP	MEMBRANE, REVERSE OSMOSIS	MBRO	SEPARATOR	SEP	VALVE, PILOT	PTV		
AERATOR, FLOATING SURFACE	AFS	DIGESTER, ANAEROBIC SECONDARY	DGAS	MEMBRANE, ULTRAFILTRATION	MBUF	SIGHT GLASS - TALL	SGT	VALVE, PINCH	VPN		
AERATOR, SURFACE	AES	DISINFECTION UNIT, UV	DSUV	MIXER, CARBON	MXC	SIGHTGLASS	SG	VALVE, PISTON OPERATED	VPO		
AFTERCOOLER	AFC	DISSOLVED AIR FLOTATION THICKENER	DAF	MIXER, FLOCCULATION	FLM	SILENCER	SIL	VALVE, PLUG	VPG		
AIR DRYER	AD	DUST COLLECTOR	DUC	MIXER, IN-LINE	MXI	SLUDGE COLLECTOR, CIRCULAR	SLC	VALVE, PRESSURE REDUCING	VPR		
AIR FILTER	AF	ELECTRICAL EQUIPMENT, GENERAL	EQPE	MIXER, PUGMILL	MXPG	SLUDGE COLLECTOR, FLOCCULATING-CLARIFYING	SFC	VALVE, PRESSURE REGULATING	VPC		
AIR RECEIVER	AR	EMERGENCY EYE WASH	EEW	MIXER, RAPID	MXR	SLUDGE COLLECTOR, SECONDARY CLARIFIERS	SCS	VALVE, PRESSURE RELIEF	VSP		
AIR SEPARATOR	AS	EMERGENCY SHOWER	ES	MIXER, STATIC	MXS	SLUDGE COLLECTOR, SOLIDS CONTACT	SSC	VALVE, PRESSURE/VACUUM RELIEF	VSPV		
AIR STRIPPER	AST	EMERGENCY SHOWER & EYEWASH	ESE	MIXER, SUBMERSIBLE PROPELLER	MXP	SLUDGE COLLECTOR, STRAIGHT LINE	SLCS	VALVE, PROCESS	VP		
BACKFLOW PREVENTER	BFP	ENGINE GENERATOR (BACKUP POWER)	EG	OVERFLOW ROOF DRAIN	ORD	SLUDGE GRINDER	SLG	VALVE, RESILIENT SEATED GATE	VGR		
BASIN, AERATION	BSNA	EQUIPMENT, GENERAL OR UNSPECIFIED	EQPT	OZONE DESTRUCT UNIT	ODU	SLUDGE SCREEN-INLINE	SCRI	VALVE, SAFETY	VS		
BASIN, ANOXIC	BSNX	EVAPORATOR	EV	OZONE GENERATOR	OGEN	SOLIDS BLENDER-INLINE	SBIL	VALVE, SURGE ARRESTOR	VSA		
BASIN, BNR	BSNR	EXPANSION CHAMBER	EXC	PARTICLE COUNTER	PCN	STOP PLATE	STPL	VALVE, SLEEVE	VSL V		
BASIN, CHLORINE CONTACT	BSNC	FAN SUPPLY OR EXHAUST	FAN	PELLETIZER	PLT	STRAINER	STR	VALVE, SOLENOID	VSL		
BASIN, OZONE CONTACT	BSNO	FILTER SEPARATOR	FTSP	PIPE	PSE	STRAINER - BASKET TYPE	STRB	VALVE, THERMAL SHUTOFF	VTS		
BELT FILTER PRESS	BFPS	FILTER, CARTRIDGE TYPE	FLC	PLATE SETTLER	PSE	STRAINER - Y TYPE	STRY	VALVE, THREE WAY	VTW		
BIN (STORAGE - ALL TYPES)	B	FILTER, UNDERDRAINS AND MEDIA	FLT	POLYMER RING	PIR	SURGE CHAMBER	SRCH	VALVE, VACUUM BREAKER	VVB		
BIN ACTIVATOR	BA	FILTER, SURFACE WASH EQUIPMENT	FSW	POWER SUPPLY UNIT	PSU	TANK, ABOVE GROUND STORAGE	TSA	VALVE, VACUUM RELIEF	VSV		
BLOWER, CENTRIFUGAL	BLC	FITTING, MISCELLANEOUS	FTTNG	PULSATION DAMPNER	PD	TANK, AMMONIA STORAGE	TCN	VALVE, V-PORT BALL	VBP		
BLOWER, POSITIVE DISPLACEMENT	BL	FLAME ARRESTER	FAR	PUMP, AIR DIAPHRAGM	PAD	TANK, CRYOGENIC STORAGE	TCR	VAPORIZER	VAP		
BOILER	BLR	FLAME CHECK	FC	PUMP, CENTRIFUGAL	PCL	TANK, DOUBLE WALL	DWT	WEIR, CIPOLETTI	WC		
BUILDING SERVICES EQUIPMENT	EQPB	FLOCCULATOR, HORIZONTAL	FLCH	PUMP, DOUBLE DIAPHRAGM	PDD	TANK, ELEVATED STORAGE	TSE	WEIR, RECTANGULAR	WR		
CALIBRATION COLUMN	CCLM	FLOCCULATOR, VERTICAL	FLCV	PUMP, DIAPHRAGM METERING	PDM	TANK, EXPANSION	TX	WEIR, V-NOTCH	WV		
CENTRIFUGE	CFG	FLOOR DRAIN	FD	PUMP, HEATING WATER	PHW	TANK, FRP CHEMICAL STORAGE	TCF	WELL, HORIZONTAL COLLECTOR	WLHC		
CHEMICAL FEEDER	CHF	FLOW SPLITTER	FS	PUMP, HORIZONTAL END SUCTION	PHE	TANK, GENERAL OR UNSPECIFIED	TNK	WELL, VERTICAL	WL V		
CHLORINE GAS SCRUBBER	CGS	FLUME, PARSHALL	FE	PUMP, HORIZONTAL SPLIT CASE	PSC	TANK, PE CHEMICAL STORAGE	TCP				
CLARIFIER, PRIMARY	PCLR	FOAM SEPARATOR	FMSP	PUMP, PERISTALTIC	PPS	TANK, STEEL CHEMICAL STORAGE	TCS				
CLARIFIER, SECONDARY	SCLR	GAS CYLINDER	CYG	PUMP, PLUNGER	PPL	TANK, STEEL WATER STORAGE	TSW				
CLASSIFIER, GRIT	CCR	GAS FEEDER	GFD	PUMP, PROGRESSING CAVITY	PPC	TRAP, DRIP	TRP				
CLEARWELL	CW	GAS FLARE	GF	PUMP, SCREW ENCLOSED	PSEN	TRAP, SEDIMENT	TRPS				
COMPRESSOR	CMP	GAS WATER HEATER	QWH	PUMP, SCREW OPEN	PSO	TURBIDIMETER	TB				
COMPRESSOR, BASE MOUNTED	CMB	GATE, FLAP	GFL	PUMP, SUBMERSIBLE	PSM	UNINTERRUPTABLE POWER SUPPLY	UPS				
COMPRESSOR, ROTARY SCREW	CMR	GATE, SLIDE	GSD	PUMP, SUBMERSIBLE CHOPPER	PCH	VACUUM REGULATOR	VRG				
CONTAINER, PROCESS	CTR	GATE, SLUICE	GSC	PUMP, SUBMERSIBLE SUMP	PSS	VALVE, AIR RELEASE	VR				
CONVEYOR, BELT	COB	GATE, WEIR	G	PUMP, SUMP	PSP	VALVE, AIR-VACUUM	VRAV				
CONVEYOR, SCREW	COS	GRAVITY BELT THICKENER	GBT	PUMP, UNSPECIFIED TYPE	P	VALVE, ANGLE	VAG				
COVER, ALUMINUM DOME BASIN	CFA	GRAVITY THICKENER	GVT	PUMP, VERTICAL DIFFUSION VANE	PVD	VALVE, ANWNA BALL	VBL				
COVER, FIXED DIGESTER	CFD	GRINDER	GRD	PUMP, VERTICAL END SUCTION	PVE	VALVE, ANWNA BUTTERFLY	VBF				
COVER, FLOATING DIGESTER	CFL	GRIT BASIN, AERATED OR VORTEX TYPE	GRB	PUMP, VERTICAL WET PIT	PVW	VALVE, BALL MISCELLANEOUS	VBM				
CRANE	CR	GRIT EQUIPMENT, FORCED VORTEX	GRV	RESERVOIR	RSV	VALVE, CHECK	VCK				
CRANE, GANTRY	CRG	HEAT EXCHANGER	HEX	RESIDUAL COLLECTOR	RCO	VALVE, CONE	VON				
CRANE, JIB	CRJ	HOIST, CHAIN	HSC	ROTAMETER	RM	VALVE, DIAPHRAGM OPERATED	VDG				
CRANE, PORTABLE GANTRY	CRP	HOIST, WIRE ROPE	HSE	RUPTURE DISK	RD	VALVE, DOUBLE DISC GATE	VGD				
CRANE, TRAVELLING BRIDGE	CRT	HYDRANT, FIRE	HYDF	SAMPLER	SAMP	VALVE, ECCENTRIC PLUG	VPL				
CYLINDER, CHLORINE	CYL	HYDRANT, WALL	HYDW	SCALE	SC	VALVE, EXPLOSION RELIEF	VER				
DEWATERING SCREW	DWS	HYDROCYCLONE	HYC	SCREEN, MECHANICALLY CLEANED BAR	SCRA	VALVE, GATE	VG				
DIAPHRAGM SEAL	DPS	INJECTOR, CHEMICAL	INJ	SCREEN, MECHANICALLY CLEANED DRUM	SCRD	VALVE, GENERAL OR UNSPECIFIED	V				
DIFFUSER	DIF	LIME SLAKER	LS	SCREEN, STEP	SCRS	VALVE, GLOBE	VGL				
DIFFUSER BANK	DFB	SCREEN, TRAVELLING WATER	SCT	SCREEN, TRAVELLING WATER	SCT	VALVE, INDUSTRIAL BUTTERFLY	VBI				

DESIGNED:

DETAILED:

CHECKED:

APPROVED:

DATE: DECEMBER 2014

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO. 182262

ISSUED FOR CONSTRUCTION

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Virginia Beach, VA

LEGEND AND ABBREVIATIONS - SHEET 3 OF 3

INSTRUMENTATION

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

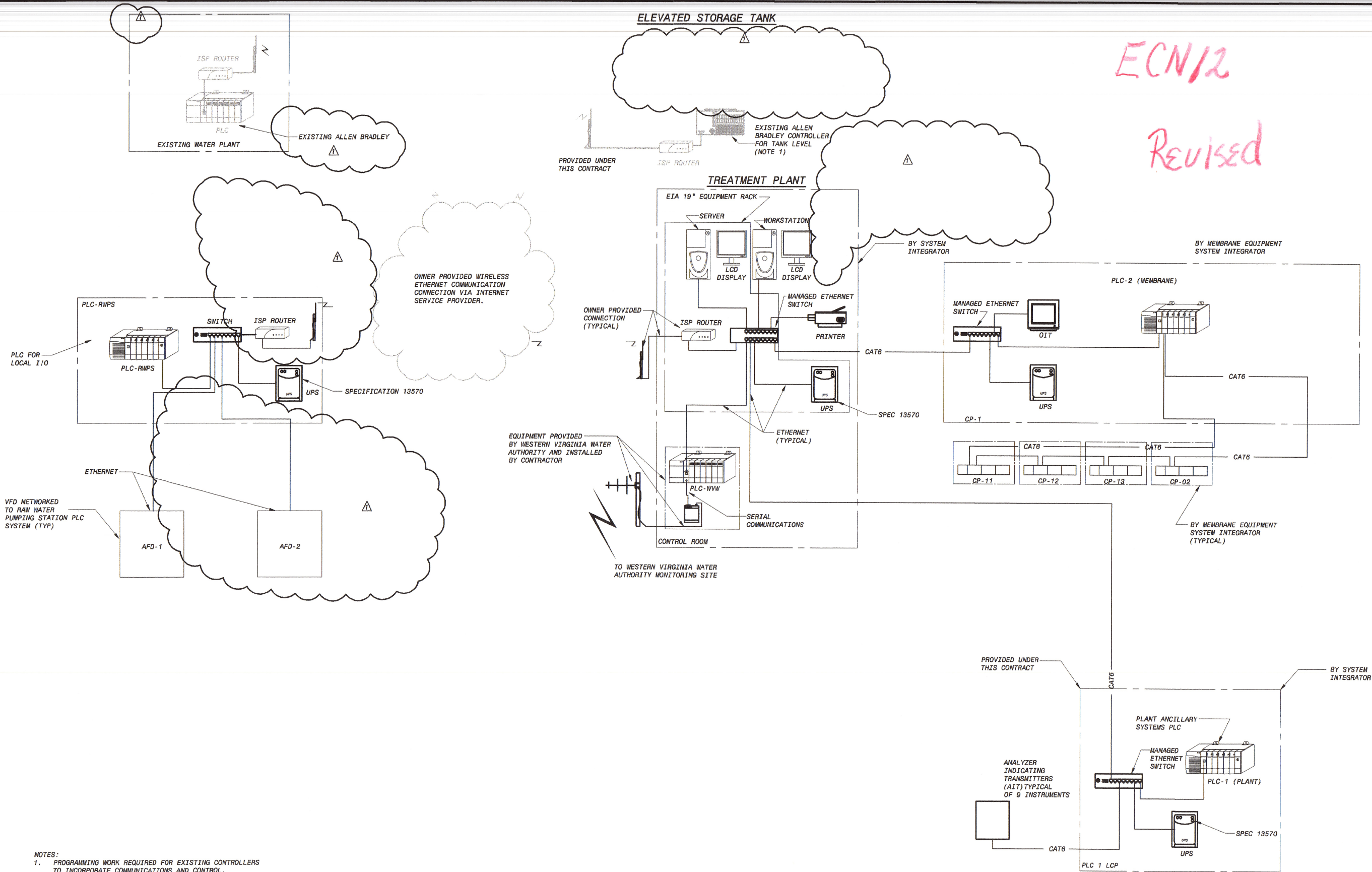
PROJECT NO. 182262

ISSUED FOR CONSTRUCTION

SHEET OF

0 1/2 1

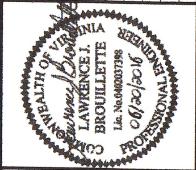
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE



NOTES:
1. PROGRAMMING WORK REQUIRED FOR EXISTING CONTROLLERS
TO INCORPORATE COMMUNICATIONS AND CONTROL.

ECN/12
Revised

DATE	BY	CHK	APP
06/20/16	LJB	1	
12/10/15	LJB	0	
DATE	REV	ISSUE	NO.
06/20/16	WTP		
1-00-004.dwg			
SAVED: 06/20/2016 9:26:51 AM			
PLOTTED: 06/20/2016 12:42:37 PM			
USER: BMS2008			



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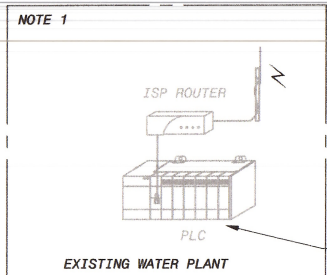
BEDFORD REGIONAL WATER AUTHORITY
SMITH MOUNTAIN LAKE WTP &
RAW WATER PUMPING STATION / INTAKE
INSTRUMENTATION
CONTROL BLOCK DIAGRAM

DESIGNED: LJB
DETAILED: LJB
CHECKED:
APPROVED:
DATE: DECEMBER 2014

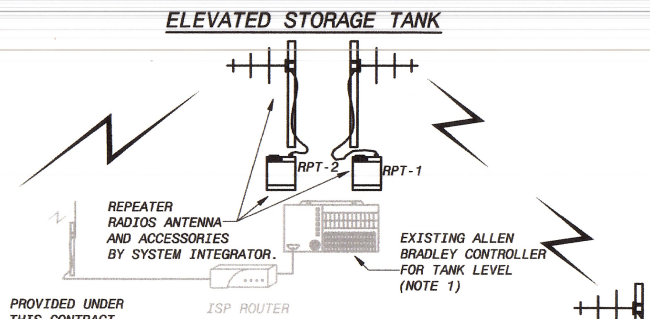
0 1/2 1
IF THIS BAR DOES NOT
MEASURE 1" THEN DRAWING IS
NOT TO FULL SCALE
PROJECT NO.
182262

I-00-004
SHEET
OF

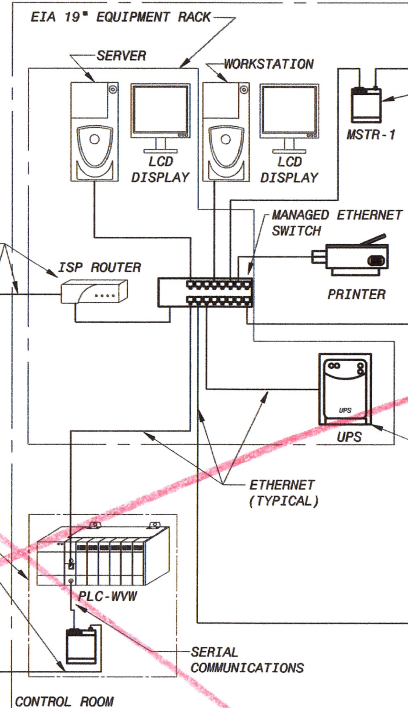
ISSUED FOR CONSTRUCTION



EXISTING ALLEN BRADLEY CONTROLLER FOR CONTROL OF POTASSIUM PERMANGANATE



TREATMENT PLANT



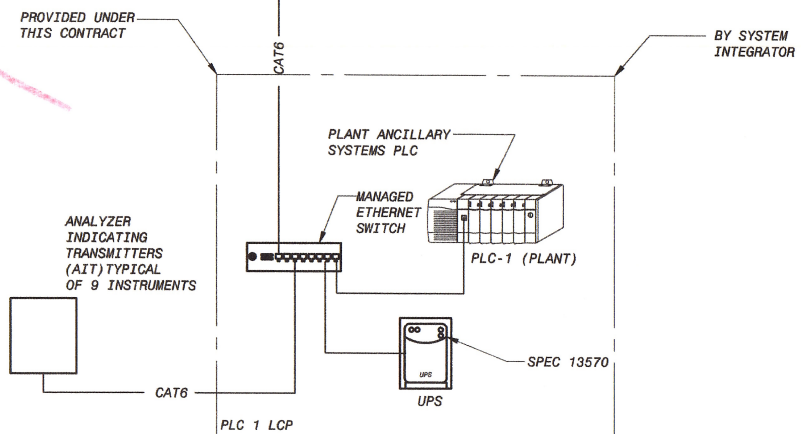
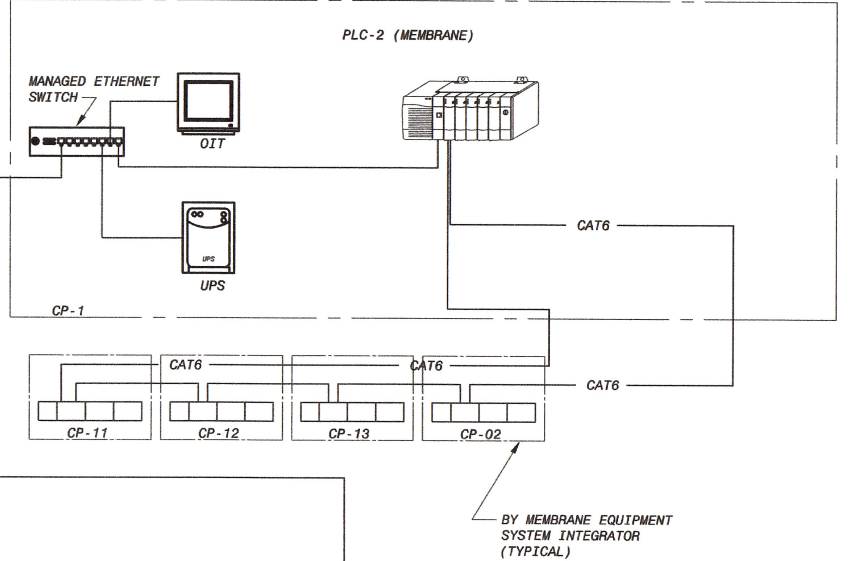
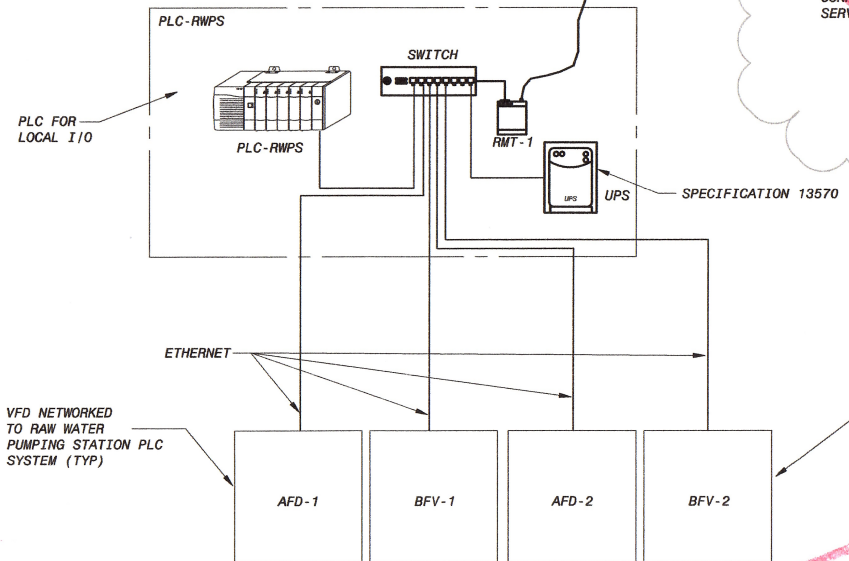
EQUIPMENT PROVIDED BY WESTERN VIRGINIA WATER AUTHORITY AND INSTALLED BY CONTRACTOR

VALVE NETWORKED TO RAW WATER PUMPING STATION PLC SYSTEM (TYP)

TO WESTERN VIRGINIA WATER AUTHORITY MONITORING SITE

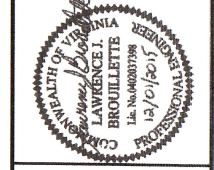
SEE REVISED

RADIO COMMUNICATION SHOWN USING ETHERNET RADIO, OTHER TYPES AND FREQUENCIES ARE ACCEPTABLE. FREQUENCY AND NECESSARY LICENSE IS THE RESPONSIBILITY OF THE SYSTEM INTEGRATOR.



NOTES:
1. PROGRAMMING WORK REQUIRED FOR EXISTING CONTROLLERS TO INCORPORATE COMMUNICATIONS AND CONTROL.

NO.	BY	CHK	DATE	REVISIONS AND RECORD OF ISSUE
0	LJB	JND	12/01/15	ISSUED FOR CONSTRUCTION
1	BY	CHK	12/01/15	REVISIONS AND RECORD OF ISSUE

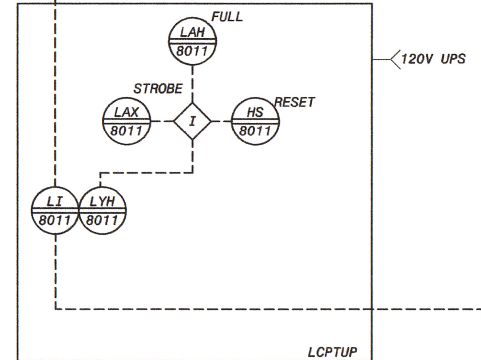


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BEDFORD REGIONAL WATER AUTHORITY
SMITH MOUNTAIN LAKE WTP &
RAW WATER PUMPING STATION / INTAKE
INSTRUMENTATION
CONTROL BLOCK DIAGRAM

DESIGNED: LJB
DETAILED: LJB
CHECKED:
APPROVED:
DATE: DECEMBER 2014
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE
PROJECT NO. 182262
I-00-004 SHEET OF

ISSUED FOR CONSTRUCTION



1. SEE LEGEND ON DRAWING I-00-001, I-00-002 AND I-00-003.
2. SYSTEM CODE IS NULL UNLESS OTHERWISE NOTED.
3. LOCATE P-TAP FILL VALVE NO MORE THAN 5 FEET ABOVE FINISHED FLOOR. P-TAP TO BE FILLED WITH WATER PRIOR TO TANK FILL.
4. LOCAL CONTROL DEVICES, SUCH AS INDICATING LIGHTS AND SWITCHES, ON LOCAL AND REMOTE PUMPS MUST BE INDICATED ON THIS P&ID.
5. PUMP SUCTION PIPING SHALL BE ROUTED TO SLOPE DOWNWARD FROM TANK WITHOUT HIGH POINTS OR LOW POINTS. TANK DISCHARGE PIPING SHALL SLOPE DOWNWARD FROM EACH TANK TO METERING PUMP SUCTION HEADER.

1. SEE MEMBRANE SYSTEM SUPPLIER/GE DRAWINGS FOR CONTINUATION.

ISSUED FOR CONSTRUCTION

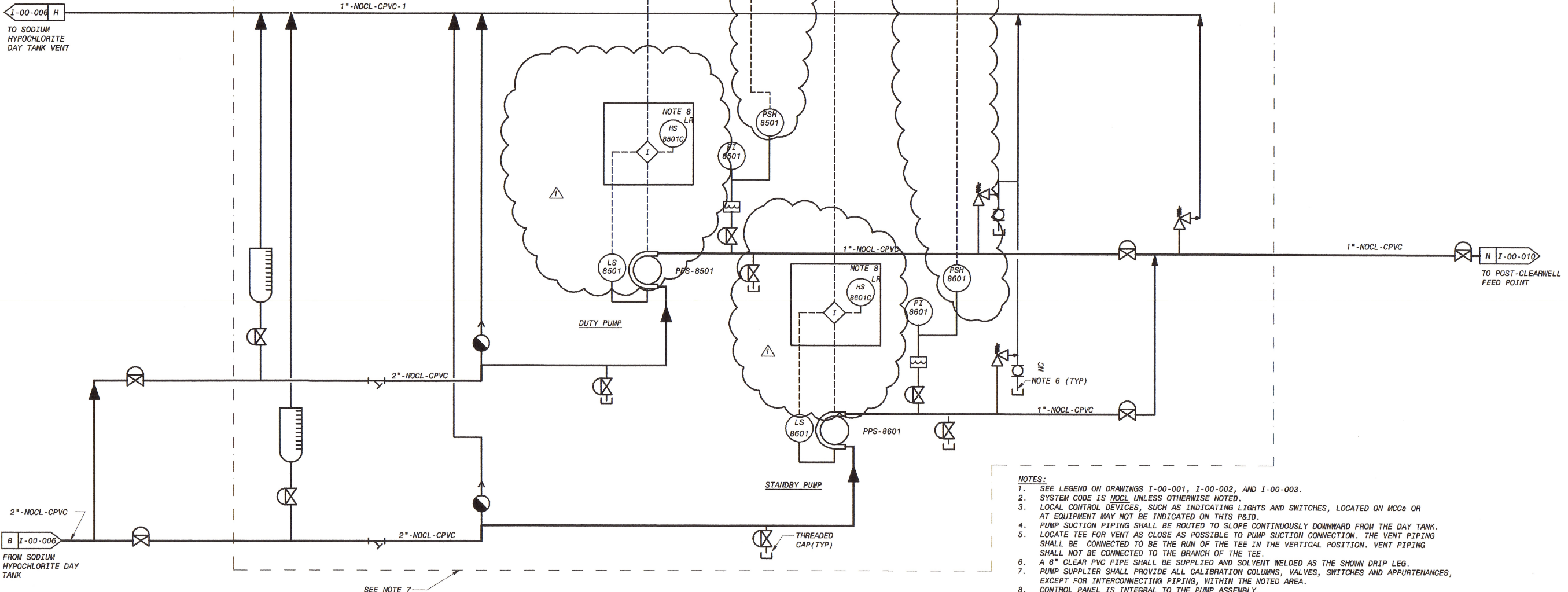
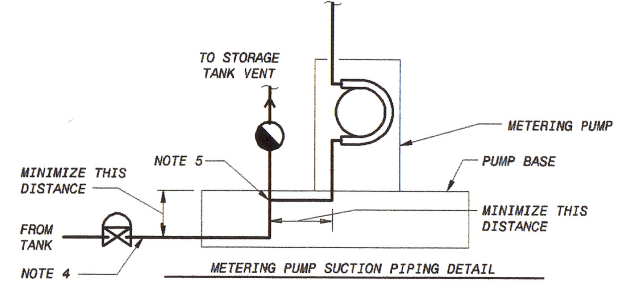
<p>BEDFORD REGIONAL WATER AUTHORITY SMITH MOUNTAIN LAKE WTP & RAW WATER PUMPING STATION / INTAKE</p>		<p>BLACK & VEATCH Building a world of difference.[®]</p>		<p>Black & Veatch Corporation Virginia Beach, VA</p>		<p>INSTRUMENTATION - P&ID SODIUM HYPOCHLORITE SYSTEM STORAGE TANKS</p>	
<p>DESIGNED:</p>		<p>DATE: DECEMBER 2014</p>		<p>0 1/2</p>		<p>IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE.</p>	
<p>DETAILED:</p>		<p>CHECKED:</p>		<p>PROJECT NO. 182262</p>		<p>I-00-006</p>	
<p>APPROVED:</p>		<p>DATE:</p>		<p>SHEET OF</p>		<p></p>	

PLC-1

TOTAL DISTRIBUTION FLOW FROM HIGH SERVICE PUMP STATION. FLOW UTILIZED TO FLOW PACE POST-CLEARWELL CHLORINE FEED. SEE SPECIFICATION 13550.

FINISHED WATER PUMP STATION CHLORINE RESIDUAL UTILIZED TO TRIM THE FLOW PACE SIGNAL FOR CHLORINE FEED. SEE SPECIFICATION 13550.

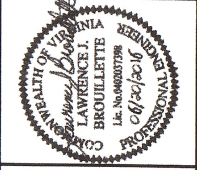
ECN 12
REVISED



- NOTES:
- SEE LEGEND ON DRAWINGS I-00-001, I-00-002, AND I-00-003.
 - SYSTEM CODE IS NOCL UNLESS OTHERWISE NOTED.
 - LOCAL CONTROL DEVICES, SUCH AS INDICATING LIGHTS AND SWITCHES, LOCATED ON MCCs OR AT EQUIPMENT MAY NOT BE INDICATED ON THIS P&ID.
 - PUMP SUCTION PIPING SHALL BE ROUTED TO SLOPE CONTINUOUSLY DOWNWARD FROM THE DAY TANK. LOCATE TEE FOR VENT AS CLOSE AS POSSIBLE TO PUMP SUCTION CONNECTION. THE VENT PIPING SHALL BE CONNECTED TO BE THE RUN OF THE TEE IN THE VERTICAL POSITION. VENT PIPING SHALL NOT BE CONNECTED TO THE BRANCH OF THE TEE.
 - A 6" CLEAR PVC PIPE SHALL BE SUPPLIED AND SOLVENT WELDED AS THE SHOWN DRIP LEG.
 - PUMP SUPPLIER SHALL PROVIDE ALL CALIBRATION COLUMNS, VALVES, SWITCHES AND APPURTENANCES, EXCEPT FOR INTERCONNECTING PIPING, WITHIN THE NOTED AREA.
 - CONTROL PANEL IS INTEGRAL TO THE PUMP ASSEMBLY.

SODIUM HYPOCHLORITE METERING PUMPS - POST CLEARWELL FEED

NO.	BY	CHK	APP	REVISIONS AND RECORD OF ISSUE	DATE	ISSUED FOR CONSTRUCTION	ECN-012 AND MISCELLANEOUS CHANGES
1	LJB				01/20/2015	ISSUED FOR CONSTRUCTION	ECN-012 AND MISCELLANEOUS CHANGES
0	LJB				01/20/2015	ISSUED FOR CONSTRUCTION	ECN-012 AND MISCELLANEOUS CHANGES



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BEDFORD REGIONAL WATER AUTHORITY
SMITH MOUNTAIN LAKE WTP &
RAW WATER PUMPING STATION / INTAKE

INSTRUMENTATION - P&ID
SODIUM HYPOCHLORITE SYSTEM
POST-CLEARWELL FEED

DESIGNED:	DATE:	DECEMBER 2014
DETAILED:		
CHECKED:		
APPROVED:		
PROJECT NO.		182262
SHEET		OF

ISSUED FOR CONSTRUCTION

PLC-1

I-00-010

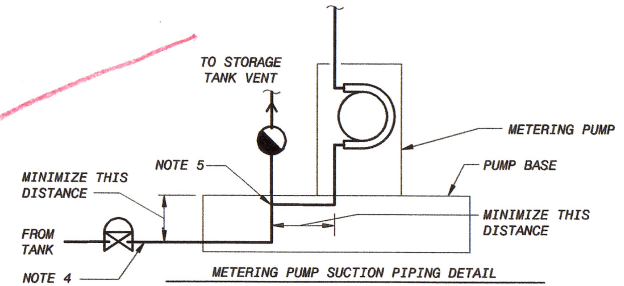
TOTAL DISTRIBUTION FLOW FROM HIGH SERVICE PUMP STATION. FLOW UTILIZED TO FLOW PACE POST-CLEARWELL CHLORINE FEED. SEE SPECIFICATION 13550.

I-00-012

FINISHED WATER PUMP STATION CHLORINE RESIDUAL UTILIZED TO TRIM THE FLOW PACE SIGNAL FOR CHLORINE FEED. SEE SPECIFICATION 13550.

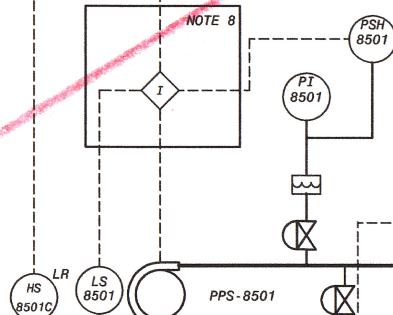
SODIUM HYPOCHLORITE PUMP PPS-8501 IN-REMOTE
SODIUM HYPOCHLORITE PUMP PPS-8501 RUNNING
SODIUM HYPOCHLORITE PUMP PPS-8501 FAIL
SODIUM HYPOCHLORITE PUMP PPS-8501 RUN CMD
SODIUM HYPOCHLORITE PUMP PPS-8501 SPEED SETPOINT
SODIUM HYPOCHLORITE PUMP PPS-8501 HIGH PRESSURE
SODIUM HYPOCHLORITE PUMP PPS-8501 SPEED FEEDBACK
SODIUM HYPOCHLORITE PUMP PPS-8601 IN-REMOTE
SODIUM HYPOCHLORITE PUMP PPS-8601 RUNNING
SODIUM HYPOCHLORITE PUMP PPS-8601 FAIL
SODIUM HYPOCHLORITE PUMP PPS-8601 RUN CMD
SODIUM HYPOCHLORITE PUMP PPS-8601 SPEED SETPOINT
SODIUM HYPOCHLORITE PUMP PPS-8601 HIGH PRESSURE
SODIUM HYPOCHLORITE PUMP PPS-8601 SPEED FEEDBACK

SEE REVISED

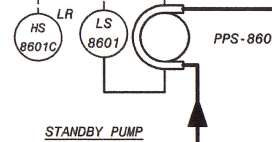


I-00-006 H
TO SODIUM HYPOCHLORITE DAY TANK VENT

1" -NOCL-CPVC-1



1" -NOCL-CPVC



1" -NOCL-CPVC

I-00-010
TO POST-CLEARWELL FEED POINT

2" -NOCL-CPVC

B I-00-006
FROM SODIUM HYPOCHLORITE DAY TANK

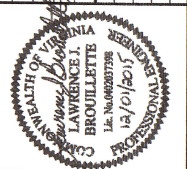
2" -NOCL-CPVC

SEE NOTE 7

SODIUM HYPOCHLORITE METERING PUMPS - POST CLEARWELL FEED

NOTES:

1. SEE LEGEND ON DRAWINGS I-00-001, I-00-002, AND I-00-003.
2. SYSTEM CODE IS NOCL UNLESS OTHERWISE NOTED.
3. LOCAL CONTROL DEVICES, SUCH AS INDICATING LIGHTS AND SWITCHES, LOCATED ON MCCs OR AT EQUIPMENT MAY NOT BE INDICATED ON THIS P&ID.
4. PUMP SUCTION PIPING SHALL BE ROUTED TO SLOPE CONTINUOUSLY DOWNWARD FROM THE DAY TANK. LOCATE TEE FOR VENT AS CLOSE AS POSSIBLE TO PUMP SUCTION CONNECTION. THE VENT PIPING SHALL BE CONNECTED TO BE THE RUN OF THE TEE IN THE VERTICAL POSITION. VENT PIPING SHALL NOT BE CONNECTED TO THE BRANCH OF THE TEE.
5. A 6" CLEAR PVC PIPE SHALL BE SUPPLIED AND SOLVENT WELDED AS THE SHOWN DRIP LEG.
6. PUMP SUPPLIER SHALL PROVIDE ALL CALIBRATION COLUMNS, VALVES, SWITCHES AND APPURTENANCES, EXCEPT FOR INTERCONNECTING PIPING, WITHIN THE NOTED AREA.
7. CONTROL PANEL IS INTEGRAL TO THE PUMP ASSEMBLY.



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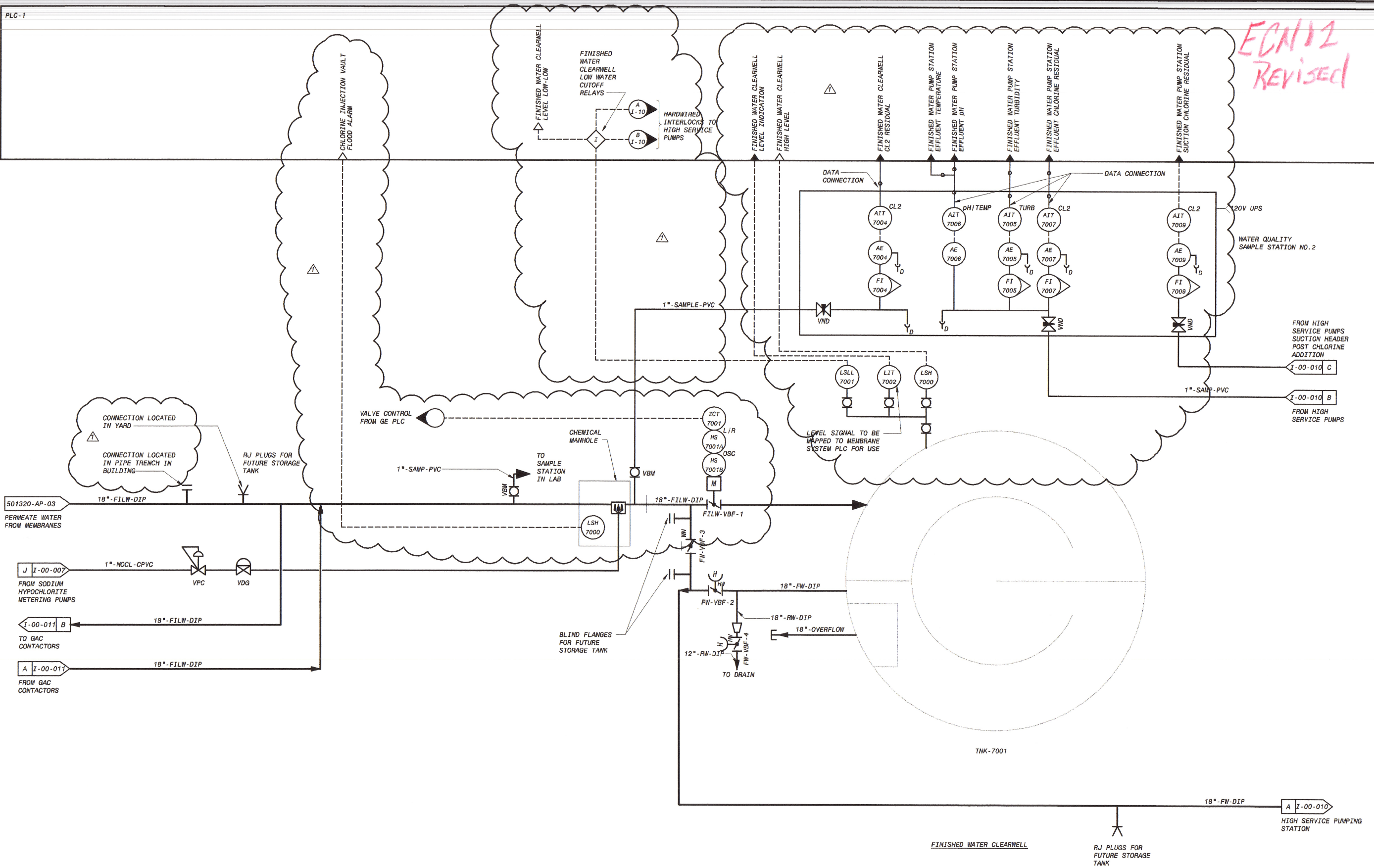
BEDFORD REGIONAL WATER AUTHORITY
SMITH MOUNTAIN LAKE WTP &
RAW WATER PUMPING STATION / INTAKE

INSTRUMENTATION - P&ID
SODIUM HYPOCHLORITE SYSTEM
POST-CLEARWELL FEED

DESIGNED:	
DETAILED:	
CHECKED:	
APPROVED:	
DATE:	DECEMBER 2014
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE	
PROJECT NO. 182262	
I-00-008 SHEET OF	

ISSUED FOR CONSTRUCTION

PLC-1



ECN 012
Revised

- NOTES:
1. SEE LEGEND ON DRAWINGS I-00-001, I-00-002 AND I-00-003.
 2. SYSTEM CODE IS FW UNLESS OTHERWISE NOTED.
 3. LOCAL CONTROL DEVICES SUCH AS INDICATING LIGHTS AND SWITCHES, LOCATED ON MCCs OR AT EQUIPMENT, MAY NOT BE INDICATED ON THIS P&ID.

DESIGNED: TRK	
DETAILED: TRK	
CHECKED:	
APPROVED:	
DATE: DECEMBER 2014	
PROJECT NO. 182262	
I-00-009 SHEET OF	

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SMITH MOUNTAIN LAKE WTP &
RAW WATER PUMPING STATION / INTAKE
INSTRUMENTATION - P&ID
FINISHED WATER CLEARWELL

0 1/2 1
IF THIS BAR DOES NOT
MEASURE 1" THEN DRAWING IS
NOT TO FULL SCALE

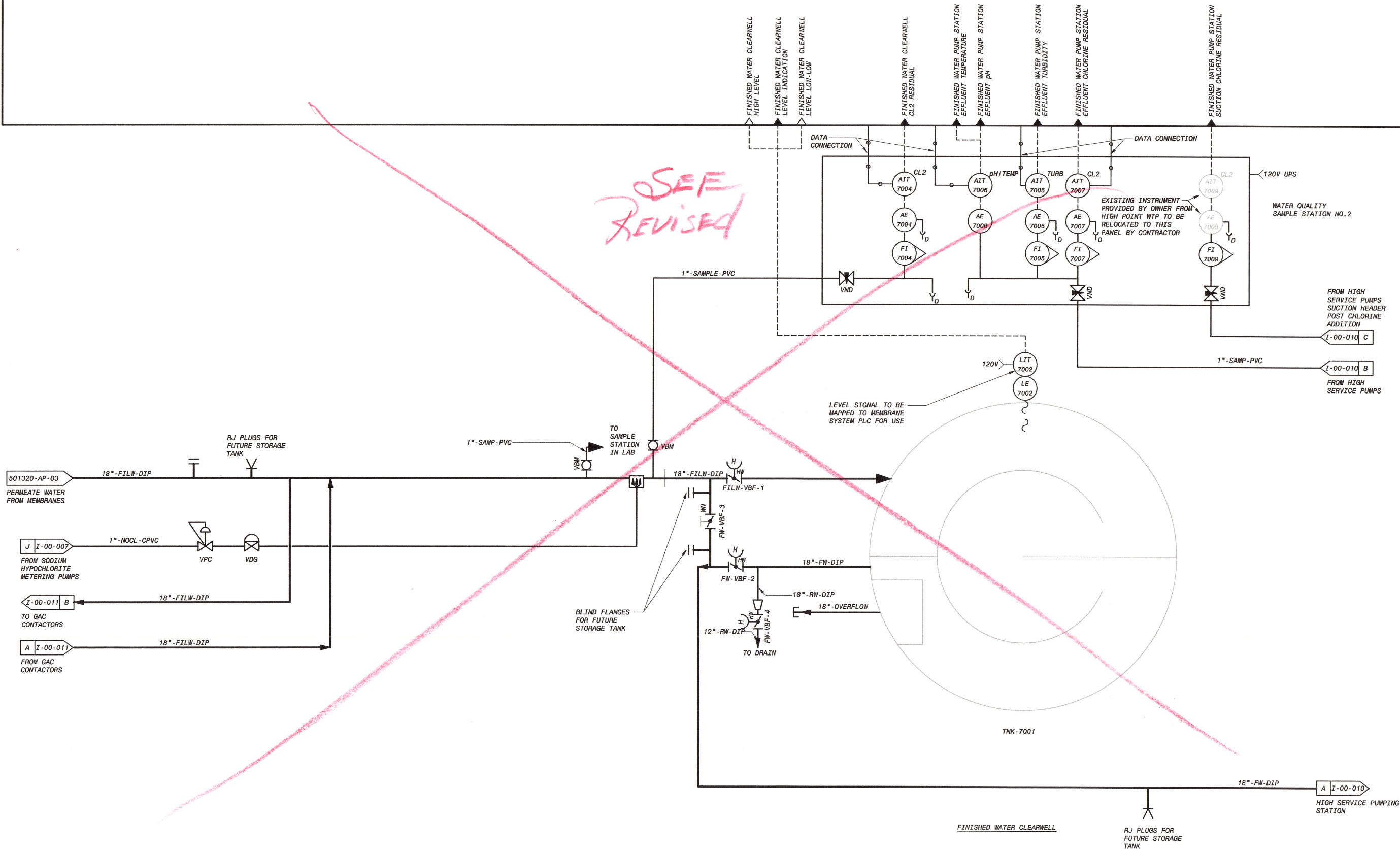
REVISIONS AND RECORD OF ISSUE

NO.	BY	CHK	APP	DATE	REVISIONS
1	LJB				ECN-012 AND MISCELLANEOUS CHANGES
0	LJB	UN	RUP		ISSUED FOR CONSTRUCTION

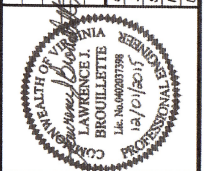
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PLOTED: BR052608, 7/11/2016 11:17:41 AM XREF2: Brouillette Seal.jpg
XREF3:

ISSUED FOR CONSTRUCTION



NO.	BY	CHK	APP
0	LJB	JUN	FND
ISSUED FOR CONSTRUCTION			
NO.	BY	CHK	APP
1	BY	CHK	APP
REVISIONS AND RECORD OF ISSUE			
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2	12/10/2015	6:56:28 AM	
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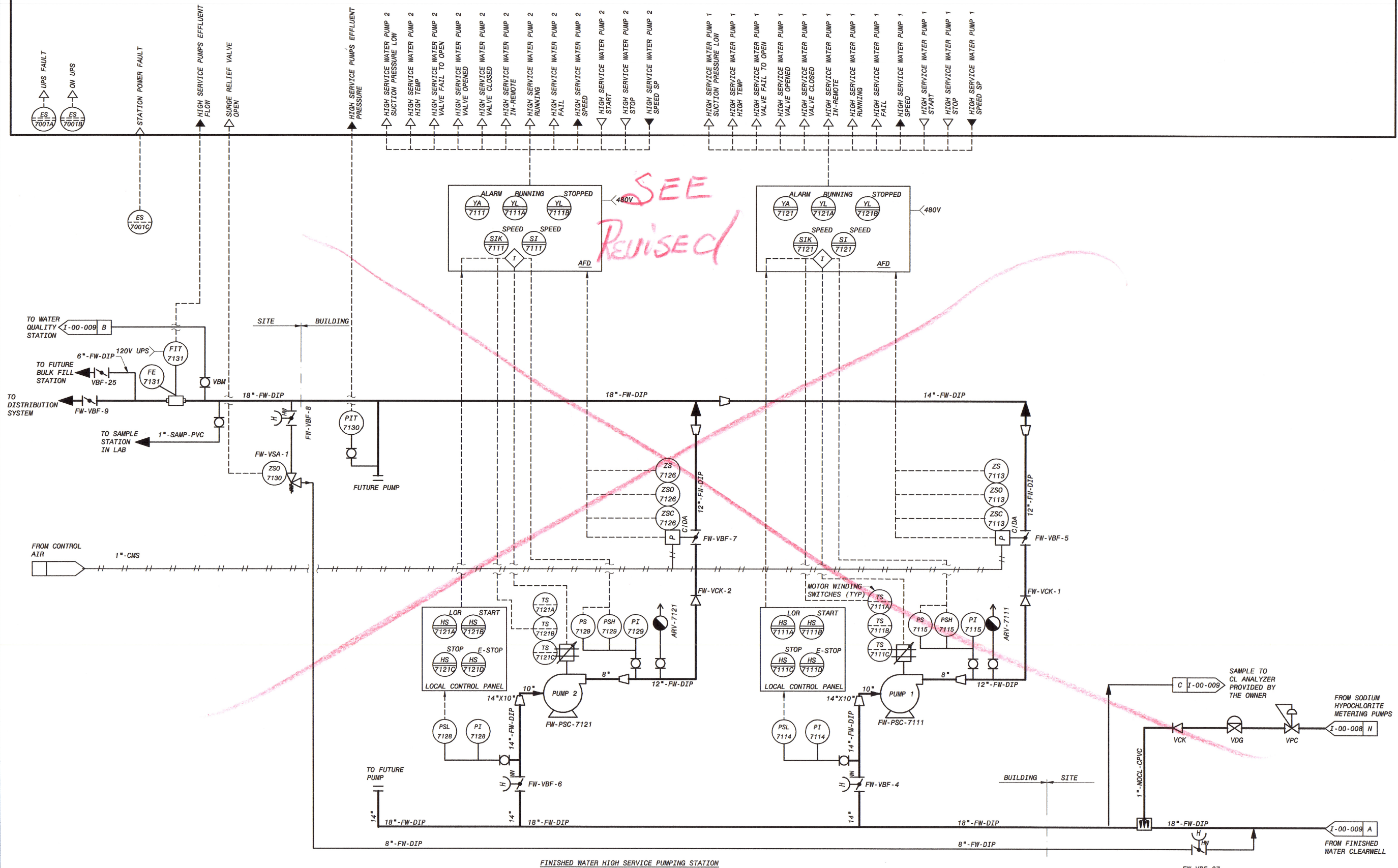
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BEDFORD REGIONAL WATER AUTHORITY
SMITH MOUNTAIN LAKE WTP & RAW WATER PUMPING STATION / INTAKE
INSTRUMENTATION - P&ID
FINISHED WATER CLEARWELL

DESIGNED:	
DETAILED:	TRK
CHECKED:	
APPROVED:	
DATE:	DECEMBER 2014
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE	
PROJECT NO. 182262	
I-00-009	
SHEET OF	

ISSUED FOR CONSTRUCTION

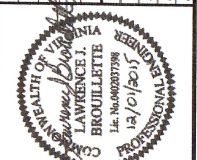
PLC-1



NOTES:

1. SEE LEGEND ON DRAWINGS I-00-001, I-00-002 AND I-00-003.
2. SYSTEM CODE IS FW UNLESS OTHERWISE NOTED.
3. LOCAL CONTROL DEVICES SUCH AS INDICATING LIGHTS AND SWITCHES, LOCATED ON MCCS OR AT EQUIPMENT, MAY NOT BE INDICATED ON THIS P&ID.

NO.	BY	CHK	APP
0	LJB	JM	PJD
ISSUED FOR CONSTRUCTION			
REVISIONS AND RECORD OF ISSUE			
DATE	12/10/2015		
USER	BR032608		
DATE	12/10/2015		
USER	BR032608		
DATE	12/10/2015		
USER	BR032608		



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BEDFORD REGIONAL WATER AUTHORITY
SMITH MOUNTAIN LAKE WTP &
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INSTRUMENTATION - P&ID
HIGH SERVICE PUMP STATION

DESIGNED:	TRK
CHECKED:	
APPROVED:	
DATE:	DECEMBER 2014

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.

182262

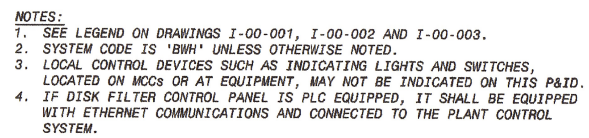
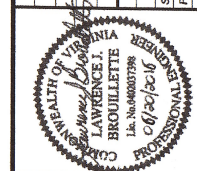
I-00-010

SHEET

ISSUED FOR CONSTRUCTION




<p>BEDFORD REGIONAL WATER AUTHORITY SMITH MOUNTAIN LAKE WTP & RAW WATER PUMPING STATION / INTAKE</p>		<p>BLACK & VEATCH Building a world of difference®</p>		<p>Black & Veatch Corporation Virginia Beach, VA</p>		<p>COMMONWEALTH OF VIRGINIA <i>James L. Lawrence I.</i> BROUILLETTE 1c No. 00001798 12/12/2015</p>		<p>DATE: 12/12/01/15 ISSUED FOR CONSTRUCTION REVISIONS AND RECORD OF ISSUE NO. BY CK APP</p>		<p>50.3082 - WTP I-00-011.dwg XREF1: Brouillette Seal.rpd XREF2: BORDER.dwg XREF3: FLOTTED: 89032608, 12/12/2015 10:38:07 AM 12/12/2015 10:01:45 AM</p>	
<p>DESIGNED:</p>						<p>Detailed: TRK</p>					
<p>CHECKED:</p>						<p>APPROVED:</p>					
<p>DATE: DECEMBER 2014</p>						<p>0 1/2 1 IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE</p>					
<p>PROJECT NO. 182262</p>						<p>I-00-011 SHEET OF</p>					

[illegible]

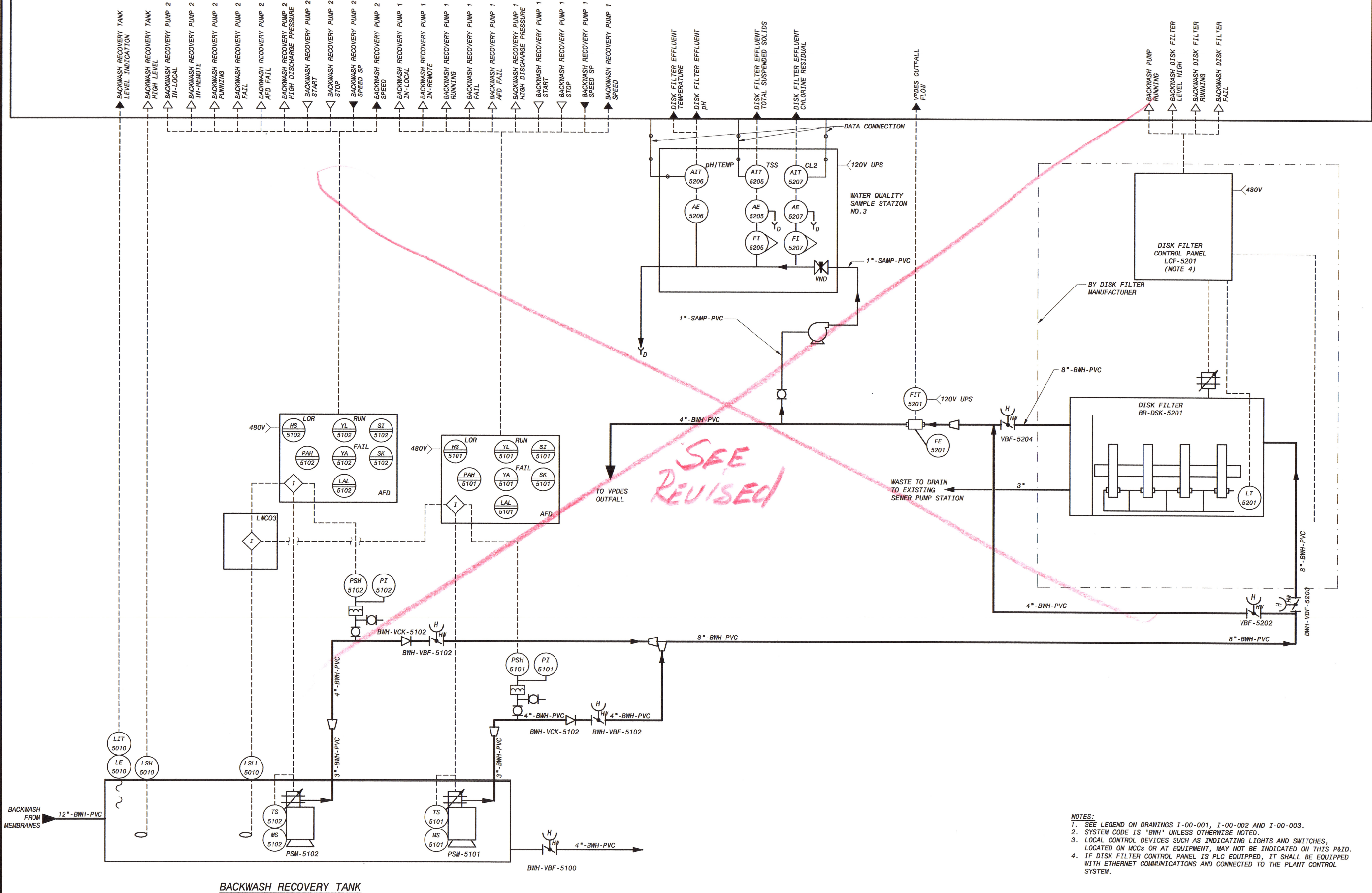
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BEDFORD REGIONAL WATER AUTHORITY SMITH MOUNTAIN LAKE WTP & RAW WATER PUMPING STATION / INTAKE	INSTRUMENTATION - P&ID FIRST STAGE MEMBRANE BACKWASH TREATMENT SYSTEM
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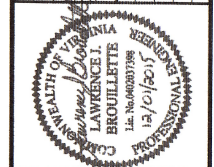
DESIGNED:	
DETAILED:	
CHECKED:	
APPROVED:	
DATE: FEBRUARY 2014	
 <p>IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE</p>	
PROJECT NO. 182262	
I-00-012 SHEET OF	

PLC-1



- NOTES:
- SEE LEGEND ON DRAWINGS I-00-001, I-00-002 AND I-00-003.
 - SYSTEM CODE IS 'BWH' UNLESS OTHERWISE NOTED.
 - LOCAL CONTROL DEVICES SUCH AS INDICATING LIGHTS AND SWITCHES, LOCATED ON MCCS OR AT EQUIPMENT, MAY NOT BE INDICATED ON THIS P&ID.
 - IF DISK FILTER CONTROL PANEL IS PLC EQUIPPED, IT SHALL BE EQUIPPED WITH ETHERNET COMMUNICATIONS AND CONNECTED TO THE PLANT CONTROL SYSTEM.

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Virginia Beach, VA

BEDFORD REGIONAL WATER AUTHORITY
SMITH MOUNTAIN LAKE WTP &
RAW WATER PUMPING STATION / INTAKE
INSTRUMENTATION - P&ID
FIRST STAGE MEMBRANE BACKWASH
TREATMENT SYSTEM

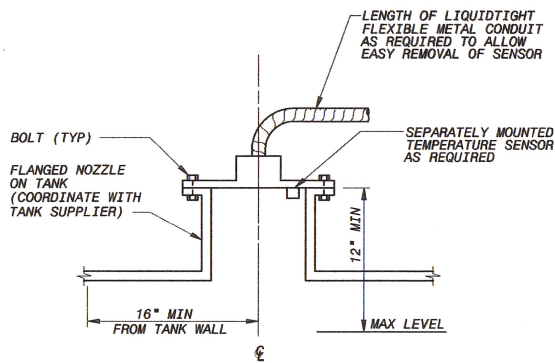
DESIGNED:
DETAILED:
CHECKED:
APPROVED:
DATE: DECEMBER 2014

0 1/2 1
IF THIS BAR DOES NOT
MEASURE 1" THEN DRAWING IS
NOT TO FULL SCALE

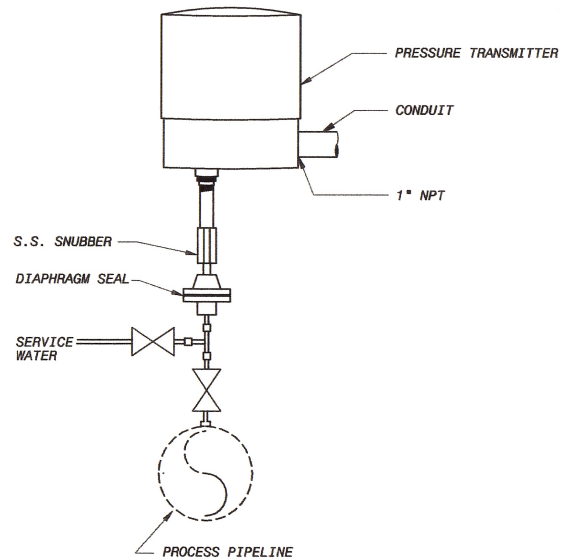
PROJECT NO.
182262

I-00-012
SHEET
OF

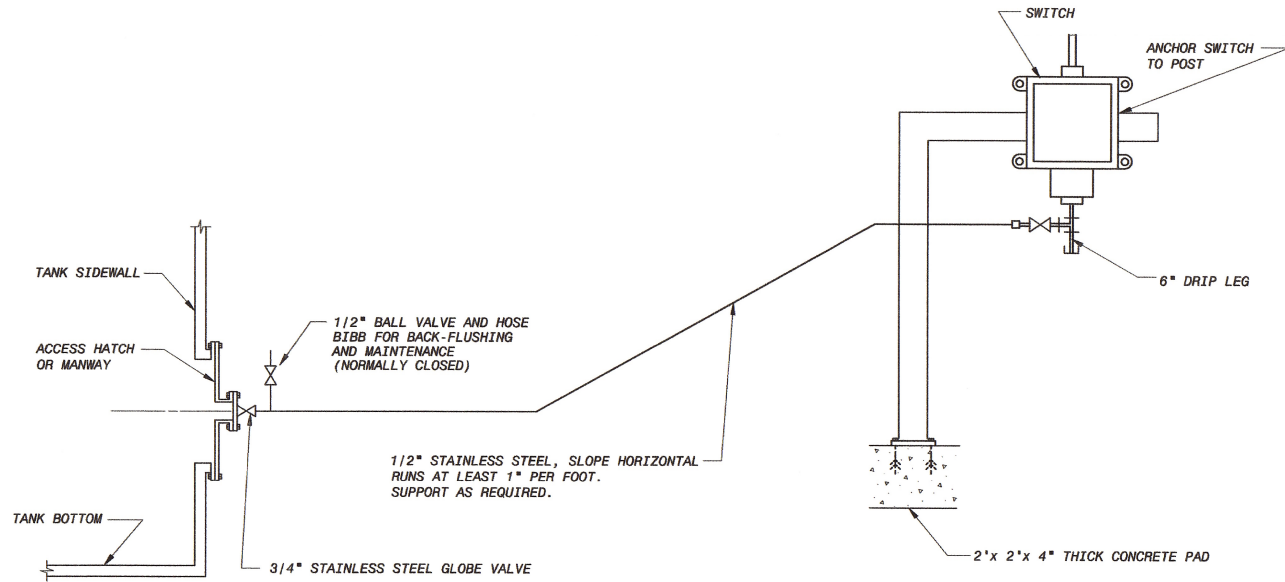
ISSUED FOR CONSTRUCTION



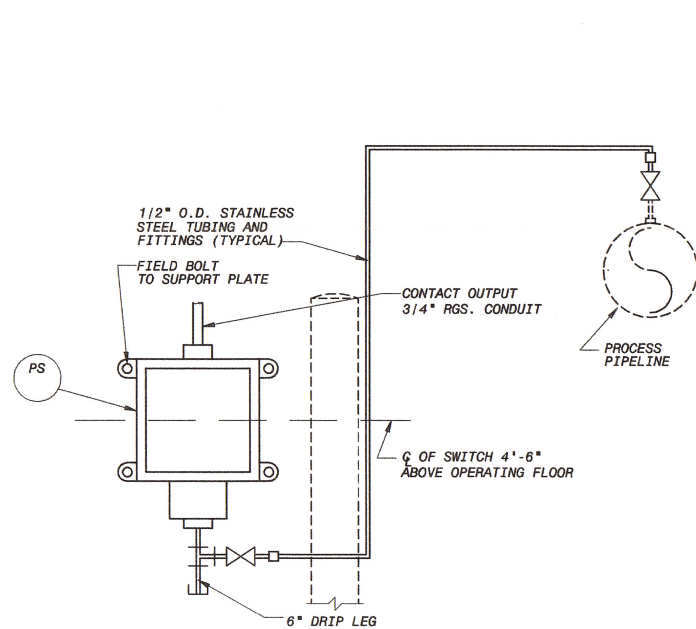
**ULTRASONIC LEVEL SENSOR
INSTALLATION DETAIL**
NO SCALE



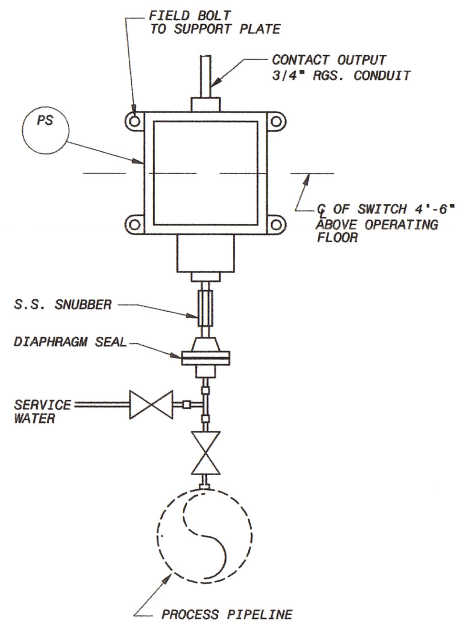
PRESSURE TRANSMITTER WITH DIAPHRAGM SEAL
NO SCALE



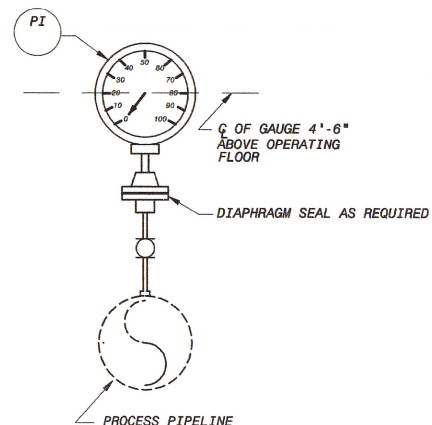
**FLANGE MOUNTED PRESSURE SENSING
LEVEL SWITCH INSTALLATION DETAIL**
NO SCALE



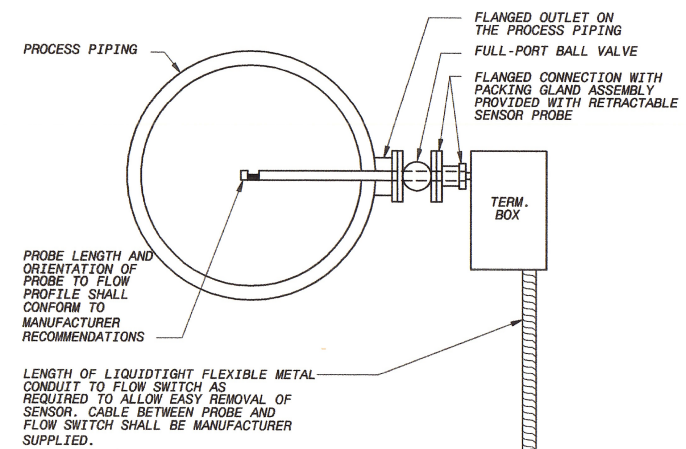
PRESSURE SWITCH (MOUNTED BELOW PROCESS)
NO SCALE



PRESSURE SWITCH (MOUNTED ABOVE PROCESS)
NO SCALE

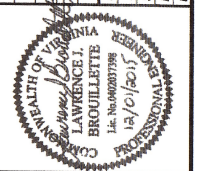


FIELD-MOUNT PRESSURE GAUGE
NO SCALE



**THERMAL DISPERSION FLOW SWITCH
HOT-TAP TYPE SENSOR
INSTALLATION DETAIL**
NO SCALE

NO.	BY	CHK	DATE	REVISIONS AND RECORD OF ISSUE	ISSUED FOR CONSTRUCTION
0	LJB	JM	12/12/15		
1	BY	CK	12/12/15		
2	BY	CK	12/12/15		
3	BY	CK	12/12/15		
4	BY	CK	12/12/15		
5	BY	CK	12/12/15		
6	BY	CK	12/12/15		
7	BY	CK	12/12/15		
8	BY	CK	12/12/15		
9	BY	CK	12/12/15		
10	BY	CK	12/12/15		
11	BY	CK	12/12/15		
12	BY	CK	12/12/15		
13	BY	CK	12/12/15		
14	BY	CK	12/12/15		
15	BY	CK	12/12/15		
16	BY	CK	12/12/15		
17	BY	CK	12/12/15		
18	BY	CK	12/12/15		
19	BY	CK	12/12/15		
20	BY	CK	12/12/15		



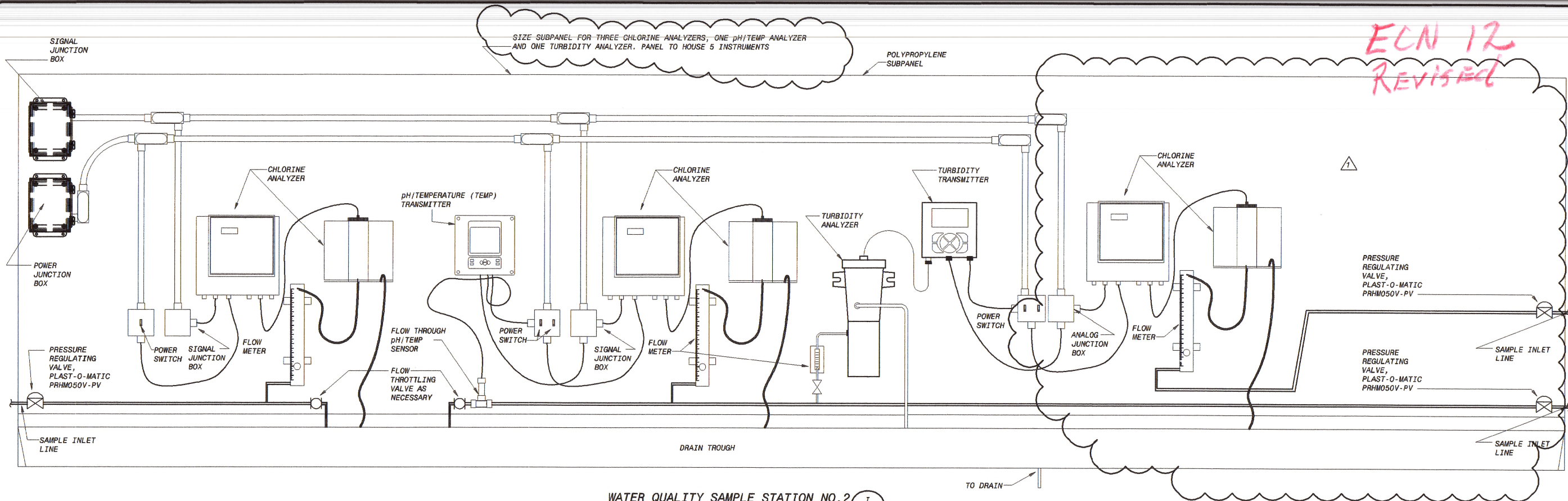
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Virginia Beach, VA

**BEDFORD REGIONAL WATER AUTHORITY
SMITH MOUNTAIN LAKE WTP &
RAW WATER PUMPING STATION / INTAKE**

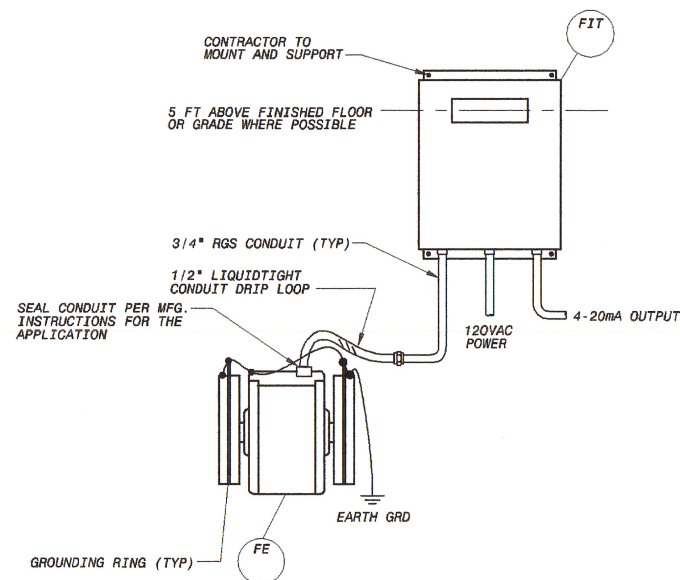
**INSTRUMENTATION
INSTALLATION DETAILS
SHEET 1 OF 3**

DESIGNED: TRK	DATE: DECEMBER 2014
DETAILED: TRK	
CHECKED:	
APPROVED:	
PROJECT NO. 182262	
I-00-013	
SHEET OF	

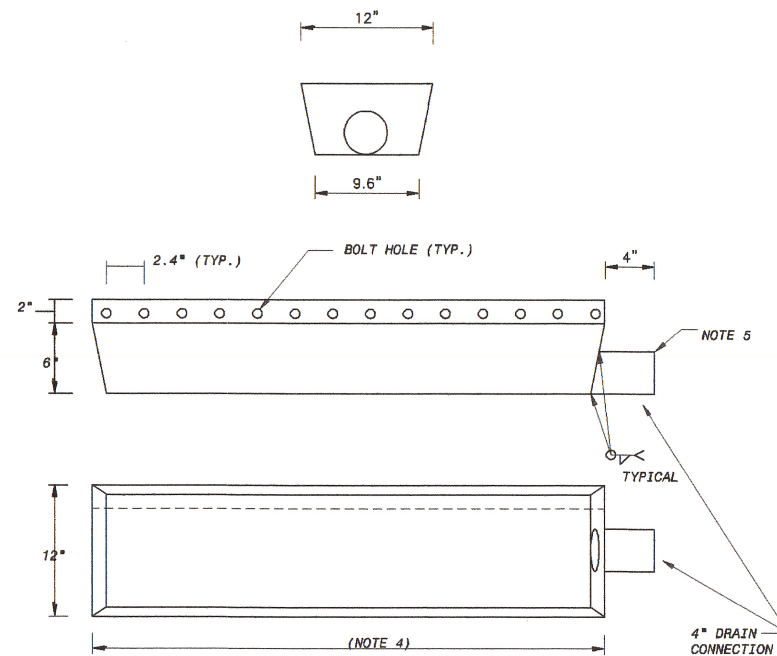
ISSUED FOR CONSTRUCTION



WATER QUALITY SAMPLE STATION NO. 2
INSTALLATION DETAIL (FRONT)
 NO SCALE

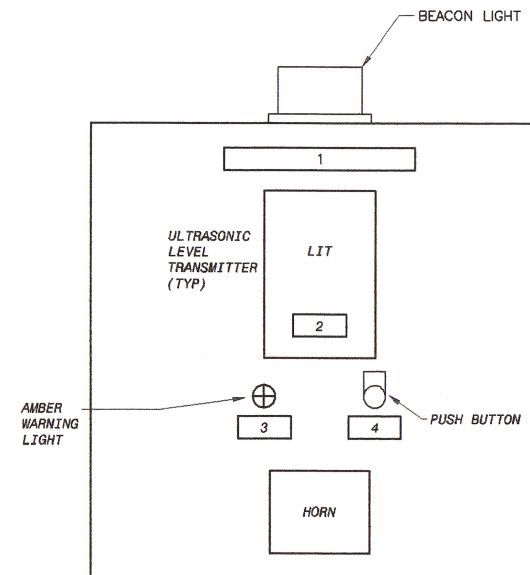


MAGNETIC FLOWMETER
INSTALLATION DETAIL
 NO SCALE
 NOTE: PIPE TO BE SUPPORTED ON BOTH SIDES OF METER.



WATER QUALITY STATION DRAIN TROUGH DETAILS
 NO SCALE

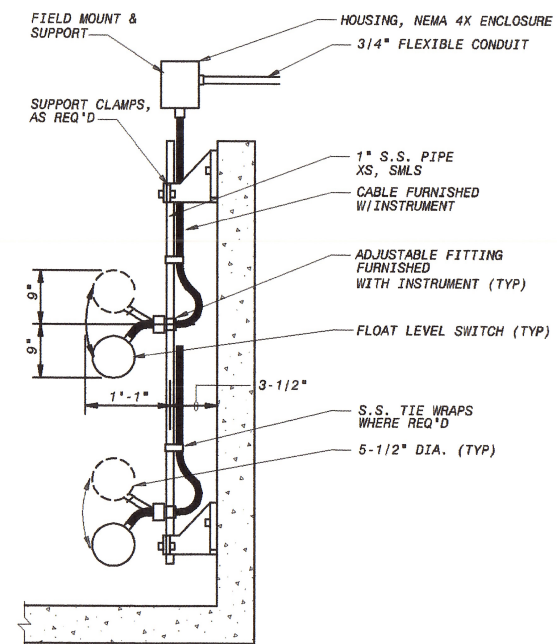
- NOTES:
1. CONSTRUCT TROUGH USING 14 GA 304 STAINLESS STEEL.
 2. ALL WELDS SHALL BE CONTINUOUS.
 3. PROVIDE 1/8" STAINLESS STEEL BOLTS, 2 WASHERS, AND NUT FOR EACH BOLT HOLE FOR CONNECTION TO POLY BOARD.
 4. DIMENSION TO COINCIDE WITH POLY BOARD WIDTH.
 5. CONNECT TO DRAIN WITH FERNCO FITTING.



TRUCK UNLOADING PANEL (LCPTUP)
 NO SCALE (PANEL SIZE 24"H X 24"W X 8"D)
 LAYOUT FOR LCPTUP

- NAMEPLATE LEGEND
1. NOCL TRUCK UNLOADING PANEL (LCPTUP)
 2. STORAGE TANK LEVEL
 3. STORAGE TANK HIGH LEVEL ALARM
 4. ALARM HORN SILENCE

- NOTES:
1. LOCATE PANEL, SO THAT LEVEL INDICATORS CAN BE VIEWED FROM THE ASSOCIATED FILL CONNECTIONS.
 2. PANEL SHALL BE NEMA 4X STAINLESS STEEL



HIGH/LOW LEVEL FLOATS
INSTALLATION DETAIL
 NO SCALE

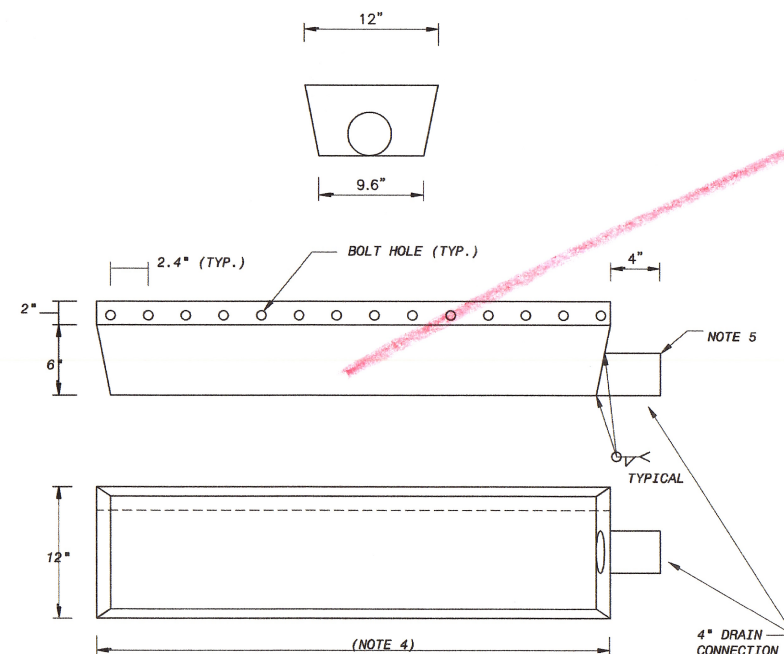
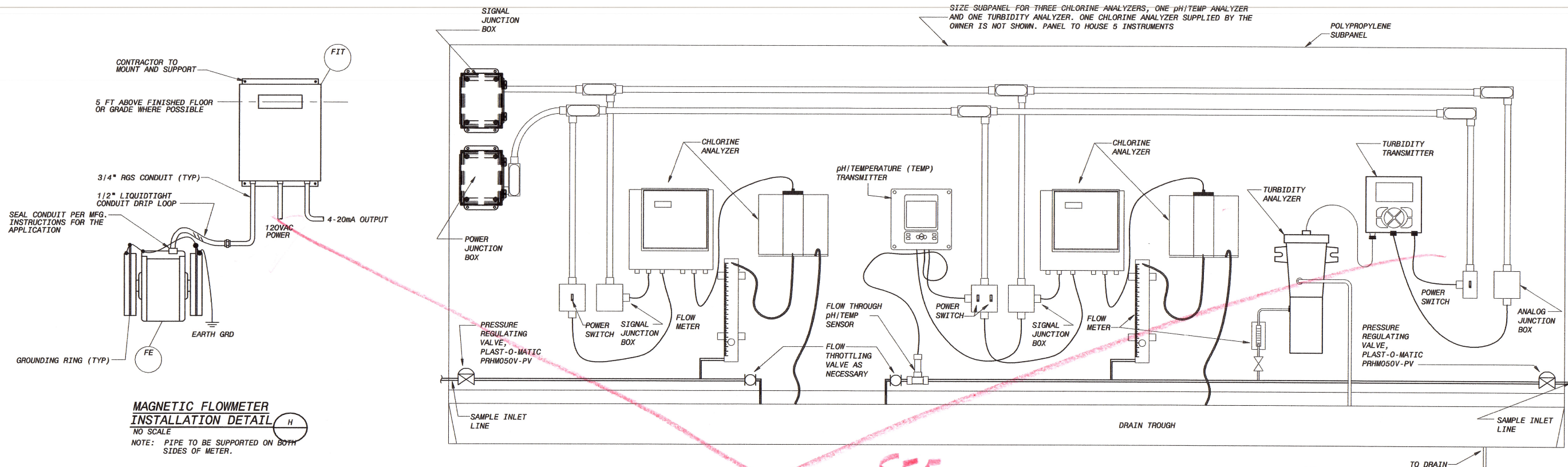
DESIGNED: TRK	DATE: DECEMBER 2014
DETAILED: TRK	
CHECKED:	
APPROVED:	
PROJECT NO. 182262	
I-00-014 SHEET OF	

BEDFORD REGIONAL WATER AUTHORITY
SMITH MOUNTAIN LAKE WTP & RAW WATER PUMPING STATION / INTAKE

INSTRUMENTATION DETAILS
SHEET 2 OF 3

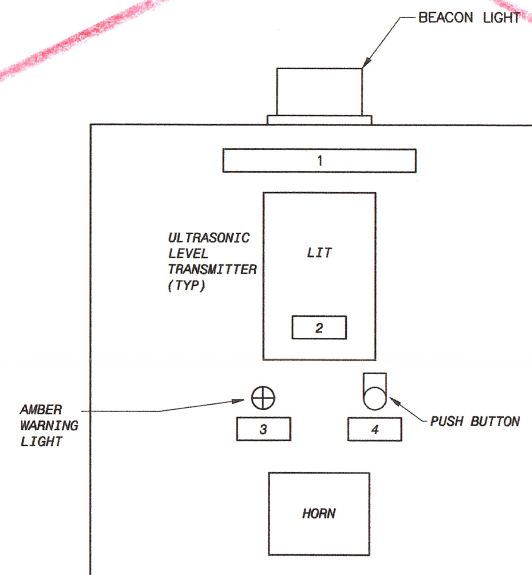
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 Black & Veatch Corporation
 Virginia Beach, VA

ECN 12
REVISED



WATER QUALITY STATION DRAIN TROUGH DETAILS
NO SCALE

- NOTES:
1. CONSTRUCT TROUGH USING 14 GA 304 STAINLESS STEEL.
 2. ALL WELDS SHALL BE CONTINUOUS.
 3. PROVIDE 1/8" STAINLESS STEEL BOLTS, 2 WASHERS, AND NUT FOR EACH BOLT HOLE FOR CONNECTION TO POLY BOARD.
 4. DIMENSION TO COINCIDE WITH POLY BOARD WIDTH.
 5. CONNECT TO DRAIN WITH FERNCO FITTING.

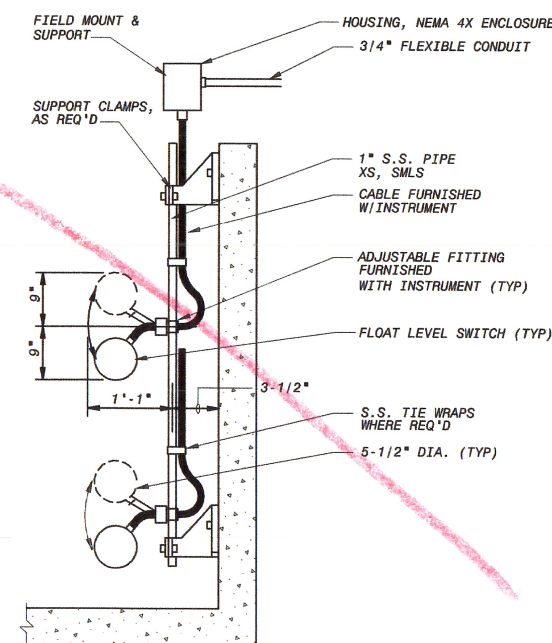


TRUCK UNLOADING PANEL (LCPTUP)
NO SCALE (PANEL SIZE 24"H X 24"W X 8"D)
LAYOUT FOR LCPTUP

NAMEPLATE LEGEND

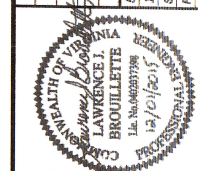
1. NOCL TRUCK UNLOADING PANEL (LCPTUP)
2. STORAGE TANK LEVEL
3. STORAGE TANK HIGH LEVEL ALARM
4. ALARM HORN SILENCE

- NOTES:
1. LOCATE PANEL, SO THAT LEVEL INDICATORS CAN BE VIEWED FROM THE ASSOCIATED FILL CONNECTIONS.
 2. PANEL SHALL BE NEMA 4X STAINLESS STEEL



HIGH/LOW LEVEL FLOATS
INSTALLATION DETAIL
NO SCALE

NO.	BY	CHK	APP	REVISIONS AND RECORD OF ISSUE	DATE	ISSUED FOR CONSTRUCTION
0	LUB	JUN	PAD		12/01/15	
1	BY	CHK	APP		12/01/15	
2	BY	CHK	APP		12/01/15	
3	BY	CHK	APP		12/01/15	
4	BY	CHK	APP		12/01/15	
5	BY	CHK	APP		12/01/15	
6	BY	CHK	APP		12/01/15	
7	BY	CHK	APP		12/01/15	
8	BY	CHK	APP		12/01/15	
9	BY	CHK	APP		12/01/15	
10	BY	CHK	APP		12/01/15	
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12	BY	CHK	APP		12/01/15	
13	BY	CHK	APP		12/01/15	
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26	BY	CHK	APP		12/01/15	
27	BY	CHK	APP		12/01/15	
28	BY	CHK	APP		12/01/15	
29	BY	CHK	APP		12/01/15	
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32	BY	CHK	APP		12/01/15	
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93	BY	CHK	APP		12/01/15	
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96	BY	CHK	APP		12/01/15	
97	BY	CHK	APP		12/01/15	
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99	BY	CHK	APP		12/01/15	
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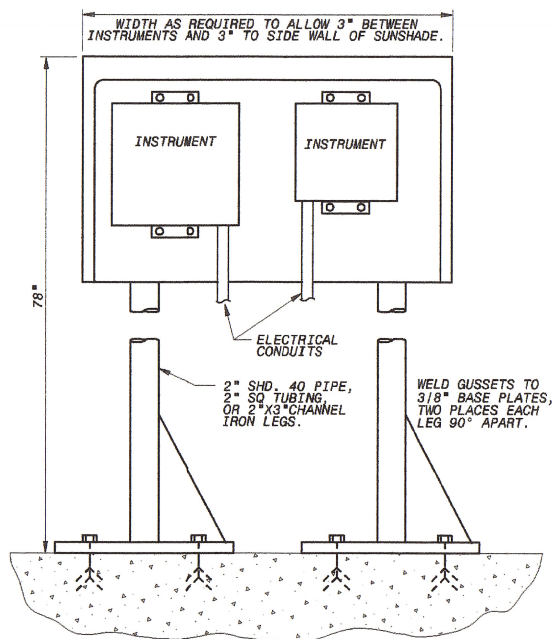


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Virginia Beach, VA

BEDFORD REGIONAL WATER AUTHORITY
SMITH MOUNTAIN LAKE WTP & RAW WATER PUMPING STATION / INTAKE
INSTRUMENTATION INSTALLATION DETAILS
SHEET 2 OF 3

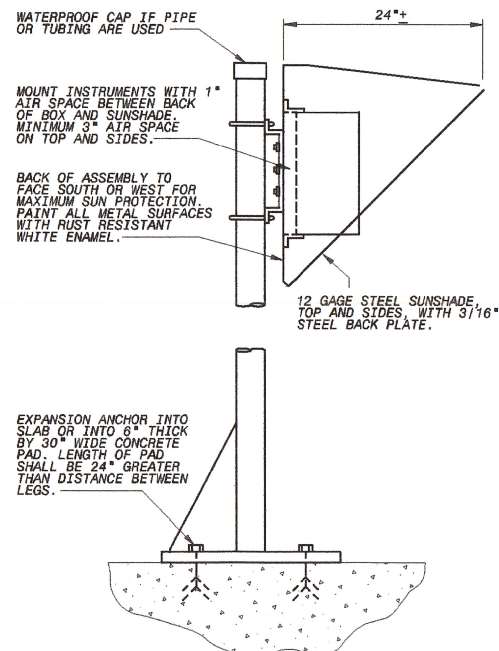
DESIGNED:	TRK
DETAILED:	TRK
CHECKED:	
APPROVED:	
DATE:	DECEMBER 2014
PROJECT NO.	182262
I-00-014	SHEET OF

ISSUED FOR CONSTRUCTION



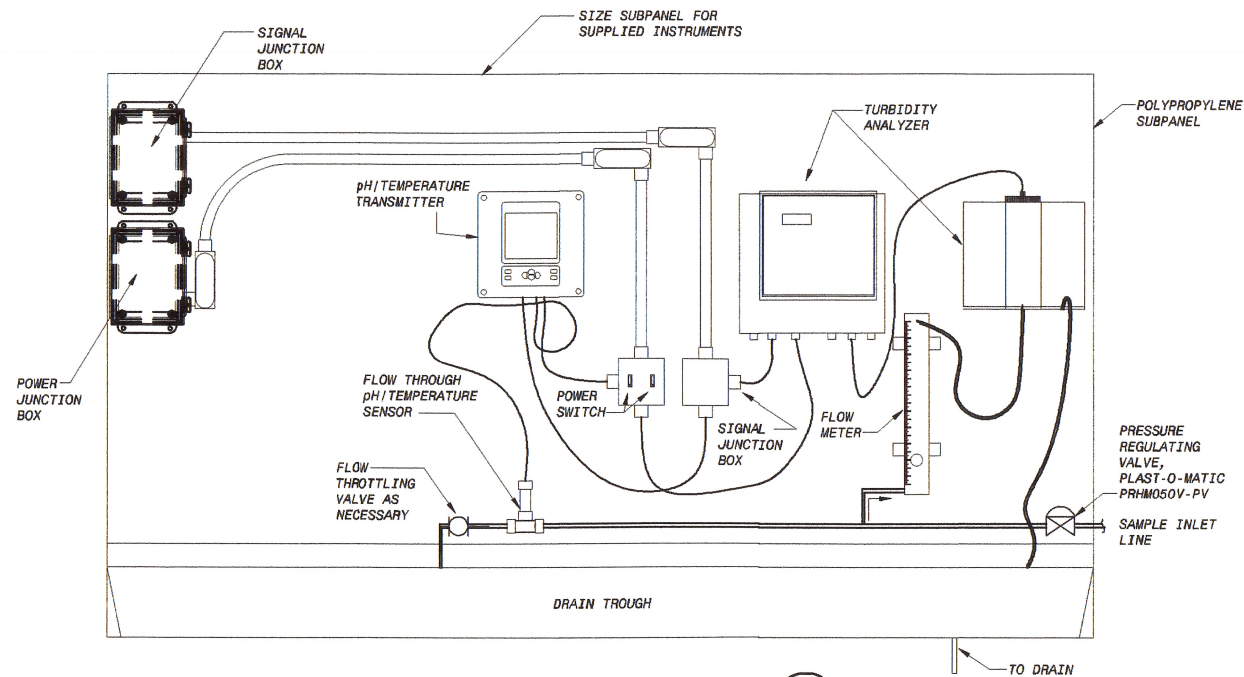
FRONT VIEW

OUTDOOR INSTRUMENT MOUNTING DETAIL (L)
NO SCALE

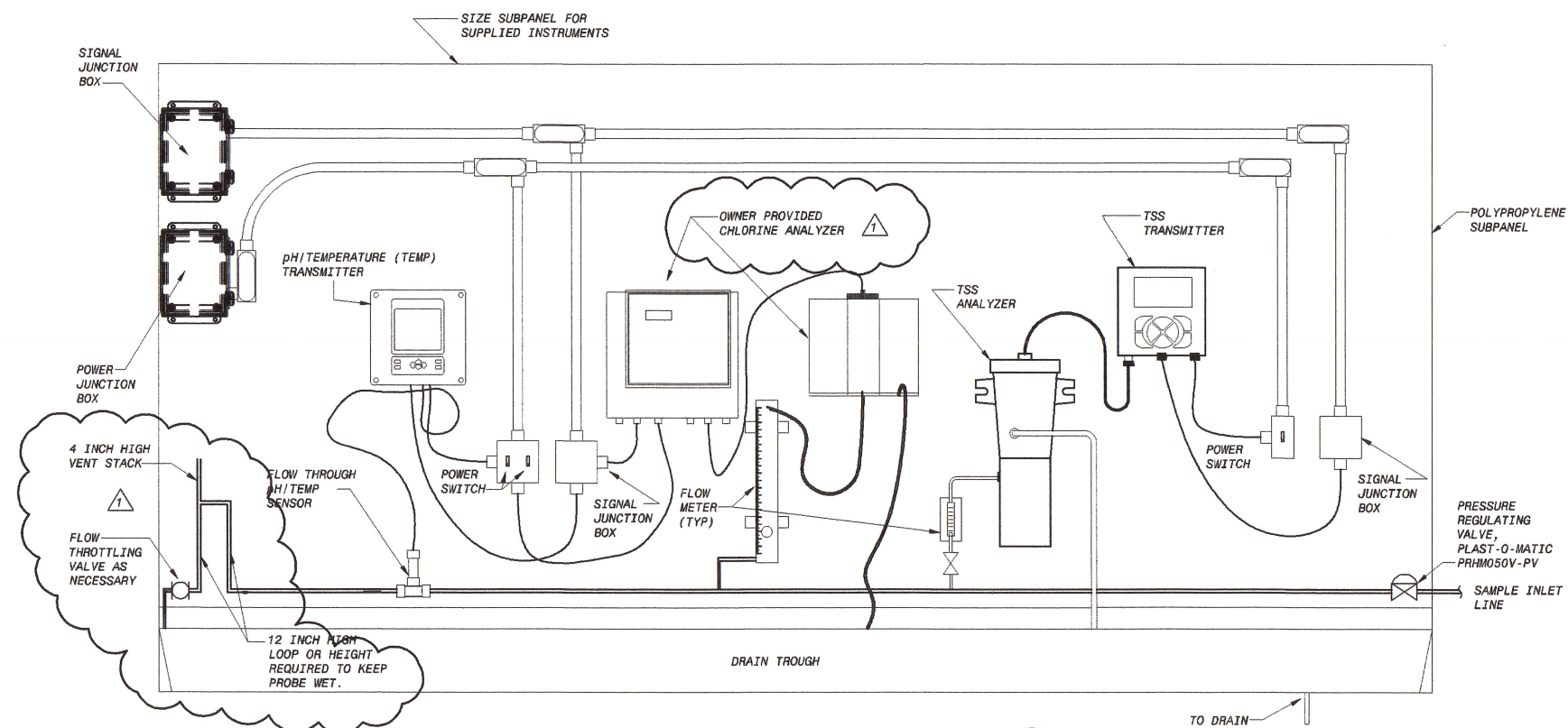


SIDE VIEW

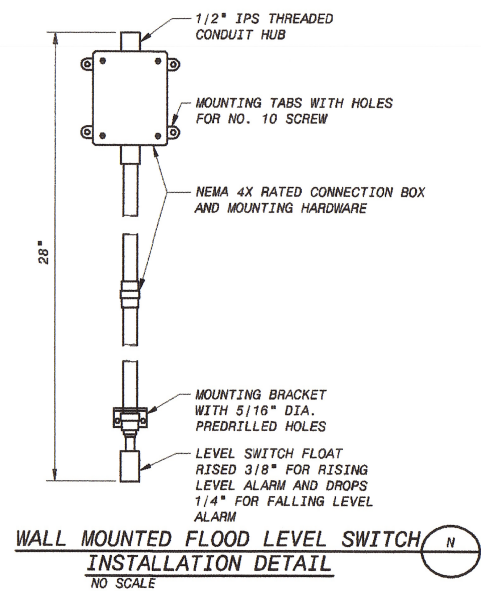
OUTDOOR INSTRUMENT MOUNTING DETAIL (O)
NO SCALE



WATER QUALITY SAMPLE STATION NO.1
INSTALLATION DETAIL (FRONT) (M)
NO SCALE



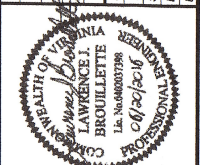
WATER QUALITY SAMPLE STATION NO.3
INSTALLATION DETAIL (FRONT) (P)
NO SCALE



WALL MOUNTED FLOOD LEVEL SWITCH
INSTALLATION DETAIL (N)
NO SCALE

ECN 12
REVISED

NO.	BY	CHK	DATE	REVISIONS AND RECORD OF ISSUE
1	LJB	UN	12/01/15	ISSUED FOR CONSTRUCTION
0	LJB	UN	12/01/15	ECN-012 AND MISCELLANEOUS CHANGES
NO.	BY	CHK	DATE	REVISIONS AND RECORD OF ISSUE
0	BY	CHK	DATE	REVISIONS AND RECORD OF ISSUE
1	BY	CHK	DATE	REVISIONS AND RECORD OF ISSUE

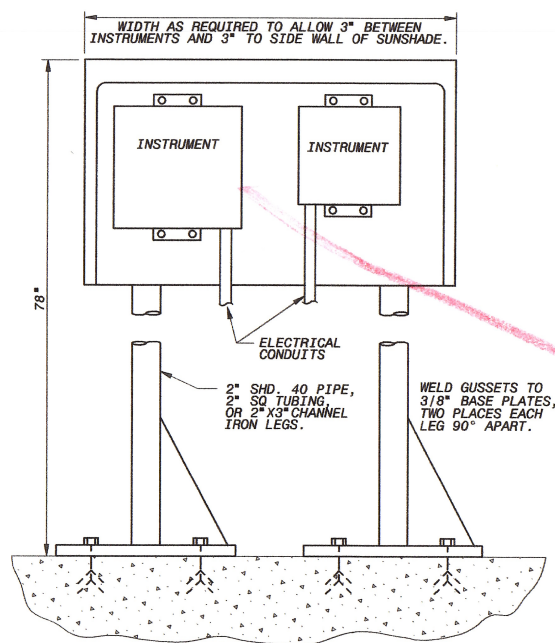


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BEDFORD REGIONAL WATER AUTHORITY
SMITH MOUNTAIN LAKE WTP & RAW WATER PUMPING STATION / INTAKE
INSTRUMENTATION DETAILS
SHEET 3 OF 3

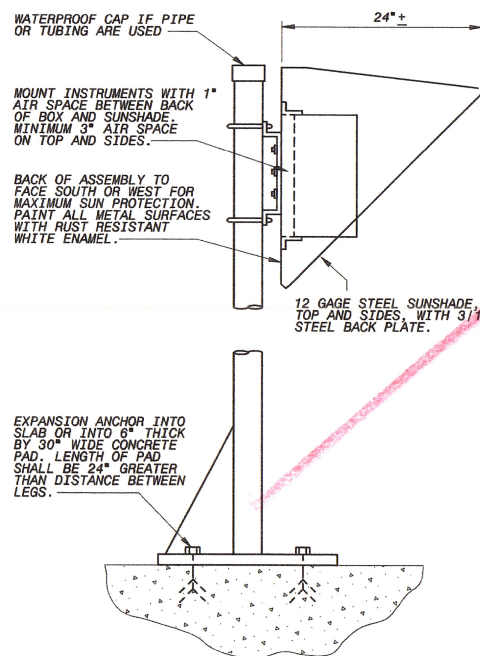
DESIGNED: TRK
DETAILED: TRK
CHECKED:
APPROVED:
DATE: DECEMBER 2014
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE
PROJECT NO. 182262
I-00-015
SHEET OF

ISSUED FOR CONSTRUCTION



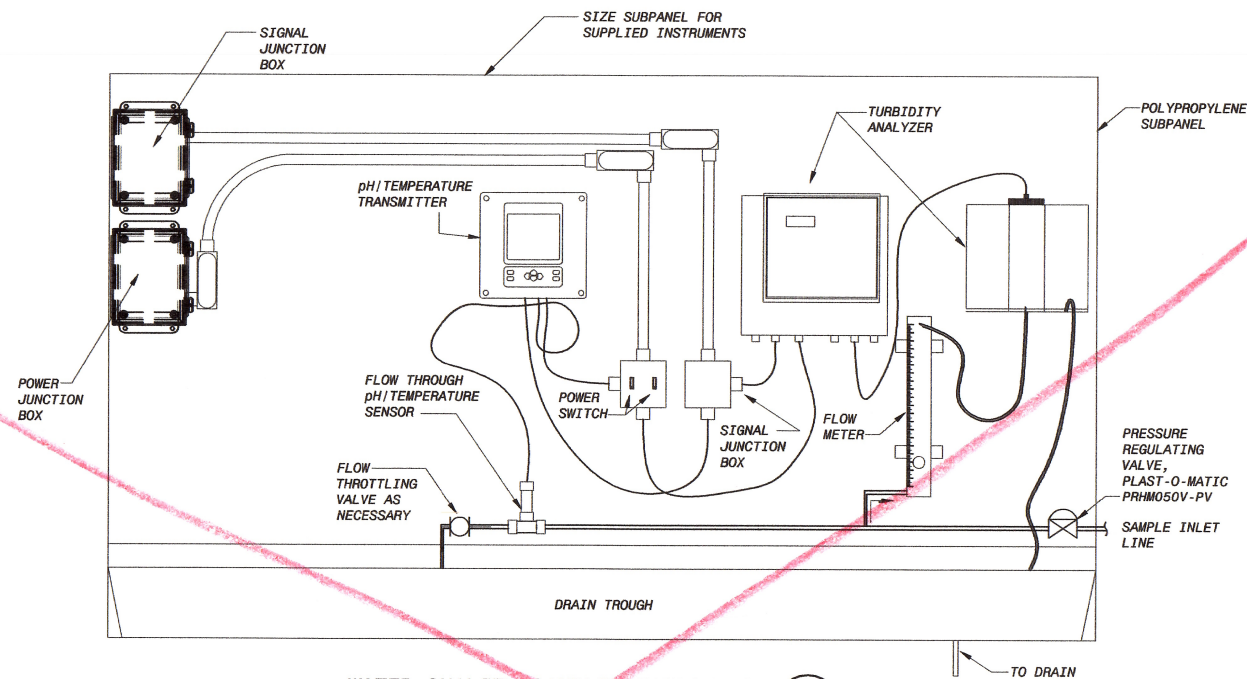
FRONT VIEW

OUTDOOR INSTRUMENT MOUNTING DETAIL (L)
NO SCALE

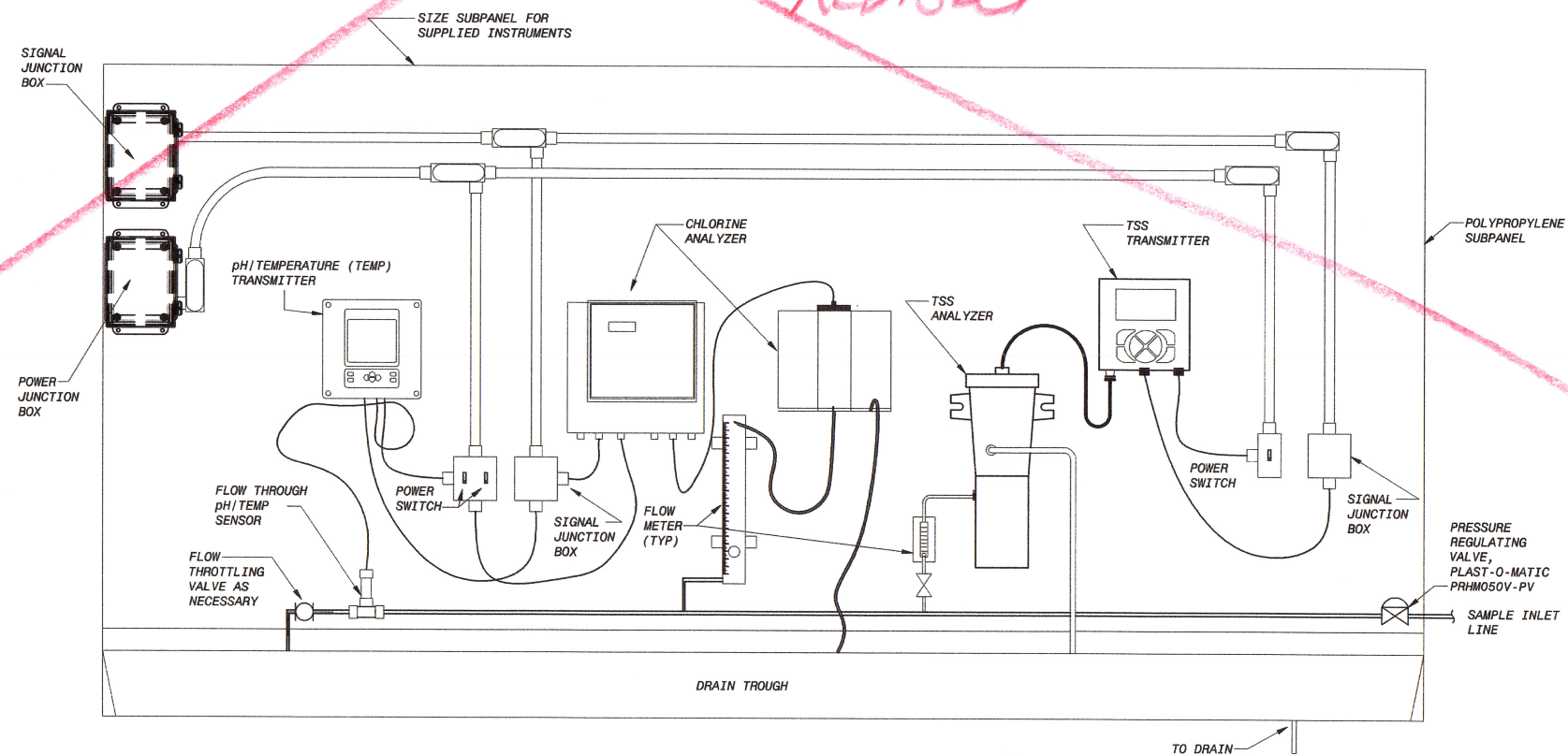


SIDE VIEW

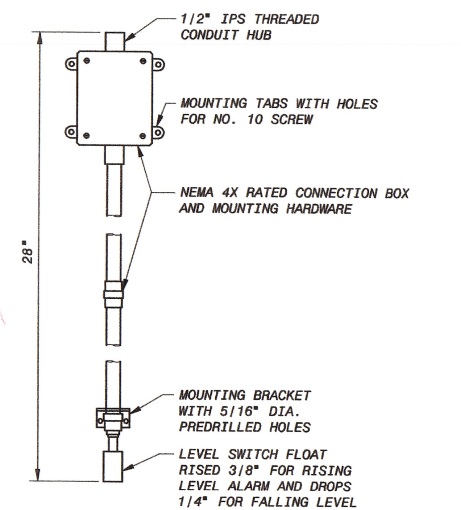
OUTDOOR INSTRUMENT MOUNTING DETAIL (O)
NO SCALE



WATER QUALITY SAMPLE STATION NO.1
INSTALLATION DETAIL (FRONT) (M)
NO SCALE



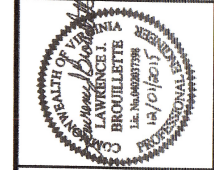
WATER QUALITY SAMPLE STATION NO.3
INSTALLATION DETAIL (FRONT) (P)
NO SCALE



WALL MOUNTED FLOOD LEVEL SWITCH
INSTALLATION DETAIL (N)
NO SCALE

SEE REVISED

NO.	BY	CHK	APP	DATE	REVISIONS AND RECORD OF ISSUE
0	LJB	JN	RJD	12/10/15	ISSUED FOR CONSTRUCTION
1	BY	CHK	APP	12/10/15	REVISED: BRO32608, 12/10/2015 10:52:11 AM
2	BY	CHK	APP	12/10/15	PLOTTED: BRO32608, 12/10/2015 10:52:19 AM
3	BY	CHK	APP	12/10/15	USER: BRO32608



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SMITH MOUNTAIN LAKE WTP &
RAW WATER PUMPING STATION / INTAKE

INSTRUMENTATION
INSTALLATION DETAILS
SHEET 3 OF 3

DESIGNED: TRK
DETAILED: TRK
CHECKED:
APPROVED:
DATE: DECEMBER 2014
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE
PROJECT NO. 182262
I-00-015 SHEET OF

ISSUED FOR CONSTRUCTION