CITY OF ANN ARBOR, MICHIGAN
WATER TREATMENT PLANT FILTER BACKWASH IMPROVEMENTS
ITB NO. 4607

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ANN ARBOR, MI 48108
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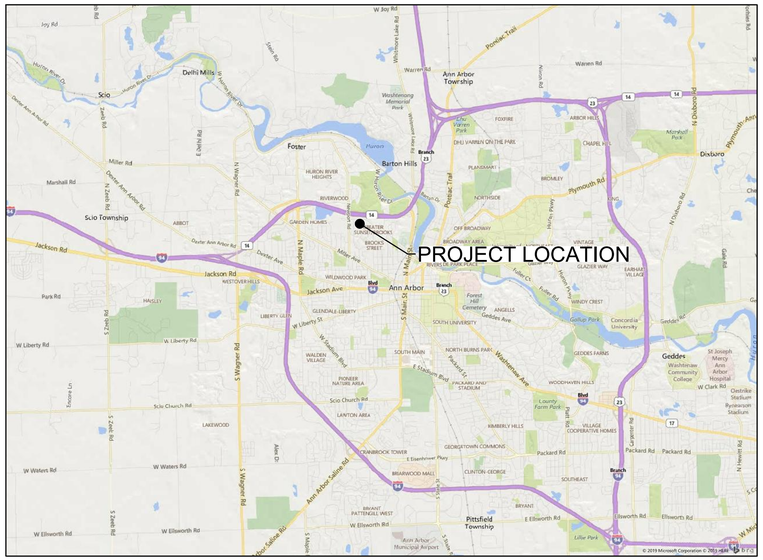

LOCATION MAP
SCALE: NONE

PROJECT LOCATION:
919 SUNSET ROAD
ANN ARBOR, MI 48103

CLIENT INFORMATION:
CITY OF ANN ARBOR
WATER TREATMENT SERVICES UNIT

Tt PROJECT No.:
200-31537-19003

CLIENT PROJECT No.:
ITB #: 4607 FILE #: 20001

PROJECT DESCRIPTION / NOTES:

ISSUED:
11/19/19 - ISSUED FOR BIDS

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PROCESS	
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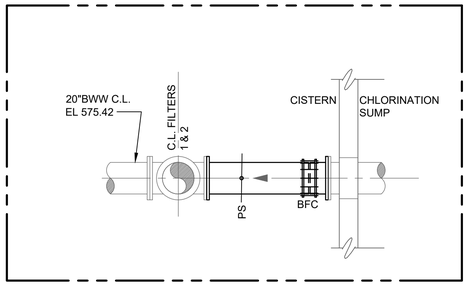
I-703	CONTROL PANEL UPGRADES
I-704	CONTROL PANEL UPGRADES
I-705	CONTROL PANEL UPGRADES

VICINITY MAP:



CISTERN PIPING MODIFICATIONS PLAN

SCALE: 1/4"=1'

NOTE: PIPE IN CISTERN SHALL BE COMPLETELY SHOP PAINTED WITH PRIMER AND FINISH COATS PRIOR TO INSTALLATION

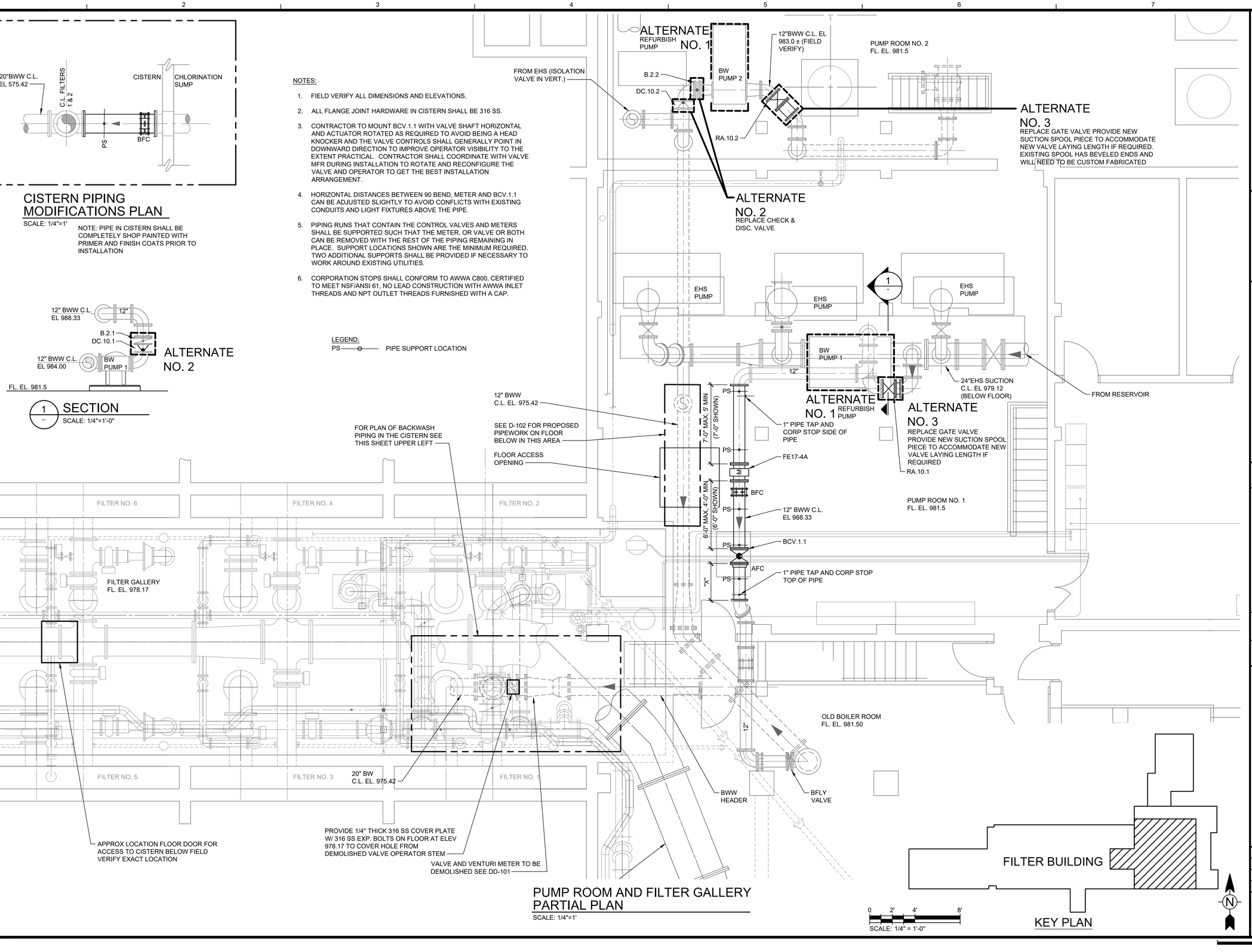
NOTES:

1. FIELD VERIFY ALL DIMENSIONS AND ELEVATIONS.
2. ALL FLANGE JOINT HARDWARE IN CISTERN SHALL BE 316 SS.
3. CONTRACTOR TO MOUNT BCV.1.1 WITH VALVE SHAFT HORIZONTAL AND ACTUATOR ROTATED AS REQUIRED TO AVOID BEING A HEAD KNOCKER AND THE VALVE CONTROLS SHALL GENERALLY POINT IN DOWNWARD DIRECTION TO IMPROVE OPERATOR VISIBILITY TO THE EXTENT PRACTICAL. CONTRACTOR SHALL COORDINATE WITH VALVE MFR DURING INSTALLATION TO ROTATE AND RECONFIGURE THE VALVE AND OPERATOR TO GET THE BEST INSTALLATION ARRANGEMENT.
4. HORIZONTAL DISTANCES BETWEEN 90 BEND, METER AND BCV.1.1 CAN BE ADJUSTED SLIGHTLY TO AVOID CONFLICTS WITH EXISTING CONDUITS AND LIGHT FIXTURES ABOVE THE PIPE.
5. PIPING RUNS THAT CONTAIN THE CONTROL VALVES AND METERS SHALL BE SUPPORTED SUCH THAT THE METER, OR VALVE OR BOTH CAN BE REMOVED WITH THE REST OF THE PIPING REMAINING IN PLACE. SUPPORT LOCATIONS SHOWN ARE THE MINIMUM REQUIRED. TWO ADDITIONAL SUPPORTS SHALL BE PROVIDED IF NECESSARY TO WORK AROUND EXISTING UTILITIES.
6. CORPORATION STOPS SHALL CONFORM TO AWWA C800, CERTIFIED TO MEET NSF/ANSI 61, NO LEAD CONSTRUCTION WITH AWWA INLET THREADS AND NPT OUTLET THREADS FURNISHED WITH A CAP.

LEGEND:
PS —o— PIPE SUPPORT LOCATION

ALTERNATE NO. 2

1 – SECTION
SCALE: 1/4"=1'-0"



PUMP ROOM AND FILTER GALLERY PARTIAL PLAN

SCALE: 1/4"=1'

KEY PLAN

0 2' 4' 8'
SCALE: 1/4" = 1'-0"

N

Bar Measures 1 inch

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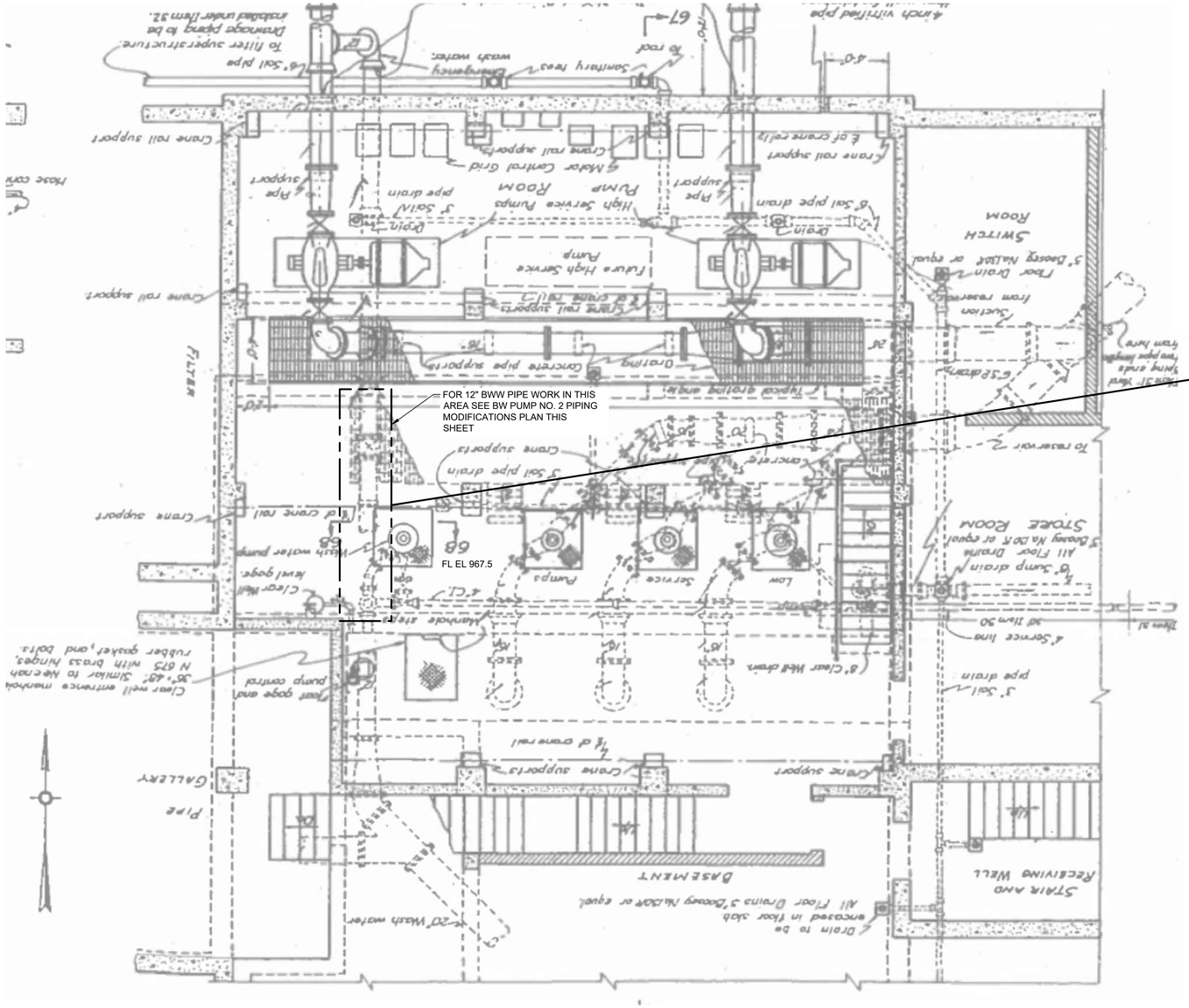
MARK	DATE	DESCRIPTION	BY
	11/19/19	ISSUED FOR BID	

CITY OF ANN ARBOR, MICHIGAN
WATER TREATMENT PLANT FILTER BACKWASH IMPROVEMENTS
PUMP ROOM NO. 1 AND FILTER GALLERY PLAN

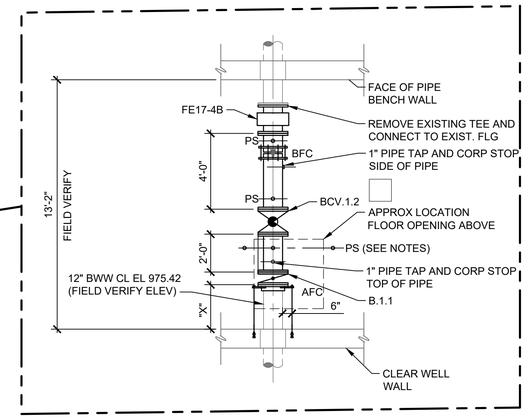
Project No.: 200-31537-19003
Designed By:
Drawn By:
Checked By:

D-101



PUMP ROOM PIPING PLAN

SCALE: 1/4"=1'



BW PUMP NO. 2 PIPING MODIFICATION PLAN

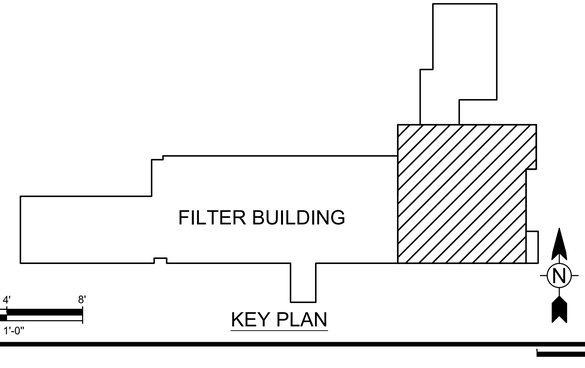
SCALE:I 1/4"=1'

LEGEND:

PS——o—— PIPE SUPPORT LOCATION

NOTES:

1. FIELD VERIFY ALL DIMENSIONS AND ELEVATIONS.
2. CONTRACTOR TO VERIFY EXISTING 12" BWW PIPE O.D..
3. PROVIDE ADDITIONAL PIPE SUPPORT MEMBERS AND ANCHORS AS REQUIRED TO SPAN FLOOR OPENING.
4. PROVIDE TWO 3/4" THICK SS FABRICATED FLANGE LUGS AND 3/4" DIA HARNESS RODS EPOXY ANCHORED INTO CONCRETE W/ 4" MIN EMBEDMENT FOR VALVE B.1.1. VALVE RESTRAINT REQUIRED TO KEEP EXISTING PIPE FROM MOVING IF PIPE NORTH OF VALVE IS NOT INSTALLED WHEN THE BACKWASH SYSTEM RETURNS TO SERVICE. LUGS TO ENGAGE MINIMUM 2 FLANGE BOLTS EACH.



KEY PLAN

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CITY OF ANN ARBOR, MICHIGAN

WATER TREATMENT PLANT FILTER BACKWASH IMPROVEMENTS

PUMP ROOM NO. 1 BASEMENT PLAN

Project No.: 200-31537-19003

Designed By:

Drawn By:

Checked By:

D-102

Bar Measures 1 inch

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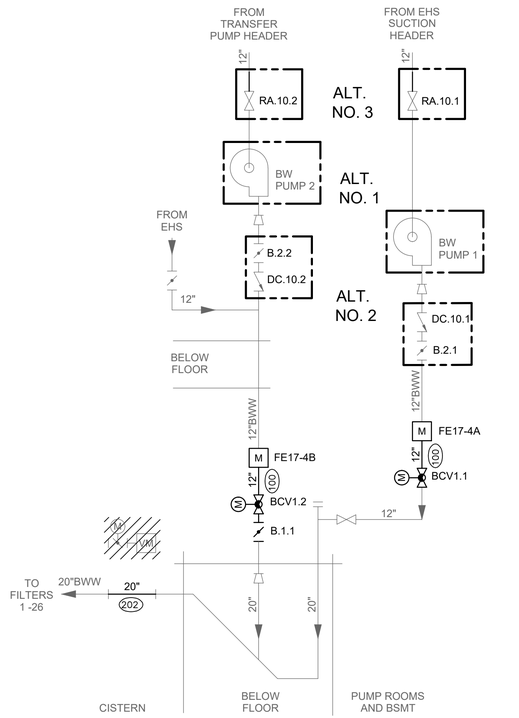
PIPE SCHEDULE

NO.	LOCATION	SERVICE	SIZE (INCHES)	MATERIALS	JOINTS	EXPOSED OR BURIED	TEST PRESSURE (PSI)	REMARKS
EXPOSED PIPE								
100	FILTER BUILDING PUMP ROOM AND BASEMENT	BWW	12	DIP	FJ, BFC	EXPOSED	75 PSI	
202	FILTER BUILDING CISTERN	BWW	20	DIP	FJ, BFC	EXPOSED	VISUAL	PRESSURIZE TO SYSTEM PRESSURE AND OBSERVE FOR LEAKS

VALVE SCHEDULE

MARK	ASSET MANAGEMENT TAG	LOCATION	SERVICE	SIZE (INCHES)	QUANT.	JOINT	OPERATOR	ACCESSORIES	REMARKS
RESILIENT SEATED GATE VALVE (RA)									
RA.10.1 & 2		FILTER BUILDING PUMP ROOM	BWW	12	2	FJ	H		ALTERNATE NO. 3
BUTTERFLY VALVE (B)									
B.1.1		FILTER BUILDING BASEMENT	BWW	12	1	FJ	CW (5')		
B.2.1 & 2		FILTER BUILDING BASEMENT	BWW	12	2	FJ	H		ALTERNATE NO. 2
DUAL VANE CHECK VALVE (DC)									
DC.10.1 & 2		FILTER BUILDING PUMP ROOM	BWW	12	2	WJ			ALTERNATE NO. 2
BALL CONTROL VALVE (BCV)									
BCV.1.1 & 2		FILTER BUILDING PUMP ROOM	BWW	12	2	FJ	M	RPI, LS, RCS	460 V, TH, STROKE TIME 45 SECONDS LS (3) OPEN, CLOSED, 95% CLOSED



PARTIAL BACKWASH SYSTEM CONSTRUCTION SEQUENCING DIAGRAM

SCALE: NONE

PIPEWORK SCHEDULE KEY

GENERAL

THE FOLLOWING PIPE SCHEDULE GIVES THE DESIGNATION FOR EACH PIPE LINE, PIPE SIZE, JOINT, MATERIAL, SERVICE AND OTHER PERTINENT DATA. THE KEY OF SYMBOLS FOR THE SCHEDULE IS AS FOLLOWS:

PROCESS PIPING

DIP	DUCTILE IRON PIPE
GLDI	GLASS LINED DUCTILE IRON
GSP	GALVANIZED STEEL PIPE
HDPE	HIGH DENSITY POLYETHYLENE
SPP	STEEL PLATE PIPE
PRP	POLYPROPYLENE RESIN PLASTIC PIPE
PVC	PLASTIC PIPE
PVCP	POLYVINYL CHLORIDE GRAVITY
SSP	STAINLESS STEEL PIPE

PIPE JOINTS

AFC	ADAPTER FLANGE COUPLING
BFC	BOLTED FLEXIBLE COUPLING
FJ	FLANGED JOINT
FSJ	FUSED JOINT
GJ	GROOVE JOINT
MJ	MECHANICAL JOINT (RESTRAINED)
RPOC	RESTRAINED PUSH ON JOINT
SJ	SCREW JOINT
SWJ	SOLVENT WELD JOINT

REMARKS

CL CLASS

VALVE SCHEDULE KEY:

THE FOLLOWING VALVE SCHEDULE GIVES THE DESIGNATION FOR EACH VALVE, ITS LOCATION, SERVICE SIZE, QUANTITY AND OTHER PERTINENT DATA.

THE DISTANCE GIVEN WITH EXTENSION STEMS OR SHAFTS IS THAT FROM CENTER LINE OF PORT TO TOP OF FLOOR AT FLOOR STAND OR FLOOR BOX, OR FROM CENTER LINE OF PORT TO GROUND SURFACE FOR VALVE BOX.

THE DISTANCE GIVEN FOR BUTTERFLY VALVES WITH EXTENSION BONNETS IS THAT FROM CENTER LINE OF VALVE TO CENTER LINE OF THE OPERATOR, 3 FEET ABOVE OPERATING FLOOR OR SLAB.

IN GENERAL, NO VALVES SMALLER THAN 4 INCHES ARE INCLUDED IN THE SCHEDULE.

UNLESS OTHERWISE NOTED ON THE SCHEDULE, THE VALVE CLASS SHALL BE 150 AND STEMS SHALL BE OF THE NONRISING TYPE FOR VALVES.

INCLUDED IN THE REMARKS COLUMN WILL BE EXCEPTION TO CLASS, STEM, SERVICE, MOTOR AND MOTOR ENCLOSURE REQUIREMENTS, ETC.

THE KEY OF SYMBOLS FOR SCHEDULE IS AS FOLLOWS:

VALVE SCHEDULE KEY

VALVE JOINT

FJ	FLANGED JOINT
GC	GROOVED COUPLING
MJ	MECHANICAL JOINT
SJ	SOLVENT WELD JOINT
W	WAFER

VALVE OPERATOR

CW	CHAIN WHEEL (LENGTH)
H	HANDWHEEL
M	MOTOR
P	PNEUMATIC
WN	WRENCH NUT
IL	INFINITE POSITION LEVER

VALVE ACCESSORIES

CP	CONTROL PACKAGE
LS	LIMIT SWITCH
SG	STEM GUIDE
VB	VALVE BOX
ES	EXTENSION STEM
EB	EXTENSION BONNET
FS	FLOOR STAND
RPI	REMOTE POSITION INDICATOR
RCS	REMOTE CONTROL STATION
WG	WORM GEAR

VALVE REMARKS

CL	CLASS
FC	FAIL CLOSE
FO	FAIL OPEN
NC	NORMALLY CLOSED
OS	OPEN SHUT
TH	THROTTLING TYPE

JOINT DESIGNATIONS

SYMBOLS	MARK	TYPE
	FJ	FLANGED JOINT
	BFC	BOLTED FLEXIBLE COUPLING
	BF	BLIND FLANGE
	AFC	ADAPTER FLANGE COUPLING

VALVE DESIGNATIONS

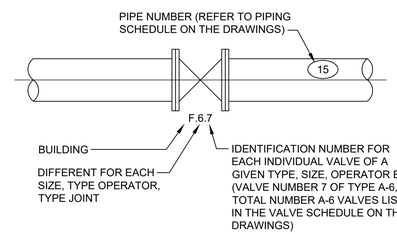
SYMBOL: PIPEWORK DRAWINGS	SYMBOL: FLOW DIAGRAMS	MARK	TYPE
		A	GATE VALVE
		B	BUTTERFLY VALVE
		BCV	BALL CONTROL VALVE
		DC	DOUBLE VANE CHECK VALVE
XX	XX		FLOW METER XX = M = MAGNETIC XX = US = ULTRASONIC XX = VM = VENTURI XX = PM = PROPELLER

OPERATOR SYMBOLS

(SCHEMATICS ONLY)

M	MOTOR OPEN-CLOSE
M	MOTOR THROTTLING

VALVE & PIPE IDENTIFICATION



ADDITIONAL NOTES (ALL VALVES):

1. UNLESS OTHERWISE NOTED ON THE SCHEDULE, VALVE MOTORS SHALL BE OPEN-SHUT, 220/440 VOLT, 60 CYCLE, 3 PH, A.C. AND ENCLOSURES SHALL BE NEMA 4X. SEE ELECTRICAL DRAWINGS.
2. INSTALL ALL PLUG BUTTERFLY AND BALL VALVES WITH THE SHAFT IN THE HORIZONTAL POSITION, UNLESS OTHERWISE DIRECTED.

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CITY OF ANN ARBOR, MICHIGAN

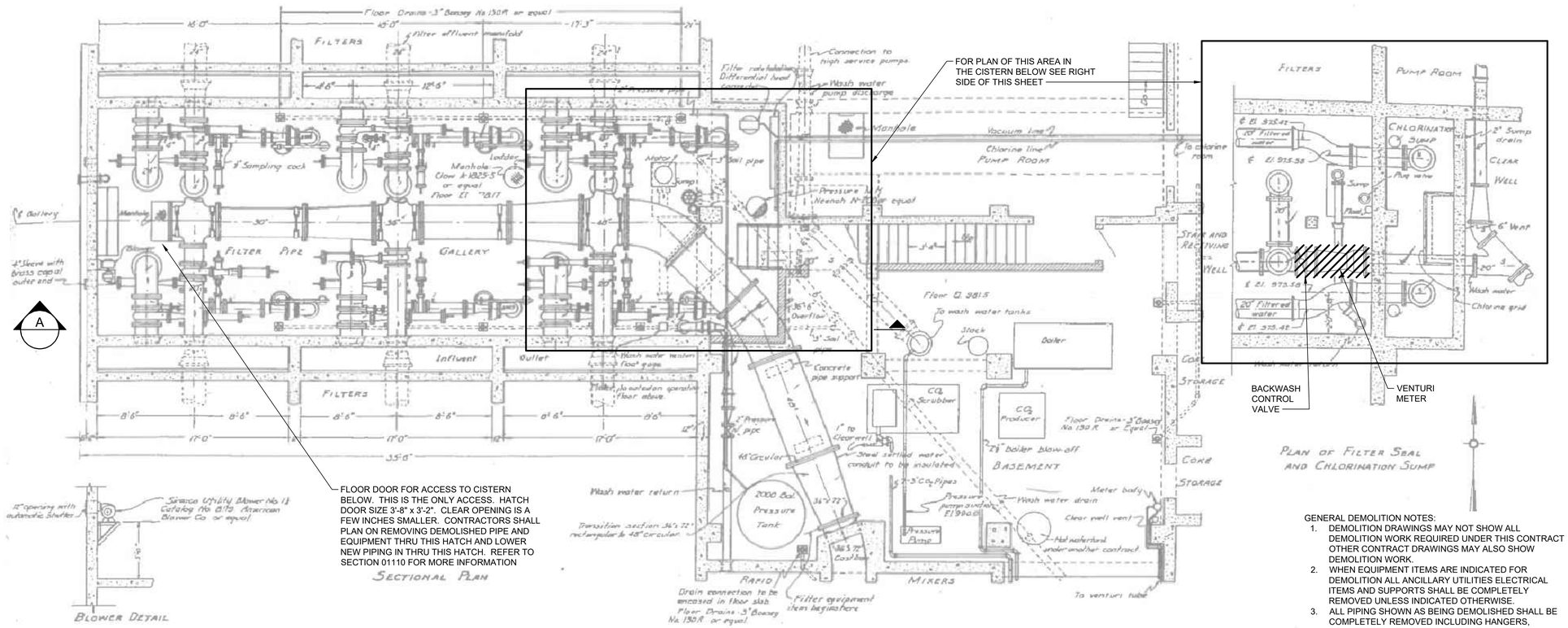
WATER TREATMENT PLANT FILTER BACKWASH IMPROVEMENTS

PROCESS & EQUIPMENT LEGEND, SCHEDULES AND PARTIAL FLOW DIAGRAM

Project No.:	200-31537-19003
Designed By:	
Drawn By:	
Checked By:	

D-103

Bar Measures 1 inch



LEGEND

DENOTES DEMOLITION

GENERAL DEMOLITION NOTES:

1. DEMOLITION DRAWINGS MAY NOT SHOW ALL DEMOLITION WORK REQUIRED UNDER THIS CONTRACT OTHER CONTRACT DRAWINGS MAY ALSO SHOW DEMOLITION WORK.
2. WHEN EQUIPMENT ITEMS ARE INDICATED FOR DEMOLITION ALL ANCILLARY UTILITIES ELECTRICAL ITEMS AND SUPPORTS SHALL BE COMPLETELY REMOVED UNLESS INDICATED OTHERWISE.
3. ALL PIPING SHOWN AS BEING DEMOLISHED SHALL BE COMPLETELY REMOVED INCLUDING HANGERS, EXPANSION AND ANCHOR BOLTS AND PIPE SUPPORTS.
4. EXPANSION AND ANCHOR BOLTS REMAINING IN WALL OR CEILINGS SHALL BE POUNDED OR CUT FLUSH WITH THE SURFACE.
5. ALL OPENINGS REMAINING IN FLOORS OR WALLS INCLUDING SLEEVES AFTER PIPE OR CONDUIT DEMOLITION SHALL BE PATCHED TO MATCH EXISTING FINISH UNLESS NOTED OTHERWISE.

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CITY OF ANN ARBOR, MICHIGAN

WATER TREATMENT PLANT FILTER BACKWASH IMPROVEMENTS

FILTER BLDG CISTERN DEMOLITION

Project No.: 200-31537-19003
Designed By:
Drawn By:
Checked By:

DD-110

Bar Measures 1 inch

BACKGROUND PLAN AND ONE LINE SYMBOLS

SYMBOL	DESCRIPTION
●	CONTROL SWITCH (SEL. OR P.B.) SEE CIRCUITS FOR SPECIFIC TYPE
F FL	SEE CIRCUITS FOR SPECIFIC TYPE FLOAT SWITCH - FLOW SWITCH
T M	TEMPERATURE - HUMIDISTAT SWITCH (SUBSCRIPT=NO. OF STAGES)
L P V	LIMIT (PROXIMITY TYPE) PRESSURE - VACUUM SWITCH
ALT	ELECTRICAL OR MECHANICAL ALTERNATOR (SEE WIRING)
OS	OVERLOAD SWITCH OR DEVICE
TB	TERMINAL BOX
⊗	SOLENOID VALVE
PC	PHOTOCELL LINE VOLTAGE
▭	AS NOTED (LIGHTING PANEL, CONTROL PANEL, DISTRIBUTION PANEL, ETC.) WALL MOUNTED
JB	JUNCTION BOX
	TRANSFORMER
	CONDUIT WITH CONDUIT SEAL FITTING
	CONDUIT EXPOSED
	CONDUIT CONCEALED
E	DIRECT BURIED CONDUIT
UG	DIRECT BURIED CABLE
OH	OVERHEAD LINE
DB	UNDERGROUND DUCT BANK
EDB	EXISTING UNDERGROUND DUCT BANK
1 2 3 4 5 6	CONCRETE ENCASED DUCT BANK WITH CABLE LOCATIONS, AND SPARE DUCTS AS INDICATED ON DRAWINGS
	CABLE REEL
L L L L	MULTI-STACK ALARM LIGHTS
	SELECTOR SWITCH / PUSHBUTTON. FUNCTIONS AS SHOWN IN WIRING DIAGRAMS
	LOW VOLTAGE DISCONNECT SWITCH
	LOW VOLTAGE FUSE (BELOW 600V)
	HIGH VOLTAGE FUSE (ABOVE 600V)
1 RV, 2 FVR, 3 2S,2W	ALL STARTERS SHALL BE FULL VOLTAGE, NON-REVERSING UNLESS OTHERWISE INDICATED. (FVR) FULL VOLTAGE REVERSING (RV) REDUCED VOLTAGE (2S, 2W) TWO SPEED, TWO WINDING
	600V, 3 POLE MOLDED CASE CIRCUIT BREAKER, FRAME & RATING AS SHOWN
1 2 A-3	SINGLE PHASE, FRACTIONAL HP MOTOR TO LOCATION INDICATED (SEE NOTE 2 ON STANDARD NOTE SHEET)
86	DEVICE SYMBOL WITH TYPE DEVICE
A 1	THREE PHASE LOAD WITH IDENTIFICATION

SYMBOL	DESCRIPTION
FT 10	TAG NO. (BALLOON) FOR DEVICE INDICATED
FT 10, A-3, MCP OR CP-1	FOR POWER (SEE NOTE 2 ON STANDARD NOTE SHEET) 3/4"C(2/C#18SH) CONDUIT AND WIRE RUN FROM DEVICE INDICATED TO LOCATION INDICATED
	CAPACITOR, 3 PHASE, SIZE AS INDICATED
F C	DISCONNECT SWITCH (F) = FUSED, (C) = CIRCUIT BREAKER
	MAGNETIC STARTER (BACKGROUND DRAWINGS ONLY)
SIZE 2	COMBINATION MAGNETIC STARTER FUSED UNLESS NOTED (CIRCUIT BREAKER)
LC	COMBINATION LIGHTING CONTACTOR WITH HAND-OFF-AUTO SWITCH
	MANUAL STARTER (R) = REVERSING
CP	CONTROL PANEL
1/8 UH-19	UNIT HEATER, 1/8 HORSEPOWER
	LIGHTING ARRESTOR
A-3	LOW VOLTAGE HOME RUNS 120/208V, 120/240V (SEE NOTE 2 ON STANDARD NOTE SHEET)
NEMA 4	WATERTIGHT
NEMA 4X	WATERTIGHT AND CORROSION PROOF
NEMA 7	EXPLOSION PROOF - CLASS I, DIVISION 1, GROUP D
NEMA 9	EXPLOSION PROOF - CLASS II, DIVISION 1
K	KEYLOCK
SD	SMOKE DETECTOR
E	EXIT LIGHT
	FLUORESCENT LUMINAIRE
	INCANDESCENT LUMINAIRE
	HIGH INTENSITY DISCHARGE LIGHT
EM	EMERGENCY BATTERY PACK
DS	DESK INTERCOM SET
	CAMERA
PTZ	DOME CAMERA (PAN, TILT, ZOOM)
52	DRAW OUT CIRCUIT BREAKER (ABOVE 600 VOLT)
	CIRCUIT BREAKER WITH STAB CONNECTION
(3) 50/5	CURRENT TRANSFORMER, AND RATIO (WITH NUMBER REQUIRED SHOWN)

WIRING DEVICE SCHEDULE

SYMBOL	DESCRIPTION	NEMA TYPE
	125V, 2P, DUPLEX, 3W	5-20 R
	SIMPLEX RECEPTACLE	
	QUAD RECEPTACLE	
	20A, 120/277V SWITCH	SPST

CONTROL CIRCUIT & PILOT DEVICE LEGEND

SYMBOL	DESCRIPTION
	PRESS. ACTUATED SWITCH
	FLOW ACTUATED SWITCH
	LIMIT SWITCH - NORMALLY OPEN
	LIMIT SWITCH - NORMALLY CLOSED - HELD OPEN
	LATCHING CABLE SWITCH
	MOMENTARY PUSHBUTTON OPERATOR-NORMALLY CLOSED
	MOMENTARY PUSHBUTTON OPERATOR-NORMALLY OPEN
	CONTROL RELAY CONTACT - NORMALLY OPEN
INST.	TIMING RELAY INSTANTANEOUS CONTACT
CR	CONTROL RELAY COIL
CR L, CR U	TWO COIL LATCHING RELAY
	TIMED CLOSED CONTACT ON ENERGIZATION
	TIMED OPEN CONTACT ON DE-ENERGIZATION
	ZERO SPEED OR ANTI-PLUGGING SWITCH
	MAINTAINED STOP-START PUSHBUTTON OPERATOR
	MAINTAINED PUSH - PULL OPERATOR
	LOCAL TERMINALS WITH EXTERNAL WIRING
T	TIMING RELAY COIL
T 1	TIMING RELAY COIL (OFF DELAY)
G	INDICATING LIGHT
	PUSH-TO-TEST INDICATING LIGHT
X1 X2	SECONDARY TRANSFORMER
	MOLDED CASE CIRCUIT BREAKER
	MOMENTARY PUSHBUTTON OPERATOR - NORMALLY CLOSED
	MOMENTARY PUSHBUTTON OPERATOR - NORMALLY OPEN
	GENERAL DISCONNECT SWITCH

SYMBOL	DESCRIPTION
	SELECTOR SWITCH - NORMALLY OPEN
	FLOAT ACTUATED SWITCH
	TEMP. ACTUATED SWITCH
	LIMIT SWITCH - NORMALLY CLOSED
	LIMIT SWITCH - NORMALLY OPEN - HELD CLOSED
	TIME DELAY FUSE
	PUSHBUTTON OPERATOR WITH MUSHROOM HEAD
(F)	FIELD LOCATED STOP BUTTON
	CONTROL RELAY CONTACT - NORMALLY CLOSED
INST.	TIMING RELAY INSTANTANEOUS CONTACT
O H C	SELECTOR SWITCH OPERATOR WITH FUNCTION SHOWN
	TIMED OPEN CONTACT ON ENERGIZATION
	TIMED CLOSED CONTACT ON DE-ENERGIZATION
R 1	PUSH-TO-TEST INDICATING LIGHT
	MAINTAINED STOP - MOMENTARY START PUSHBUTTON (JOG)
	SOLENOID OR CLUTCH
ETI	ELAPSED TIME INDICATOR
X1 X2	120VAC TRANSFORMER
	PUSHBUTTON OPERATOR WITH MUSHROOM HEAD
	SOLENOID OR CLUTCH
	THERMAL OVERLOAD
(F)	FIELD LOCATED
	TERMINAL POINT
	TERMINAL
	LOW VOLTAGE FUSE
	FUSIBLE TERMINAL BLOCK
	CONTROL POWER TRANSFORMER
	RECEPTACLE

NOTE: THE PLC I/O ADDRESS SHALL BE USED AS THE WIRING TAG SCHEME FOR ALL PANEL AND FIELD CONTROL WIRING. COORDINATE WITH ELECTRICAL CONTRACTOR.

I.S.A. STANDARD LETTER FUNCTIONS

SYMBOL	FIRST LETTER	SUCCEEDING LETTERS
A	ANALYSIS, ANALOG	ALARM
B	BURNER, FLAME	BATCH
C	CONDUCTIVITY, COMMAND	CONTROL (FEEDBACK TYPE)
D	DENSITY, SPECIFIC GRAVITY	
E	VOLTAGE	PRIMARY ELEMENT
F	FLOW RATE	RATIO
G	GAGING	GLASS
H	HAND, MANUAL	HIGH
I	CURRENT	INDICATE
J	POWER	SCAN
K	TIME, TIME SCHEDULE	CONTROL (NO FEEDBACK)
L	LEVEL, LIGHT	LOW
M	MOISTURE, HUMIDITY	MIDDLE, MODULATE
N		
O	OVERLOAD	ORIFICE
P	PRESSURE, VACUUM	POINT
Q	QUANTITY	TOTALIZE, INTEGRATE
R	RADIOACTIVITY	RECORD, PRINT, RECEIVE
S	SPEED, FREQUENCY, SOLENOID	SWITCH
T	TEMPERATURE, TURBIDITY	TRANSMIT, TRANSFORM
U	MULTIVARIABLE	MULTIFUNCTION
V	VIBRATION, VISCOSITY	VALVE, DAMPER, LOUVER
W	WEIGHT, FORCE	
X		
Y		RELAY, COMPUTE
Z	POSITION	DRIVE, ACTUATE

PROTECTIVE RELAY LEGEND

DEVICE NO.	DESCRIPTION
2	SYNC. TIMER 0-5 MIN.
25	SYNCHRONIZING
27	SHORT TIME UNDERVOLTAGE
32	REVERSE POWER RELAY
38	TEMPERATURE
40	LOSS OF EXCITATION
43	SELECTOR SWITCH
47	PHASE SEQUENCE & UNDERVOLTAGE
49	THERMAL
50/51	INSTANTANEOUS AND VERY INVERSE
51	VERY INVERSE
51G	INVERSE GROUND FAULT
51N	NEUTRAL OVERCURRENT
51V	OVERCURRENT RELAY WITH VOLTAGE RESTRAINT
52/CS	CONTROL SWITCH
59	INSTANTANEOUS OVERVOLTAGE
60	VOLTAGE BALANCE
62	TIME DELAY
64	SHORT TIME LOW PICK UP OVERVOLTAGE
67	DIRECTIONAL OVERCURRENT
69	LOCKOUT CONTROL SWITCH
78	OUT OF STEP
81	OVER/UNDER FREQUENCY RELAY
83	MULTI-CONTACT AUXILIARY
86/HR	MULTI-CONTACT AUX. HAND RESET
87	DIFFERENTIAL OVERCURRENT

SYMBOL LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
PT	POTENTIAL TRANSFORMER	W	WATTMETER
CT	CURRENT TRANSFORMER	AP	ALARM POINT
A	AMMETER	CPT	CONTROL POWER TRANSFORMER
V	VOLTMETER	(2) (3)	NUMBER OF DEVICES REQUIRED
PF	POWER FACTOR METER	ETI	ELAPSED TIME METER

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MARK	DATE	DESCRIPTION	BY
	11/19/19	ISSUED FOR BID	

CITY OF ANN ARBOR, MICHIGAN
WATER TREATMENT PLANT FILTER BACKWASH IMPROVEMENTS

ELECTRICAL LEGEND

Project No.: 200-31537-19003
Designed By: WAP
Drawn By: VLM
Checked By: GCJ

E-001

Bar Measures 1 inch

GENERAL CONSTRUCTION NOTES:

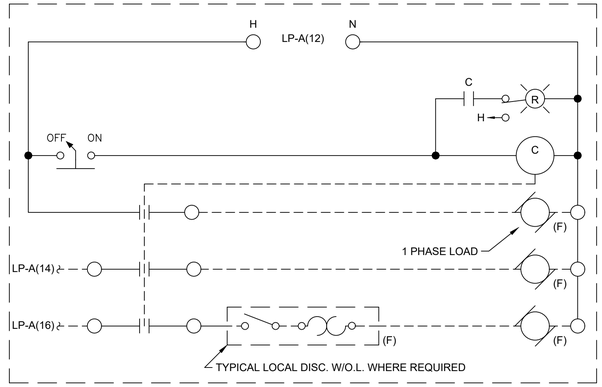
1. ELECTRICAL MATERIALS AND EQUIPMENT ITEMS SHOWN IN LIGHT LINE WEIGHTS ON THE DRAWINGS ARE EXISTING ITEMS TO REMAIN. ELECTRICAL MATERIALS AND EQUIPMENT ITEMS SHOWN IN HEAVY LINE WEIGHTS ARE NEW THIS CONTRACT.
2. ITEMS SHOWN OR NOTED TO BE DEMOLISHED ON THE DRAWINGS ARE EXISTING ITEMS TO BE REMOVED FROM SITE BY CONTRACTOR UNLESS NOTED TO BE TURNED OVER TO OWNER.
3. FOR ITEMS INDICATED AS "FIELD LOCATE", THE CONTRACTOR SHALL FIELD VERIFY FOR INTERFERENCE AND FOR LOCATIONS OF MOUNTING FLANGES, CONNECTION POINTS, ETC.
4. INSTALL A SINGLE CONDUCTOR INSULATED (THWN) COPPER GROUND WIRE IN EACH CONDUIT, SIZE AS SHOWN ON DRAWINGS, OR AS A MINIMUM PER THE NATIONAL ELECTRICAL CODE, WHICHEVER IS LARGER. THIS GROUND WIRE SHALL BE CONNECTED AT EACH END TO THE EQUIPMENT GROUND.
5. CONDUIT ROUTINGS SHOWN ON BACKGROUND PLANS ARE INTENDED ROUTINGS ONLY. EXACT CONDUIT ROUTINGS FOR CONDUITS, AND LENGTH SHALL BE FIELD LOCATED AND VERIFIED BY THE CONTRACTOR. COORDINATE CONDUIT ROUTING IN FINISHED AREAS WITH OWNER. CONDUIT TO BE CONCEALED IN THESE AREAS.
6. ETHERNET AND FIBER OPTIC TERMINATIONS (SC STYLE) SHALL BE PERFORMED BY A QUALIFIED CONTRACTOR, (NOT THE INSTALLING CONTRACTOR). THE CABLES SHALL BE TESTED. NO SPLICING SHALL BE PERMITTED OF FIBER OPTIC CABLES, BETWEEN PANELS. FIBERS SHALL BE TERMINATED AT PATCH PANELS, INCLUDING SPARES.
7. REFER TO THE CABLE MANUFACTURER'S RECOMMENDATIONS FOR MINIMUM BEND RADIUS FOR FIBER OPTIC CABLES. INSTALL NEW PULL BOXES (PB) AS REQUIRED FOR CONDUITS. SIZE PULL BOXES AS REQUIRED PER FIBER OPTIC CABLE MANUFACTURERS RECOMMENDATIONS.
8. CONDUITS/RACEWAYS, PULL BOXES AND JUNCTION BOXES TO BE INSTALLED WITH 316 STAINLESS STEEL CHANNEL STRUT. MINIMUM STRUT LENGTH TO BE 12 INCHES, WHERE POSSIBLE.
9. PANELS SHALL BE MOUNTED OFF WALLS WITH STRUT, CONDUITS SHALL BE MOUNTED ON STRUT INCLUDING SINGLE RUNS.
10. CONDUIT ENTERING CONTROL PANELS AND ELECTRICAL EQUIPMENT ENCLOSURES SHALL BE FILLED WITH DUCT SEAL, INCLUDING OPENINGS IN BOTTOM OF PANELS, AND EQUIPMENT.
11. REPAIR SIDEWALKS AND ROADWAYS DUE TO SITE WORK ADDITIONS, THE EXTENT OF THE REPAIR REQUIRED SHALL BE FIELD VERIFIED PRIOR TO BIDS IN CONJUNCTION WITH THE WORK SHOWN IN THE CONTRACT DOCUMENTS. PRIOR TO TRENCHING, FIELD LOCATE EXISTING GAS LINES, TELEPHONE LINES, SPRINKLER LINES, ETC. COORDINATE WITH OWNER
12. CABLES (INCLUDING FIBER, ETHERNET, CONTROL WIRE, ETC.) WHERE PASSING THROUGH A PULL BOX SHALL BE LABELED AND COMPLETELY IDENTIFIED WITH IDENTIFICATION NUMBERS AND ORIGINATION/DESTINATION. THIS ALSO INCLUDES ALL CABLE BUNDLES ENTERING CONTROL PANELS, PULL BOXES, ETC.
13. PULL CORDS SHALL BE INSTALLED IN CONDUITS CONTAINING NETWORK CABLES, AND FIBER OPTIC CABLES.
14. CORE HOLES AS REQUIRED TO SUIT INSTALLATION OF CONDUIT AND WIRING/CABLING AS SHOWN. FIELD VERIFY EXACT EXTENT OF WORK REQUIRED.
15. FURNISH PULL BOXES FOR FIBER OPTIC CABLE. COORDINATE EXACT BENDING RADIUS WITH MANUFACTURER.
16. NEW CONDUITS INSTALLED THIS CONTRACT WITH FIBER OPTIC CABLES ARE TO BE LABELED WITH PHENOLIC TAGS (AT BEGINNING TO END) TO INDICATE THE NUMBER OF STRANDS, ORIGINATION AND DESTINATION. TAGS TO BE COLOR CODED ORANGE FOR MULTIMODE.
17. WHERE NEW CONDUITS SHOWN TO BE INSTALLED PASS UNDER ROADWAYS, CONDUITS SHALL BE CONCRETE ENCASED.
18. PRIOR TO EXCAVATION, FIELD LOCATE EXISTING UTILITIES. COORDINATE WITH OWNER.
19. AREAS WHERE CAMERAS ARE SHOWN TO BE INSTALLED SHALL BE CLASSIFIED AS NEMA 4, UNLESS CALLED OUT OTHERWISE.
20. THE ASSOCIATED INSTRUMENTATION DRAWINGS SHOW EXISTING WIRES AND TERMINAL NUMBERS REQUIRED TO PROPERLY INTERFACE WITH NEW EQUIPMENT. THIS INFORMATION WAS COLLECTED FROM AS-BUILT DRAWINGS AND EXTENSIVE FIELD VERIFICATION. THE INFORMATION SHALL BE USED AS A GUIDE IN RE-TERMINATION. IT SHALL REMAIN THE CONTRACTOR'S RESPONSIBILITY TO EXAMINE THE WIRING AND TO REVISE TO SUIT AS REQUIRED. CHANGES IN THE CONTRACT OR COST WILL NOT BE GRANTED FOR THIS COORDINATION. IT IS THE CONTRACTOR'S RESPONSIBILITY TO EXAMINE PROPOSED WORK SHOWN.
21. CONDUIT ROUTINGS SHOWN ON BACKGROUND PLANS ARE PROPOSED ROUTINGS ONLY. EXACT CONDUIT ROUTINGS AND LENGTH SHALL BE FIELD LOCATED AND VERIFIED BY THE CONTRACTOR. COORDINATE CONDUIT ROUTING IN FINISHED AREAS WITH OWNER. CONDUIT TO BE CONCEALED IN THESE AREAS.
22. RACEWAYS, PULL BOXES AND JUNCTION BOXES TO BE INSTALLED WITH 316 STAINLESS STEEL FASTENERS SUPPORTS, AND THREADED ROD, ETC. (CHANNEL STRUT TO ALSO BE STAINLESS STEEL). MINIMUM STRUT LENGTH TO BE 12 INCHES, WHERE POSSIBLE. TYPICAL FOR NEMA 12, 4, AND 7 AREAS.
23. WIRING FOR STARTERS SHALL BE IN ACCORDANCE WITH NEMA CLASS II B STANDARDS. SUBMIT ENGINEERED SHOP DRAWINGS FOR ALL STARTERS SHOWN TO BE WIRED.
24. WIRE NUMBERS (1, 3, 5, ETC.) SHALL BE PREFIXED WITH STARTER TAG NUMBERS. THE WIRE NUMBER AFTER THE PREFIX SHALL BE THE MANUFACTURER'S WIRE NUMBERING SYSTEM. WIRE MARKERS SHALL BE USED AT EACH WIRE TERMINATION POINT.
25. IN AREAS WHERE EQUIPMENT AND CONDUIT IS REMOVED, REPAIR WALL AND FLOOR SURFACES AS REQUIRED TO MATCH SURROUNDING AREA. WHERE DEVICES ARE REMOVED FROM CONCEALED BOXES, FURNISH AND INSTALL A BLANK COVER ON THE BOX.
26. FIBER OPTIC CABLE SHALL BE AS CALLED OUT ON SYSTEM CONFIGURATION DRAWINGS, SINGLE MODE, ALL DIELECTRIC, SUITABLE FOR INSTALLATION UNDERGROUND IN WET CONDUIT.
27. FIELD VERIFY CONDUIT ROUTING AT THE PLANT WITH OWNER. CORE HOLES AS REQUIRED TO SUIT INSTALLATION OF THE CONDUITS SHOWN. PATCH WITH NON-SHRINK GROUT.
28. TURN OVER TO OWNER AT PROJECT COMPLETION OPERATION AND MAINTENANCE MANUALS (QUANTITY AS SPECIFIED) TO OWNER.

GENERAL NOTES:

1. PRIOR TO SUBMITTING A BID FOR THE WORK DETAILED UNDER THIS CONTRACT, BIDDER SHALL VISIT THE WATER TREATMENT PLANT. THE BIDDER SHALL FULLY ACQUAINT ONESELF WITH EXISTING FIELD CONDITIONS AT EACH SITE. NO BULLETINS WILL BE WRITTEN FOR WORK DUE TO LACK OF VERIFICATION OF EXISTING SITE CONDITIONS AND WIRING.
2. NO WIRES SHALL BE TERMINATED TO TERMINAL STRIPS, OR OTHER EQUIPMENT WITHOUT FIRST VERIFYING SIGNAL TYPE. DAMAGES RESULTING IN LACK OF VERIFICATION SHALL BE BORNE BY THE CONTRACTOR. CONTRACTOR SHALL COORDINATE SIGNAL TYPE AND VOLTAGE WITH I/O CARDS SHOWN.
3. WITHIN CONTROL PANELS, NAMEPLATES SHALL BE PROVIDED TO INDICATE DIFFERENT VOLTAGE LEVELS WITHIN PANELS. ALSO, A NAME TAG (YELLOW BACKGROUND, RED LETTERING) SHALL BE LOCATED ON THE FRONT OF EVERY PANEL INDICATING THAT WHEN MAIN PANEL DISCONNECTED 120V IS STILL PRESENT FROM FIELD DEVICES (YELLOW WIRING/ISOLATED INPUT CARDS.)
4. PHENOLIC TAGS ON FACE OF CONTROL PANELS TO HAVE WHITE BACKGROUND AND BLACK LETTERING (EXCEPT WARNING TAGS; YELLOW BACKGROUND RED LETTERING).
5. PROVIDE SAFETY COVERS ON ALL 480V MOLDED CASE MAIN CIRCUIT BREAKERS TO INSULATE THE INCOMING CABLES AND SIDE CONDUCTORS FROM CONTACT. (TYP. FOR CONTROL PANELS.) PROVIDE BREAKER LOCKS FOR PUMP CIRCUIT BREAKERS (MCP)AND MAIN PANEL BREAKERS.
6. REFER TO WIRING DIAGRAMS FOR ADDITIONAL INFORMATION ON ISOLATED I/O. A COMMON NEUTRAL MAY BE USED FOR SEVERAL ISOLATED INPUTS FROM THE SAME STARTER. PROVIDE NEUTRAL JUMPERS WIRES WITHIN THE PANEL AS REQUIRED.
7. ELECTRICAL MATERIALS AND EQUIPMENT ITEMS SHOWN IN LIGHT LINE WEIGHTS ON THE DRAWINGS ARE EXISTING ITEMS TO REMAIN. ELECTRICAL MATERIALS AND EQUIPMENT ITEMS SHOWN IN HEAVY LINE WEIGHTS ARE NEW THIS CONTRACT.
8. ITEMS SHOWN CROSSHATCHED (OR NOTED TO BE DEMOLISHED) ON THE DRAWINGS ARE EXISTING ITEMS TO BE REMOVED, FROM SITE BY CONTRACTOR.
9. INSTALL A SINGLE CONDUCTOR INSULATED (RHW, THHN, OR XHHW) COPPER GROUND WIRE IN EACH CONDUIT, SIZE AS SHOWN ON DRAWINGS, OR AS A MINIMUM PER THE NATIONAL ELECTRICAL CODE. THIS GROUND WIRE SHALL BE CONNECTED AT EACH END TO THE EQUIPMENT GROUND. THIS ALSO INCLUDES INSTRUMENTATION DEVICES SUCH AS LEVEL, PRESSURE, FLOW TRANSMITTERS, LIMIT SWITCHES, CONDUITS, NETWORK AND I/O CABLES.
10. THE FOLLOWING EXAMPLE COMPONENT IDENTIFICATION SHALL BE USED AS APPROPRIATE:

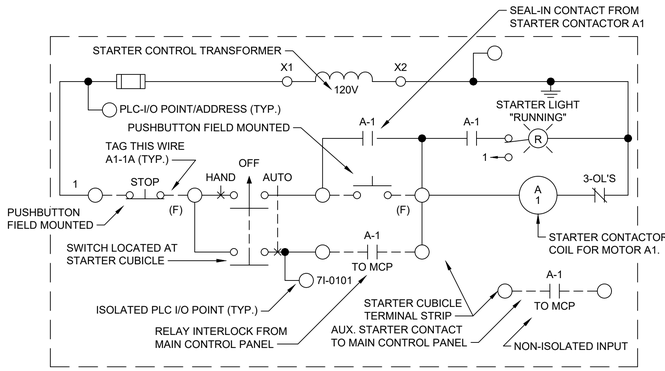
(F) FIELD MOUNTED, NOT AT STARTER OR OTHER CONTROL PANELS
(S) STARTER PANEL MOUNTED
(MCP)AT MAIN CONTROL PANEL
(1) AT CONTROL PANEL NO.1
(2) AT CONTROL PANEL NO.2
(TCP) AT TEMPERATURE CONTROL PANEL

11. REFER TO DETAIL SHEETS. CONTRACTOR SHALL FURNISH AND INSTALL HARDWARE AND APPURTENANCES (I.E. PIPE TAPS, WETWELL BUBBLER TUBES, VALVES, COPPER TUBING, BALL VALVES, PNEUMATIC PIPING, SPOOL PIECES, ETC.) FOR FIELD DEVICES SHOWN (FLOWMETERS, PRESSURE TRANSMITTERS, LEVEL TRANSMITTERS, ETC.). WORK SHALL BE COORDINATED WITH OTHER TRADES (MECHANICAL INSTRUMENTATION, ETC.) CONTRACTOR SHALL BE RESPONSIBLE FOR SYSTEM COORDINATION AND INSTALLATION.
12. ETHERNET AND FIBER OPTIC TERMINATIONS SHALL BE PERFORMED BY A QUALIFIED REPRESENTATIVE OF CABLE MANUFACTURER, THE CABLES SHALL BE TESTED. NO SPLICING SHALL BE PERMITTED OF FIBER OPTIC CABLES, BETWEEN PANELS. FIBERS SHALL BE TERMINATED AT PATCH PANELS, INCLUDING SPARES.
13. REFER TO THE CABLE MANUFACTURER'S RECOMMENDATIONS FOR MINIMUM BEND RADIUS FOR FIBER OPTIC CABLES. INSTALL NEW PULL BOXES (PB) AS REQUIRED FOR CONDUITS. SIZE PULLBOXES AS REQUIRED PER FIBER OPTIC CABLE MANUFACTURERS RECOMMENDATIONS.
14. CONDUIT ENTERING CONTROL PANELS AND ELECTRICAL EQUIPMENT ENCLOSURES SHALL BE FILLED WITH DUCT SEAL, INCLUDING OPENINGS IN BOTTOM OF PANEL.
15. CABLES (INCLUDING FIBER, ETHERNET, CONTROL WIRE, ETC.) WHERE PASSING THROUGH A PULLBOX SHALL BE LABELED AND COMPLETELY IDENTIFIED WITH IDENTIFICATION NUMBERS AND ORIGINATION/DESTINATION. THIS ALSO INCLUDES ALL CABLE BUNDLES ENTERING CONTROL PANELS, PULLBOXES, ETC.
16. CONTROL WIRES SHALL BE TAGGED WITH THE PLC I/O ADDRESS IN THE FIELD AND AT THE PANEL.
17. THE FIELD DEVICES SHOWN ON THE P&ID'S, ELECTRICAL BACKGROUNDS, AND DETAILS SHEETS MAKEUP THE FIELD DEVICE EQUIPMENT REQUIREMENTS. NOT ALL FIELD DEVICES REQUIRED ARE SHOWN ON THE P&ID'S.
18. UPS SELECTED SHALL BE COMPATIBLE WITH ISOLATION TRANSFORMERS. (TYP.)
19. REFER TO I/O DRAWING LAYOUT FOR ADDITIONAL SIGNALS NOT SHOWN ON P&ID FLOW DIAGRAMS.



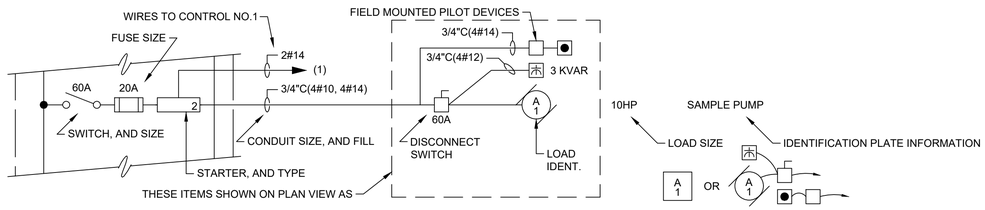
TYPICAL 120V 3 POLE CONTACTOR

(EXAMPLE CIRCUIT)



A 1 **EXAMPLE PUMP** ← STARTER NAMEPLATE

(TAG A1)
(EXAMPLE CIRCUIT)



MCC LEGEND EXAMPLE

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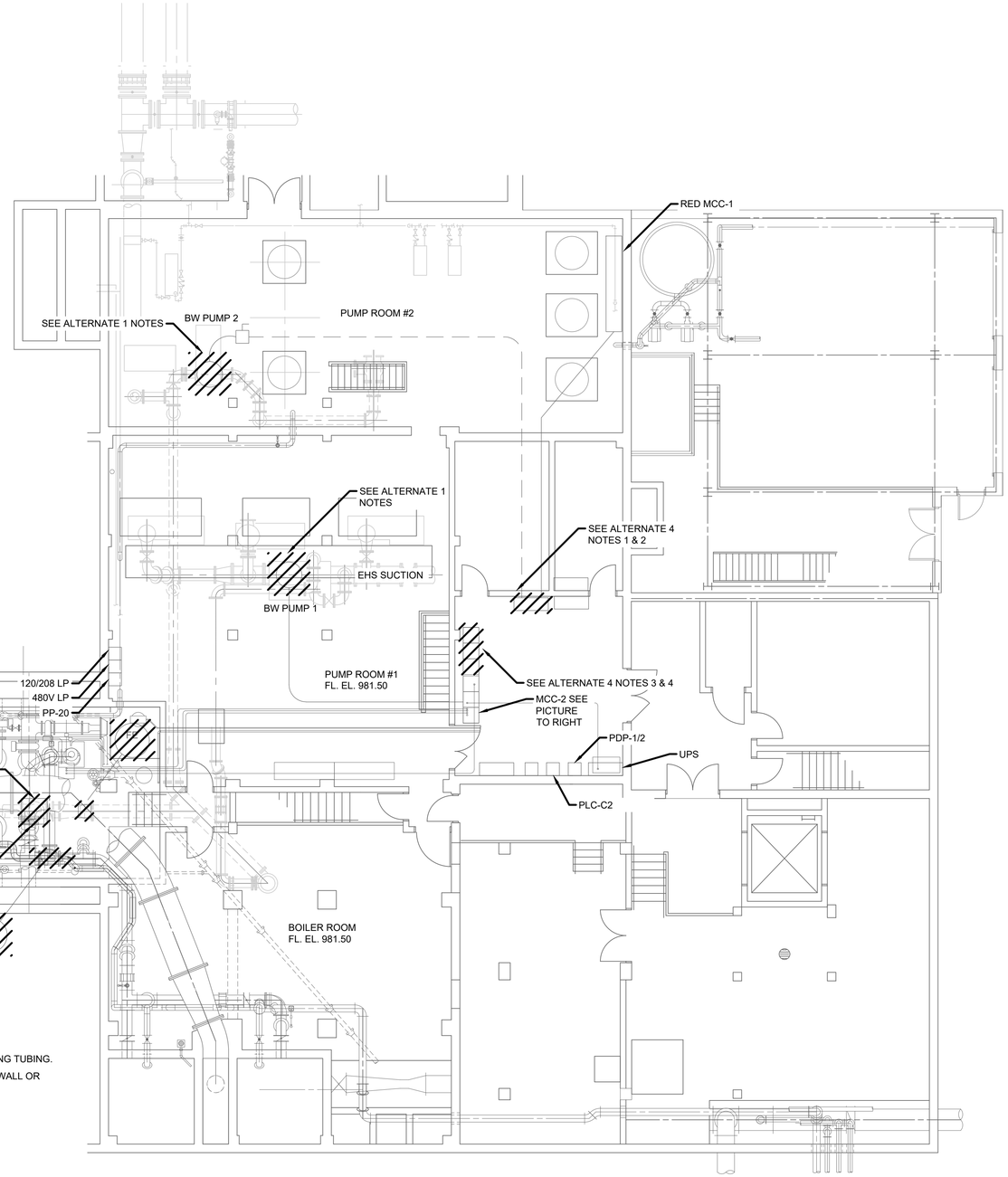
CITY OF ANN ARBOR, MICHIGAN
WATER TREATMENT PLANT FILTER BACKWASH IMPROVEMENTS

ELECTRICAL LEGEND, NOTES

Project No.:	200-31537-19003
Designed By:	WAP
Drawn By:	VLM
Checked By:	GCJ

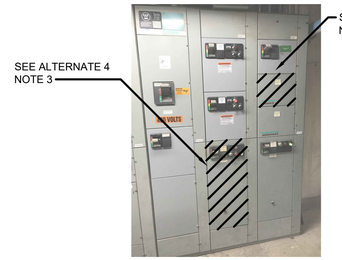
E-002

Bar Measures 1 inch

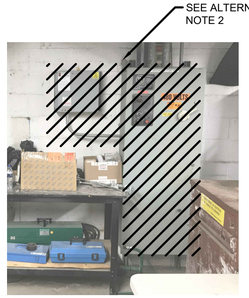


DEMOLITION FLOOR PLAN

SCALE: 1 1/2" = 1'-0



ALTERNATE 4 BW PUMP #1 STARTER DEMOLITION



ALTERNATE 4 BW PUMP 2 STARTER DEMOLITION

NOTES:

BASE BID NOTES

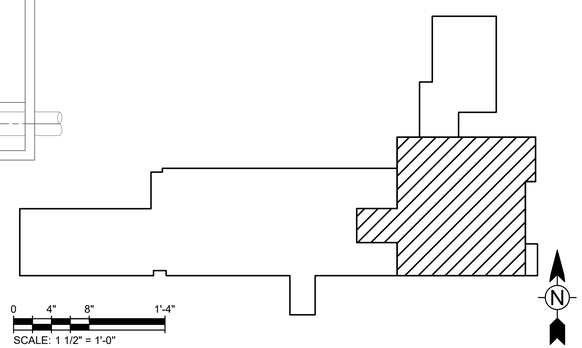
1. DEMOLISH FLOW CONTROL VALVE, VENTURI TUBE, DIFFERENTIAL PRESSURE SENSOR AND ASSOCIATED SENSING TUBING.
2. DEMOLISH POWER AND CONTROL WIRE BACK TO SOURCE. DEMOLISH CONDUIT BACK TO FIRST CONDULET AT WALL OR CEILING. PROVIDE PULL LINE IN CONDUIT AND CAP WITH SCREW IN PLUG.

ALTERNATE 1 NOTES

1. DISCONNECT CONDUIT AND WIRE FROM MOTOR AND PROTECT FOR RECONNECTION.
2. ONLY ONE PUMP MAY BE OUT OF SERVICE AT A TIME.

ALTERNATE 4 NOTES

1. DEMOLISH WIRE FROM MOTOR TO STARTER, AND FROM STARTER TO FEEDER BREAKER IN RED MCC1.
2. DEMOLISH WALL MOUNTED STARTER AND CAPACITOR FOR BACKWASH PUMP #2 AND TURN OVER TO OWNER. SAVE CONDUITS FOR REUSE ON PROPOSED REPLACEMENT STARTER.
3. DEMOLISH MCC MOUNTED STARTER AND POWER FACTOR CORRECTION CAPACITOR FOR BACKWASH PUMP #1.
4. DEMOLISH WIRE FROM BACKWASH PUMP #1 TO STARTER IN MCC. SAVE CONDUITS FOR REUSE ON PROPOSED REPLACEMENT STARTER.
5. ONLY ONE PUMP MAY BE OUT OF SERVICE AT A TIME.



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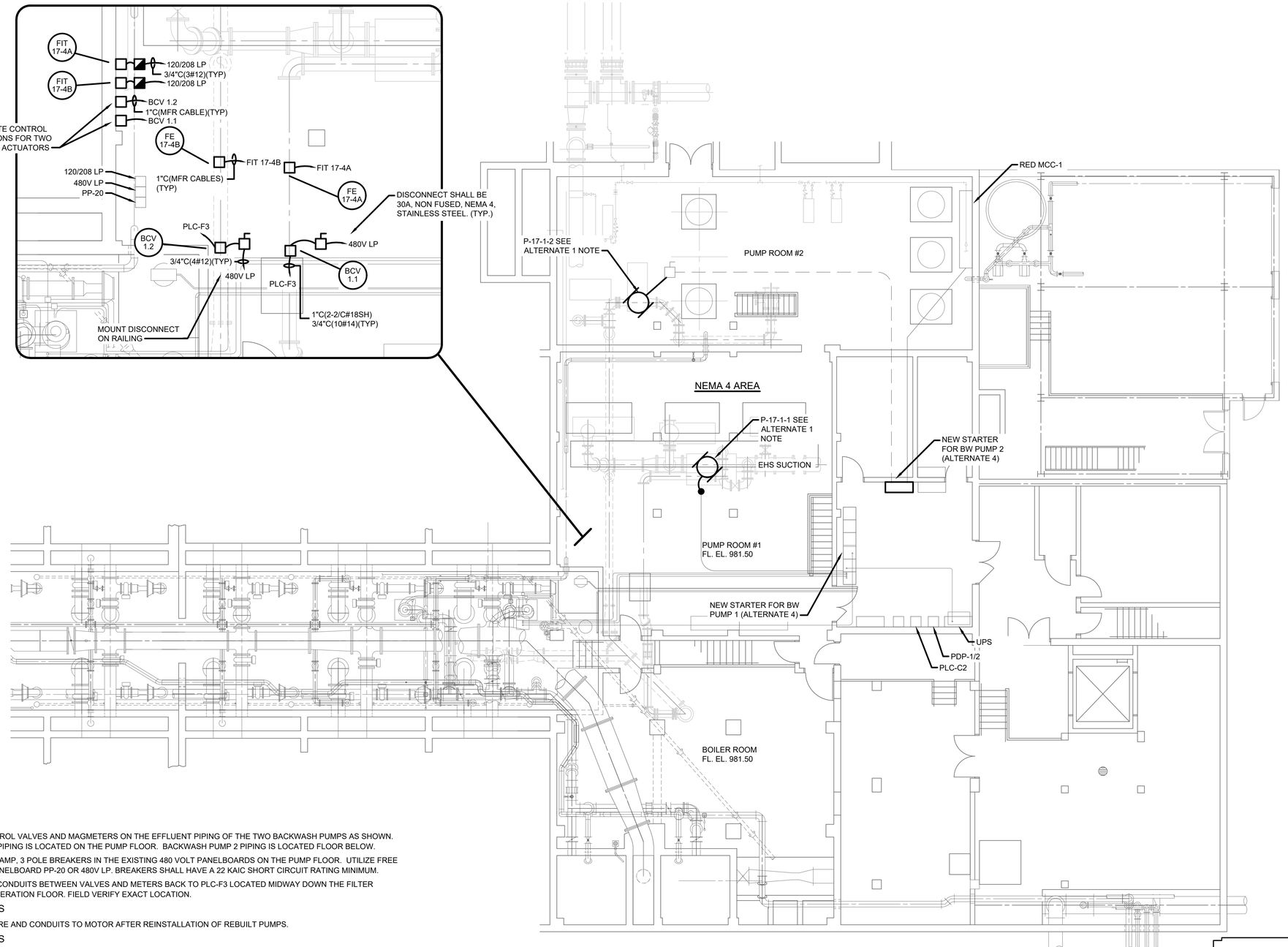
CITY OF ANN ARBOR, MICHIGAN

WATER TREATMENT PLANT FILTER BACKWASH IMPROVEMENTS

DEMOLTION FLOOR PLAN

Project No.:	200-31537-19003
Designed By:	WAP
Drawn By:	VLM
Checked By:	GCJ

E-301



NOTES:

BASE BID NOTES

1. INSTALL FLOW CONTROL VALVES AND MAGMETERS ON THE EFFLUENT PIPING OF THE TWO BACKWASH PUMPS AS SHOWN. BACKWASH PUMP 1 PIPING IS LOCATED ON THE PUMP FLOOR. BACKWASH PUMP 2 PIPING IS LOCATED FLOOR BELOW.
2. PROVIDE TWO (2) 15 AMP, 3 POLE BREAKERS IN THE EXISTING 480 VOLT PANELBOARDS ON THE PUMP FLOOR. UTILIZE FREE SPACE IN EITHER PANELBOARD PP-20 OR 480V LP. BREAKERS SHALL HAVE A 22 KAIC SHORT CIRCUIT RATING MINIMUM.
3. PROVIDE CONTROL CONDUITS BETWEEN VALVES AND METERS BACK TO PLC-F3 LOCATED MIDWAY DOWN THE FILTER GALLERY ON THE OPERATION FLOOR. FIELD VERIFY EXACT LOCATION.

ALTERNATE 1 NOTES

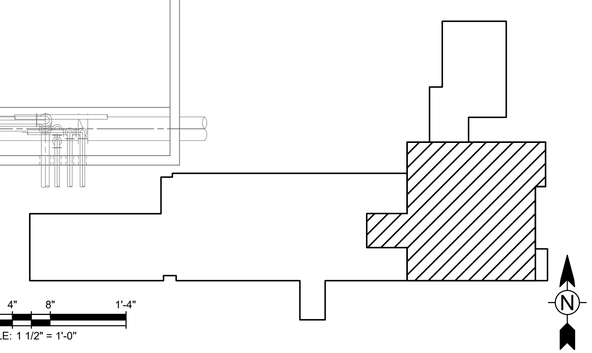
1. RECONNECT THE WIRE AND CONDUITS TO MOTOR AFTER REINSTALLATION OF REBUILT PUMPS.

ALTERNATE 4 NOTES

1. PROVIDE NEW COMBINATION STARTERS FOR BACKWASH PUMPS 1 AND 2. STARTERS SHALL BE INSTALLED IN SAME LOCATIONS AS DEMOLISHED UNITS. BW PUMP 1 STARTER SHALL BE INSTALLED IN MCC-2, AND BW PUMP 2 STARTER SHALL BE WALL MOUNTED NEMA 12 ENCLOSURE. REFER TO SCHEMATIC ON E-501 FOR STARTER CONTROLS. MCC-2 IS A WESTINGHOUSE SERIES 2100. PROVIDE NEW DOORS FOR THE MCC STARTER REPLACEMENT. THE STARTER OCPD SHALL HAVE THE SAME SHORT CIRCUIT RATINGS AS THE MCC. OCPD SHALL BE SIZED PER CODE.
2. EXTEND CONDUITS AS REQUIRED TO RECONNECT TO NEW STARTERS AND CAPACITORS.
3. PROVIDE NEW 20 kVAR POWER FACTOR CORRECTION CAPACITORS FOR EACH BACKWASH PUMP STARTER IN SAME LOCATIONS AS DEMOLISHED UNITS. BW PUMP 1 CAPACITOR SHALL BE INSTALLED IN MCC-2, AND BW PUMP 2 CAPACITOR SHALL BE WALL MOUNTED NEMA 12 ENCLOSURE. MCC-2 IS A WESTINGHOUSE SERIES 2100.
4. PROVIDE NEW 3#2/0, 1#6, 2#14 IN EXISTING CONDUITS FROM MOTOR TO STARTER, TO ASSOCIATED MCC FEEDER BREAKER (TYPICAL OF 2). PROVIDE 10#14 FROM STARTER TO PLC-F3 IN EXISTING CONDUITS (TYPICAL OF 2).

PROPOSED WORK FLOOR PLAN

SCALE: 1 1/2" = 1'-0



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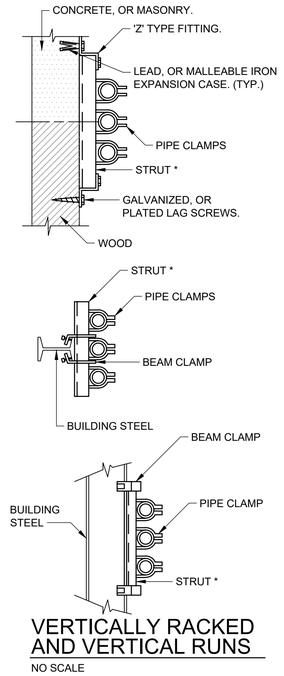
WATER TREATMENT PLANT FILTER BACKWASH IMPROVEMENTS
PROPOSED WORK FLOOR PLAN

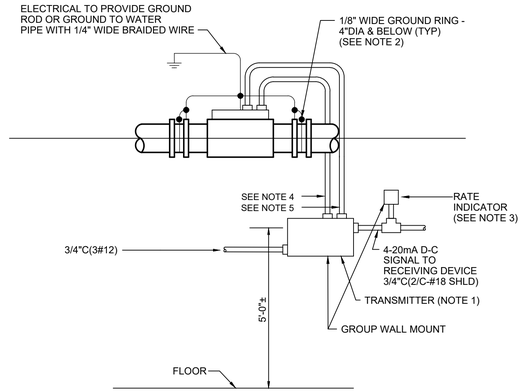
Project No.:	200-31537-19003
Designed By:	WAP
Drawn By:	VLM
Checked By:	GCJ

E-302



VERTICALLY RACKED AND VERTICAL RUNS

NO SCALE

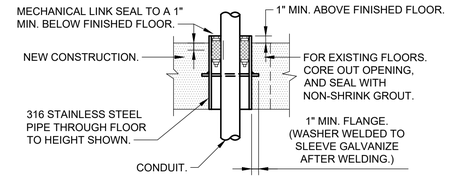


NOTES:

1. LOCATION FOR TRANSMITTERS NOT INTEGRALLY MOUNTED ON THE FLOW METER.
2. GROUND MAGMETER AS INSTRUCTED BY THE VENDOR.
3. INSTALL SEPARATELY MOUNTED INDICATOR. NOT REQUIRED ON INDICATING WALL MOUNTED TRANSMITTERS.
4. POWER WIRING, 3/4"C(4#12) OR AS SUPPLIED BY MANUFACTURER.
5. SIGNAL WIRING, 3/4"C(6/C-#18SHLD.) OR AS SUPPLIED BY MANUFACTURER.

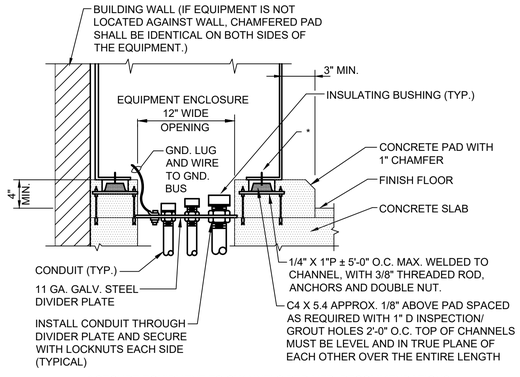
MAGNETIC FLOW METER INSTALLATION

NO SCALE



INTERIOR FLOOR CONDUIT SLEEVE DETAIL

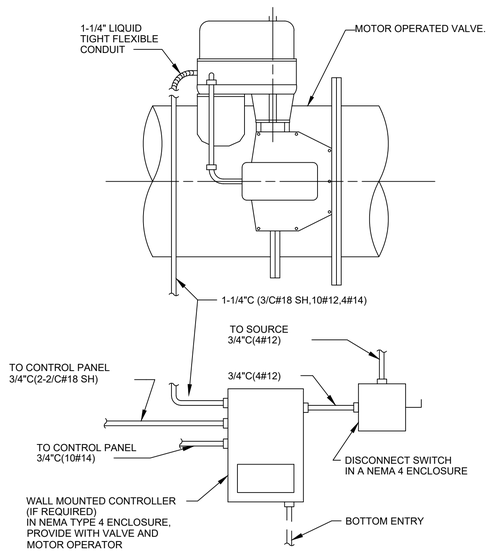
NO SCALE



* SECURE EQUIPMENT TO CHANNELS PER MFR. RECOMMENDATIONS

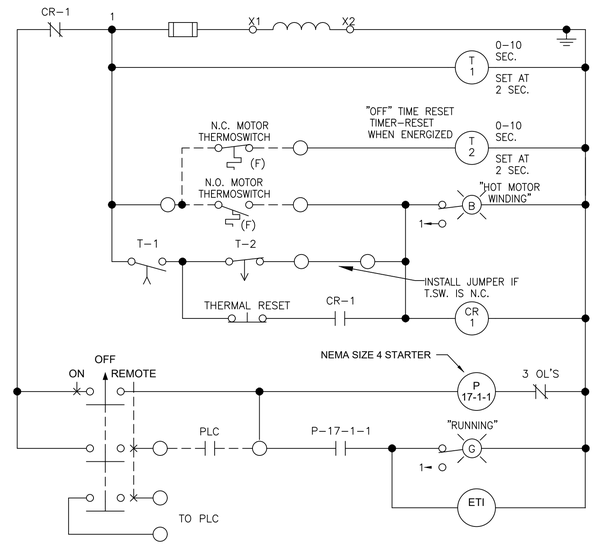
EQUIPMENT PAD INTERIOR

NO SCALE



MOTOR OPERATED VALVE THROTTLING SERVICE 480VOLT,3PHASE

NO SCALE



BW PUMP 1 & 2

(TYP OF 2)

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WATER TREATMENT PLANT FILTER BACKWASH IMPROVEMENTS

DETAILS AND WIRING SCHEMATIC

Project No.:	200-31537-19003
Designed By:	WAP
Drawn By:	VLM
Checked By:	GCJ

E-501

GRAPHIC SYMBOL FOR INSTRUMENTATION ITEMS

	LOGIC IN PLC DISPLAYED ON OIP & SCADA (INCLUDING INPUTS & OUTPUTS)		CONTROL RELAY CONTACT-NORMALLY OPEN
	LOGIC IN PLC		CONTROL RELAY CONTACT-NORMALLY CLOSED
	FIELD OR LOCALLY MOUNTED DEVICE		LIGHTNING ARRESTOR
	PROGRAMMED FUNCTION NOT NORMALLY ACCESSIBLE TO OPERATOR	ETI	ELAPSED TIME INDICATOR
	PROGRAMMED FUNCTION ACCESSIBLE THROUGH OPERATOR'S INTERFACE DEVICE	T	TIMING RELAY COIL
	LOGIC IN PLC DISPLAYED ON OIP (INCLUDING INPUTS AND OUTPUTS)	T	TIMED RELAY COIL (OFF-DELAY)
	INTERLOCKING	G	INDICATING LIGHT
XOR	EXCLUSIVE OR		PUSH-TO-TEST INDICATING LIGHT
A	ALTERNATOR		BATTERY
OR	OR	X1 X2	SECONDARY TRANSFORMER
AND	AND		VARIABLE RESISTOR
S	MOTOR STARTER		RESISTOR
P	PURGE		MOLDED CASE CIRCUIT BREAKER
L	COMPLEX LOGIC		SPEED SWITCH
	COMPUTER LOGIC SYSTEM		MOMENTARY PUSHBUTTON OPERATOR- NORMALLY CLOSED
	TERMINAL OR TRANSITION POINT		MOMENTARY PUSHBUTTON OPERATOR- NORMALLY OPEN
	FLOAT SWITCH		SELECTOR SWITCH-NORMALLY OPEN
	PARSHALL FLUME		PUSHBUTTON OPERATOR WITH MUSHROOM HEAD
	MIXER		SOLENOID OR CLUTCH
	SEAL		THERMAL OVERLOAD
	OFF PAGE CONNECTOR		A-C SURGE PROTECTOR
	PROCESS MACHINERY MOTOR		HORN
	VENTURI OR INSERT FLOW TUBE	(F)	FIELD LOCATED
	IN-LINE FLOW ELEMENT (PROPELLER TYPE)		TERMINAL POINT
	IN-LINE FLOW ELEMENT (MAGNETIC TYPE)		TERMINAL POINT ARROW
	IN-LINE FLOW ELEMENT (ULTRA SONIC)		LOW VOLTAGE FUSE
	FLOW ORIFICE		CIRCUIT BREAKER WITH STAB CONNECTION
	TURBIDIMETER		CONTROL POWER TRANSFORMER
	ROTAMETER	CR L CR U	TWO COIL LATCHING RELAY
	PUMP		
	BLOWER		RECEPTACLE
	GENERAL USE DISCONNECTING SWITCH		SELECTOR SWITCH OPERATOR WITH FUNCTION SHOWN
	TIMED CLOSED CONTACT ON ENERGIZATION		
	TIMED OPEN CONTACT ON ENERGIZATION		MAINTAINED PUSH-PULL OPERATOR
	TIMED OPEN CONTACT ON DE-ENERGIZATION		
	TIMED CLOSED CONTACT ON DE-ENERGIZATION		MAINTAINED STOP-START PUSHBUTTON OPERATOR
	FLOAT ACTUATED SWITCH-NO		
	FLOAT ACTUATED SWITCH-NC		DIODE RECTIFIER OR D-C SURGE PROTECTOR
	PRESSURE ACTUATED SWITCH-NC		LIMIT SWITCH - NORMALLY OPEN
	PRESSURE ACTUATED SWITCH-NO		LIMIT SWITCH - NORMALLY OPEN - HELD CLOSED
	FLOW ACTUATED SWITCH-NO		LIMIT SWITCH - NORMALLY CLOSED - HELD OPEN
	FLOW ACTUATED SWITCH-NC		LIMIT SWITCH - NORMALLY CLOSED
	TEMPERATURE SWITCH-NO		
	TEMPERATURE SWITCH-NC		

GRAPHIC SYMBOLS FOR VALVES

SYMBOL	DESCRIPTION
	STROKE OR POSITION ACTUATOR CYLINDER (OPEN-SHUT)
	STROKE OR POSITION ACTUATOR CYLINDER (THROTTLING)
	PNEUMATIC DIAPHRAGM OR POSITIONER (OPEN-SHUT)
	PNEUMATIC DIAPHRAGM OR POSITIONER (THROTTLING)
M	MOTOR OPERATED (THROTTLING)
M	MOTOR OPERATED (OPEN-SHUT)
	SLIDE-STOP GATE
	SLUICE GATE
	AIR SET ASSEMBLY
	BALL VALVE
	GLOBE VALVE
	GATE VALVE OR KNIFE GATE
	CHECK VALVE
	PLUG VALVE
	BUTTERFLY VALVE, DAMPER OR LOUVER
S	TWO-WAY SOLENOID VALVE OPERATOR
M	ELECTRONICALLY CONTROLLED CHECK VALVE
S D	TWO-WAY SOLENOID VALVE OPERATOR-DETENTED
S	THREE-WAY SOLENOID VALVE OPERATOR
S	FOUR-WAY SOLENOID VALVE OPERATOR

ABBREVIATIONS

SYMBOL	DESCRIPTION
R	RESET
T	TRIP
AS	AIR SUPPLY
DO	DISSOLVED OXYGEN
GS	GAS SUPPLY
HS	HYDRAULIC SUPPLY
NS	NITROGEN SUPPLY
ORP	OXYGEN REDUCTION POTENTIAL
SS	STEAM SUPPLY
SP	SET POINT
WS	WATER SUPPLY
PV	PROCESS VARIABLE
F.O.	FAIL OPEN
F.C.	FAIL CLOSE
%	GAIN OR PROPORTIONAL CONTROL
∫	INTEGRAL OR RESET CONTROL
D	DERIVATIVE OR RATE CONTROL
V	VELOCITY ALGORITHM
1-0	ON-OFF CONTROL
√‾	SQUARE ROOT EXTRACTOR
Σ	ADD OR TOTALIZE
Δ	SUBTRACT OR DIFFERENCE
⟩	HIGHEST MEASURED VARIABLE
⟨	LOWEST MEASURED VARIABLE
E/I , I/P	CONVERT ONE TO ANOTHER
X , ÷	MULTIPLY , DIVIDE
	BIAS OR REVERSING
f(x)	CHARACTERIZE - (EQUATION / /D/%/ETC.)

INSTRUMENTATION LINE SYMBOLS

SYMBOL	DESCRIPTION
	ELECTRICAL SIGNAL
	AIR LINE
	HYDRAULIC SIGNAL
	ELECTROMAGNETIC OR SONIC SIGNAL
	SOFTWARE SIGNAL
	CONNECTION TO PROCESS, OR MECHANICAL LINK

I.S.A. STANDARD LETTER FUNCTIONS

SYMBOL	FIRST LETTER	SUCEEDING LETTERS
A	ANALYSIS , ANALOG	ALARM
B	BURNER , FLAME	BATCH
C	CONDUCTIVITY , COMMAND	CONTROL (FEEDBACK TYPE)
D	DENSITY , SPECIFIC GRAVITY	
E	VOLTAGE	PRIMARY ELEMENT
F	FLOW RATE	RATIO
G	GAGING	GLASS
H	HAND , MANUAL	HIGH
I	CURRENT	INDICATE
J	POWER	SCAN
K	TIME , TIME SCHEDULE	CONTROL (NO FEEDBACK)
L	LEVEL , LIGHT	LOW
M	MOISTURE , HUMIDITY	MIDDLE , MODULATE
N		
O	OVERLOAD	ORIFICE
P	PRESSURE , VACUUM	POINT
Q	QUANTITY	TOTALIZE , INTEGRATE
R	RADIOACTIVITY	RECORD , PRINT , RECEIVE
S	SPEED , FREQUENCY , SOLENOID	SWITCH
T	TEMPERATURE , TURBIDITY	TRANSMIT , TRANSFORM
U	MULTIVARIABLE	MULTIFUNCTION
V	VIBRATION , VISCOSITY	VALVE , DAMPER , LOUVER
W	WEIGHT , FORCE	
X		
Y		RELAY , COMPUTE
Z	POSITION	DRIVE , ACTUATE

ABBREVIATIONS

SYMBOL	DESCRIPTION
MCC	MOTOR CONTROL CENTER
CP-A	MAIN CONTROL PANEL
RCP-1	REMOTE CONTROL PANEL 1 (NEAR STORAGE TANK)
DC-LP	DIRECT CURRENT- LIGHTING/DISTRUBUTION PANEL
LP	LIGHTING/DISTRUBUTION PANEL
LC	LIGHTING CONTACTOR PANEL
ANT	ANTENNA
RD	RADIO
NS	NETWORK SWITCH
CM	CAMERA
UP	UNINTERRUPTIBLE POWER SUPPLY
DS	DATA STORAGE
OP	OPERATOR INTERFACE
PL	PROGRAMMABLE LOGIC CONTROLLER
RO	REMOTE I/O
VD	VARIABLE FREQUENCY DEVICE - DISPLAY
VP	VARIABLE FREQUENCY DEVICE - PROTECTION
FB	FEEDER BREAKER
MB	MAIN BREAKER
IRR	IRRIGATION CONTROLLER

NOTES:

1. NEW WORK IS SHOWN IN BOLD.
2. PROVIDE SURGE SUPPRESSION NETWORKS ACROSS RELAYS, SOLENOIDS, CONTACTORS, STARTERS, ETC., AS RECOMMENDED BY PLC MANUFACTURER.
3. NO WIRES SHALL BE TERMINATED TO TERMINAL STRIPS, OR OTHER EQUIPMENT WITHOUT FIRST VERIFYING SIGNAL TYPE. DAMAGES RESULTING IN LACK OF VERIFICATION SHALL BE BORNE BY THE CONTRACTOR. CONTRACTOR SHALL COORDINATE SIGNAL TYPE AND VOLTAGE WITH I/O CARDS SHOWN.
4. CONTROL PANELS SHALL HAVE DOOR HANDLES WITH LOCKS. LOCKS SHALL BE KEYED ALIKE AS COORDINATED WITH OWNER.
5. POINTS ON CARDS SHOWN TO BE USED, AND SHOWN AS SPARE SHALL BE WIRED TO TERMINAL STRIPS.
6. SCALES/RANGES NOT SHOWN ON P & ID'S SHALL BE OBTAINED FROM THE ENGINEER DURING THE SHOP DRAWING REVIEW PROCESS.
7. SIGNALS SHOWN ON P & ID'S AND I/O CARDS COMPRISE I/O WIRING REQUIRED FOR THE INSTALLATION OF THE NEW CONTROL SYSTEM. REFER TO ELECTRICAL SITE PLAN/BACKGROUND DRAWINGS FOR ADDITIONAL INFORMATION.
8. WITHIN CONTROL PANELS, NAMEPLATES SHALL BE PROVIDED TO INDICATE DIFFERENT VOLTAGE LEVELS WITHIN PANELS. ALSO, A NAME TAG (YELLOW BACKGROUND, RED LETTERING) SHALL BE LOCATED ON THE FRONT OF EVERY PANEL INDICATING THAT WHEN MAIN PANEL IS DISCONNECTED 120V IS STILL PRESENT FROM FIELD DEVICES (YELLOW WIRING/ISOLATED INPUT CARDS.)
9. CONTROL PANELS ARE TO BE PROVIDED WITH THERMOSTATICALLY CONTROLLED AIR CONDITIONERS WHERE SHOWN WITH CARBON FILTERS, ADEQUATELY SIZED FOR PROPER PANEL COOLING. PROVIDE 30' OF PLASTIC DRAIN LINE TUBING (TYP.) AIR CONDITIONERS TO BE THE PRODUCT OF MCLEAN GENESIS SERIES (PROVIDE STEP DOWN TRANSFORMER AND SECONDARY CIRCUIT BREAKER PROTECTION AS REQUIRED TO SUIT VOLTAGE REQUIREMENTS OF AIR CONDITIONER.)
10. PAINT CONTROL PANELS; COLOR AS DIRECTED BY OWNER/ENGINEER. SUBMIT COLOR SELECTION CHART DURING SHOP DRAWING REVIEW PROCESS.
11. PHENOLIC TAGS ON FACE OF CONTROL PANELS TO HAVE WHITE BACKGROUND AND BLACK LETTERING (EXCEPT WARNING TAGS; YELLOW BACKGROUND RED LETTERING).
12. SIGNALS SHOWN ON P & ID'S AND I/O CARDS COMPRISE WIRING AND FIELD DEVICES REQUIRED FOR THE CONTROL SYSTEM. REFER TO ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.
13. FIBER OPTIC CABLE INSTALLATION AND TERMINATIONS SHALL BE PERFORMED BY A QUALIFIED ORGANIZATION WHICH SPECIALIZES IN THIS TYPE OF WORK. ONCE INSTALLED, FO CABLE SHALL BE TESTED AS OUTLINED IN THE SPECIFICATIONS BY A QUALIFIED TESTING ORGANIZATION.
14. ETHERNET AND PLC FIBER OPTIC CABLE SHALL NOT BE SPLICED BETWEEN PANELS.
15. REFER TO ELECTRICAL WIRING DIAGRAMS FOR ADDITIONAL INFORMATION ON ISOLATED I/O. A COMMON NEUTRAL MAY BE USED FOR SEVERAL ISOLATED INPUTS FROM THE SAME STARTER. PROVIDE NEUTRAL JUMPER WIRES WITHIN THE PANEL AS REQUIRED.
16. TERMINAL BLOCKS TO BE 12" MINIMUM ABOVE FLOOR. HIGH DENSITY TERMINAL BLOCKS MAY BE USED.
17. BELDEN 9463 I/O CABLE WHERE TERMINATED SHALL HAVE ITS ENDS HEAT SHRINK WITH BLACK TUBING, AND THE DRAIN WIRE SHALL BE COVERED WITH GREEN INSULATION.
18. PROVIDE SAFETY COVERS ON ALL 480V MOLDED CASE MAIN CIRCUIT BREAKERS TO INSULATE THE INCOMING CONDUCTORS AND LOAD SIDE CONDUCTORS FROM CONTACT. (TYP. FOR ALL CONTROL PANELS)
19. UPS SELECTED TO BE COMPATIBLE WITH SOLA MCR TRANSFORMERS. (TYP)
20. THE FIELD DEVICES SHOWN ON THE P&ID'S, I/O CARD DRAWINGS, ELECTRICAL BACKGROUNDS, AND DETAIL SHEETS MAKE UP THE FIELD DEVICE EQUIPMENT REQUIREMENTS. NOT ALL FIELD DEVICES REQUIRED ARE SHOWN ON THE P&ID'S.
21. PROVIDE SUN SHADE AROUND ALL CONTROL PANELS AND INSTRUMENTS THAT ARE MOUNTED OUTSIDE.
22. OUTSIDE EQUIPMENT MUST BE RATED FOR -40 TO 150 DEG F.
23. PROVIDE ANALOG SURGE SUPPRESSOR FOR ALL FIELD MOUNTED TRANSMITTERS.

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MARK	DATE	DESCRIPTION	BY
	11/19/19	ISSUED FOR BID	

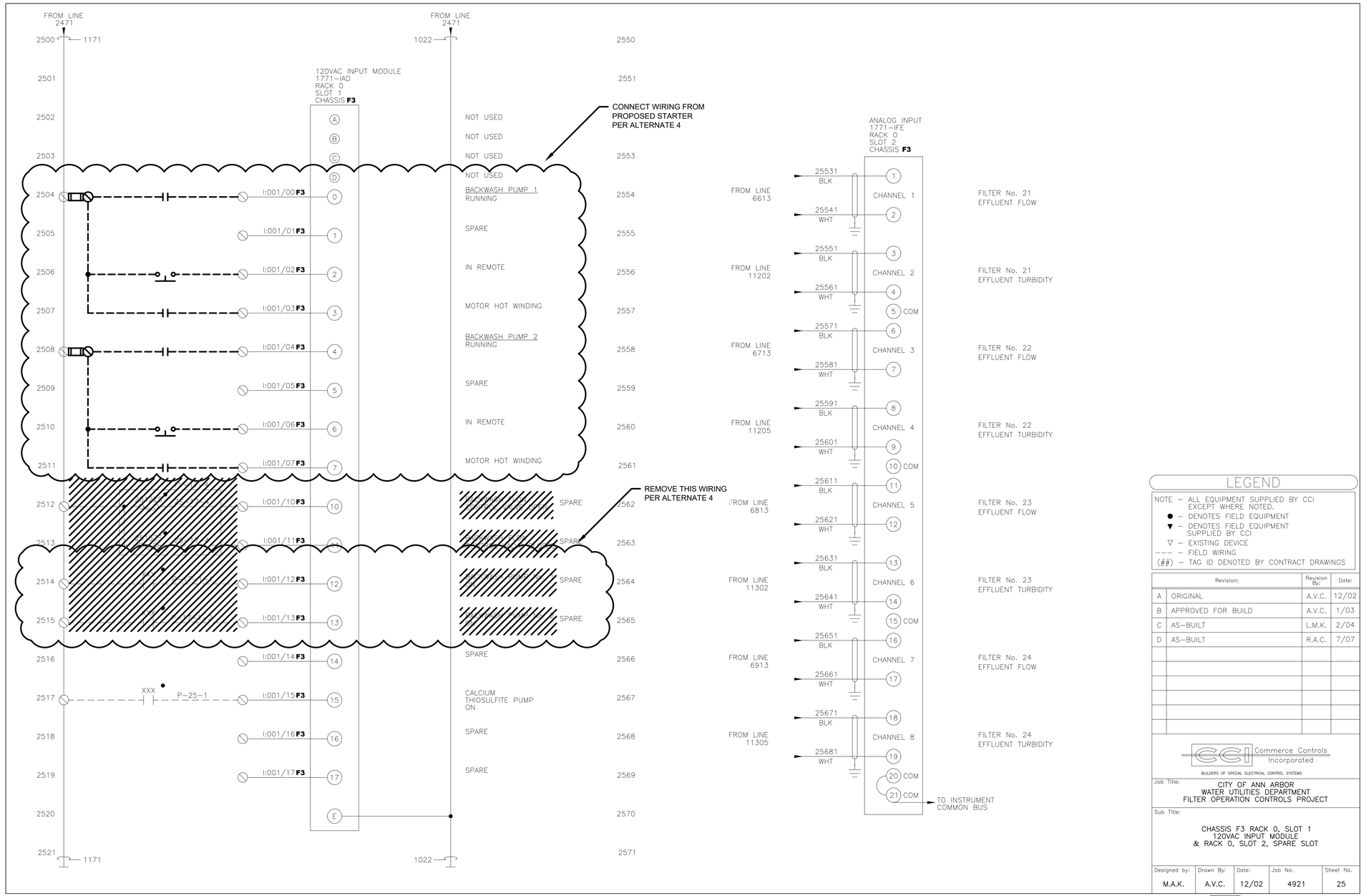
CITY OF ANN ARBOR, MICHIGAN
WATER TREATMENT PLANT FILTER BACKWASH IMPROVEMENTS
LEGEND

Project No.:	200-31537-19003
Designed By:	WAP
Drawn By:	JLS
Checked By:	GCJ

I-001

Bar Measures 1 inch

11/19/2019 9:14:05 AM - P:\IER\31537\200-31537-19003\CAD\SHEETFILES\I-001 INSTRUMENTATION LEGEND.DWG - MELLING, VICKIE



LEGEND

NOTE – ALL EQUIPMENT SUPPLIED BY CCI EXCEPT WHERE NOTED.
● – DENOTES FIELD EQUIPMENT
▼ – DENOTES FIELD EQUIPMENT SUPPLIED BY CCI
▽ – EXISTING DEVICE
--- – FIELD WIRING
(##) – TAG ID DENOTED BY CONTRACT DRAWINGS

	Revision:	Revision By:	Date:
A	ORIGINAL	A.V.C.	12/02
B	APPROVED FOR BUILD	A.V.C.	1/03
C	AS-BUILT	L.M.K.	2/04
D	AS-BUILT	R.A.C.	7/07

Commerce Controls Incorporated
BUILDERS OF SPECIAL ELECTRICAL CONTROL SYSTEMS

Job Title: CITY OF ANN ARBOR
WATER UTILITIES DEPARTMENT
FILTER OPERATION CONTROLS PROJECT

Sub Title: CHASSIS F3 RACK 0, SLOT 1
120VAC INPUT MODULE
& RACK 0, SLOT 2, SPARE SLOT

Designed by:	Drawn By:	Date:	Job No.	Sheet No.
M.A.K.	A.V.C.	12/02	4921	25

Commerce Controls Incorporated JOB No. – 4921

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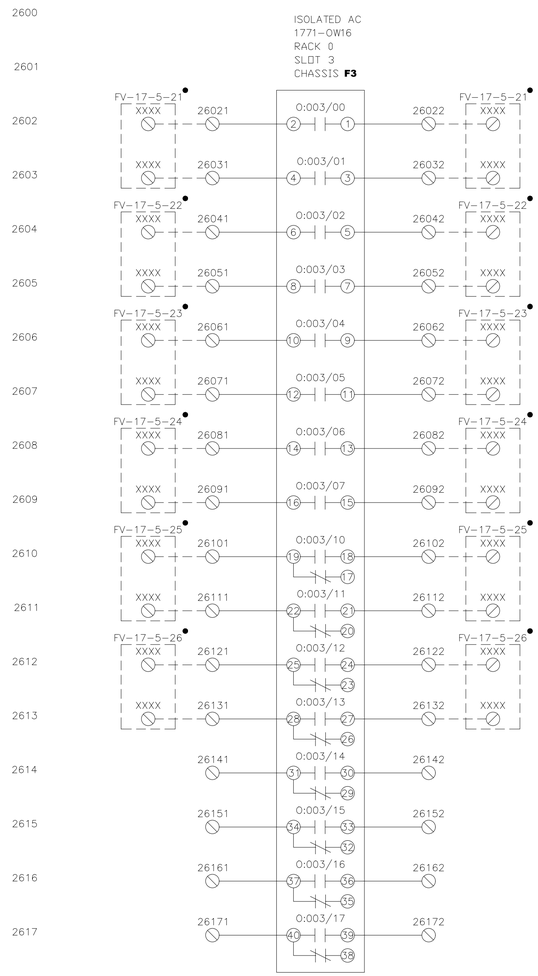
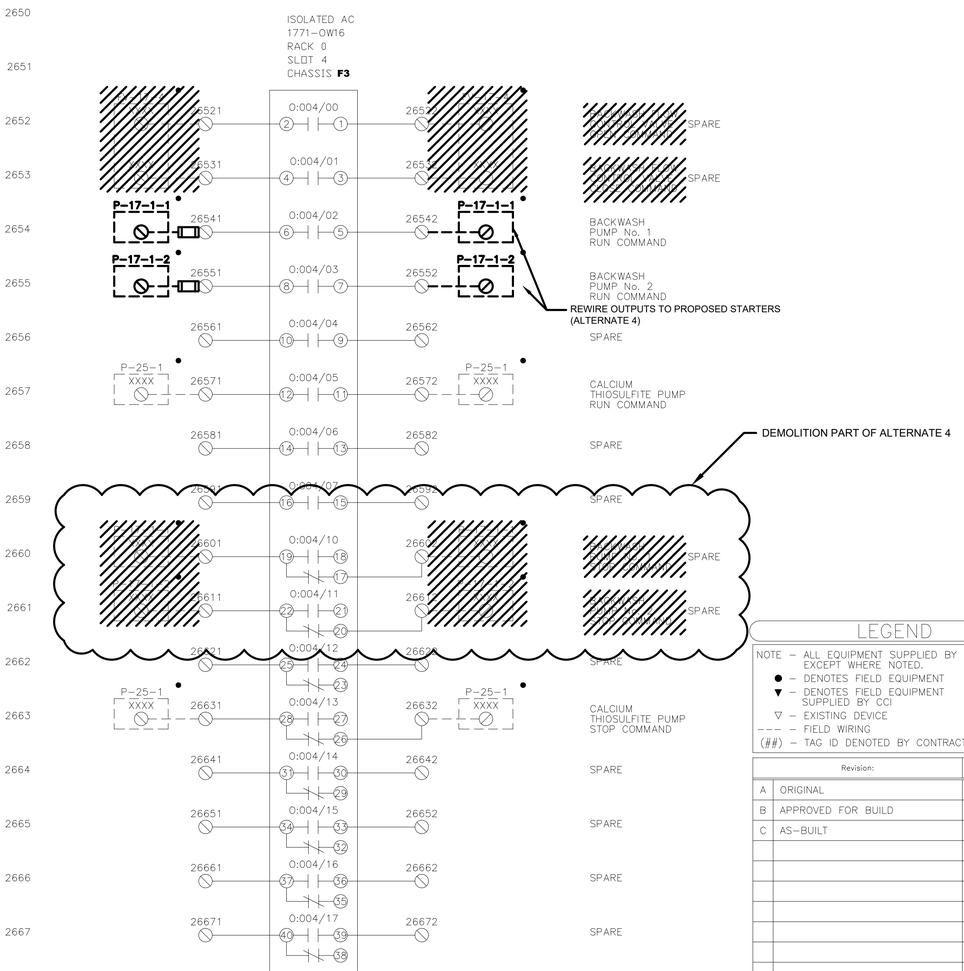
MARK	DATE	DESCRIPTION	BY
	11/19/19	ISSUED FOR BID	

CITY OF ANN ARBOR, MICHIGAN
WATER TREATMENT PLANT FILTER BACKWASH IMPROVEMENTS
CONTROL PANEL UPGRADES

Project No.: 200-31537-19003
Designed By: WAP
Drawn By: VLM
Checked By: GCJ

I-701





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Commerce Controls Incorporated
BUILDERS OF SPECIAL ELECTRICAL CONTROL SYSTEMS

Job Title: CITY OF ANN ARBOR
WATER UTILITIES DEPARTMENT
FILTER OPERATION CONTROLS PROJECT

Sub Title: CHASSIS F3 RACK 0, SLOT 3, ISOLATED OUTPUT MODULE & RACK 0, SLOT 4, ISOLATED OUTPUT MODULE

Designed by:	Drawn By:	Date:	Job No.	Sheet No.
M.A.K.	A.V.C.	12/02	4921	26

Commerce Controls Incorporated JOB No. – 4921

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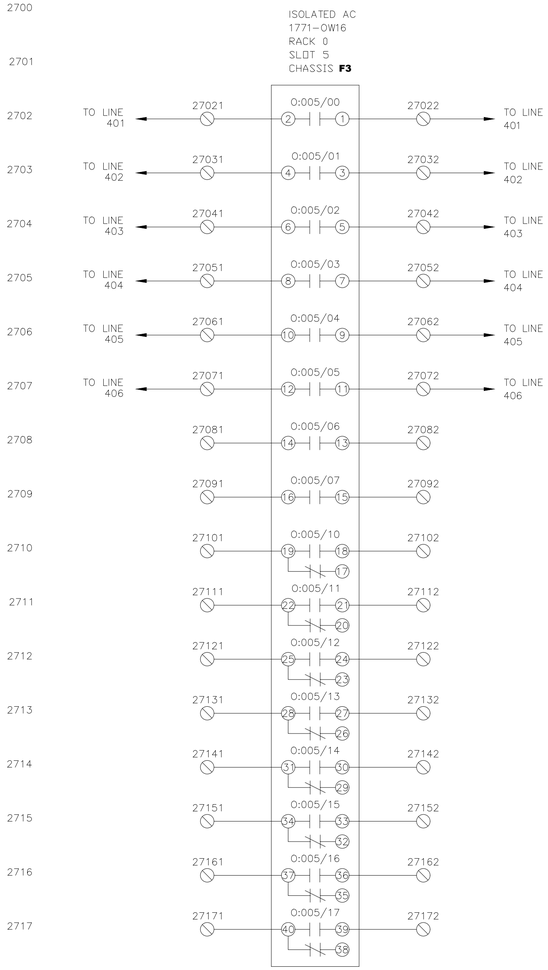
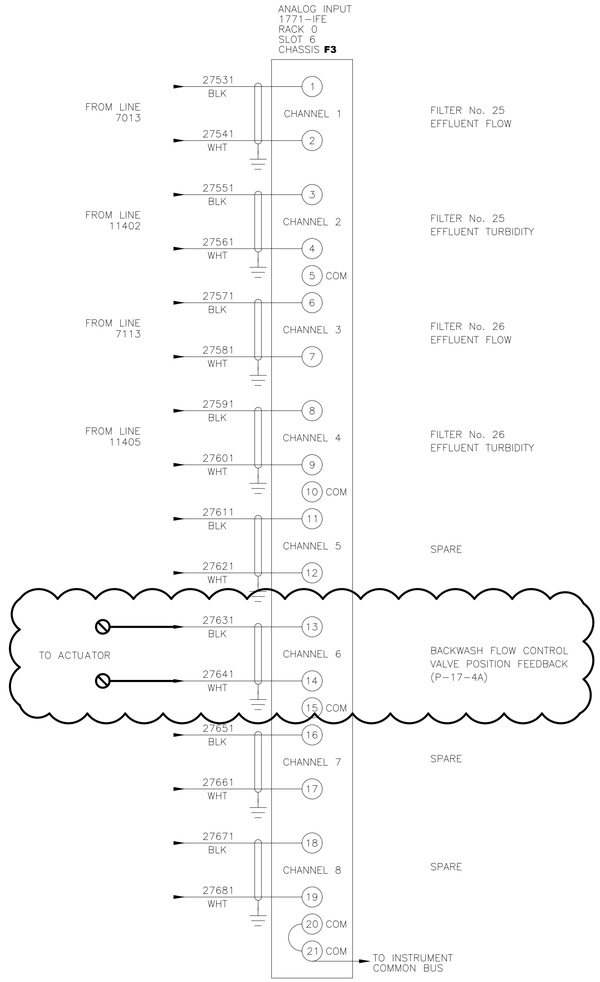
CITY OF ANN ARBOR, MICHIGAN
WATER TREATMENT PLANT FILTER BACKWASH IMPROVEMENTS
CONTROL PANEL UPGRADES

Project No.:	200-31537-19003
Designed By:	WAP
Drawn By:	VLM
Checked By:	GCJ

I-702





LEGEND

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Commerce Controls Incorporated
BUILDERS OF SPECIAL ELECTRICAL CONTROL SYSTEMS

Job Title: CITY OF ANN ARBOR
WATER UTILITIES DEPARTMENT
FILTER OPERATION CONTROLS PROJECT

Sub Title: CHASSIS F3 RACK 0, SLOT 5, ISOLATED OUTPUT MODULE & RACK 0, SLOT 6, SPARE SLOT

Designed by:	Drawn By:	Date:	Job No.	Sheet No.
M.A.K.	A.V.C.	12/02	4921	27

Commerce Controls Incorporated JOB No. – 4921

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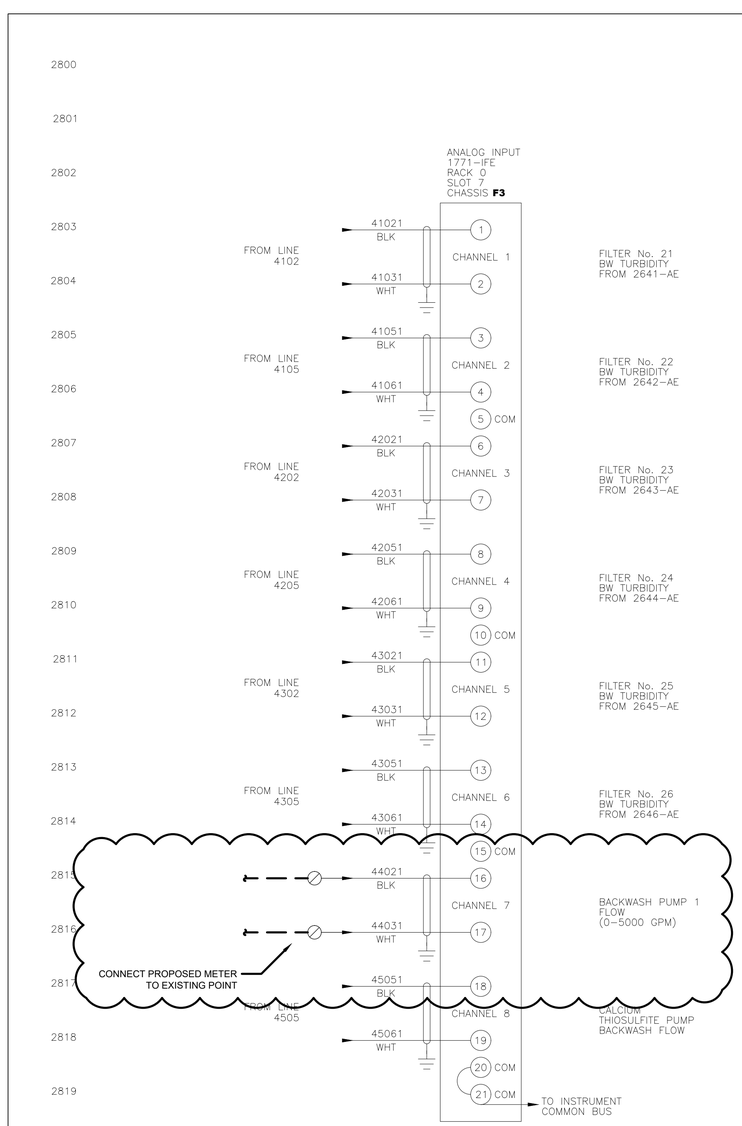
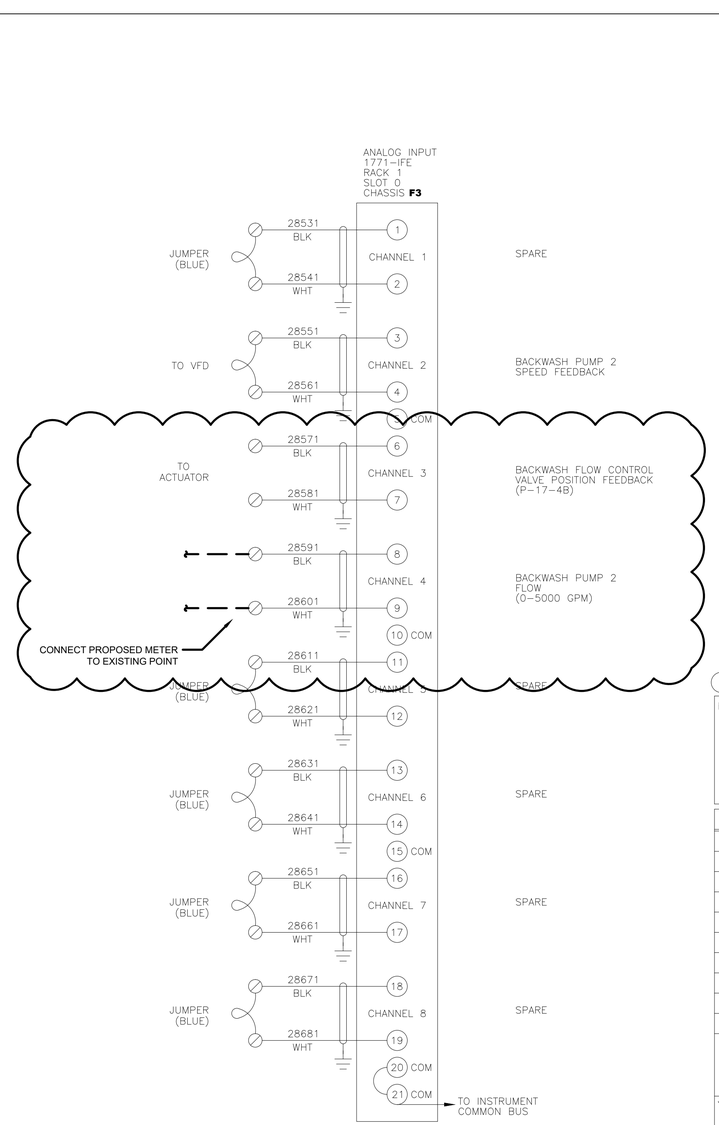
WATER TREATMENT PLANT FILTER BACKWASH IMPROVEMENTS
CONTROL PANEL UPGRADES

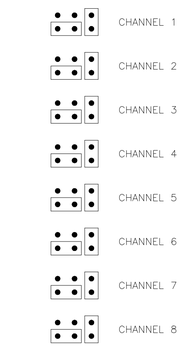
Project No.: 200-31537-19003
Designed By: WAP
Drawn By: VLM
Checked By: GCJ

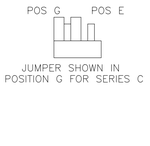
I-703





1771-IFE
CONFIGURATION SETTINGS





JUMPER SHOWN IN POSITION G FOR SERIES C

LEGEND

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Commerce Controls Incorporated
BUILDERS OF SPECIAL ELECTRICAL CONTROL SYSTEMS

Job Title: CITY OF ANN ARBOR
WATER UTILITIES DEPARTMENT
FILTER OPERATION CONTROLS PROJECT

Sub Title: CHASSIS F3 RACK 0, SLOT 7, ANALOG INPUT MODULE & RACK 1, SLOT 0, ANALOG INPUT MODULE

Designed by:	Drawn By:	Date:	Job No.	Sheet No.
M.A.K.	A.V.C.	12/02	4921	28

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CITY OF ANN ARBOR, MICHIGAN
WATER TREATMENT PLANT FILTER BACKWASH IMPROVEMENTS

CONTROL PANEL UPGRADES

Project No.:	200-31537-19003
Designed By:	WAP
Drawn By:	VLM
Checked By:	GCJ

I-704

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ANALOG OUTPUT
1771-OFE2
RACK 1
SLOT 1
CHASSIS **F3**

+ A
– 0
+ 1 — BLK
– 2 — WHT
+ 3 — BLK
– 4 — WHT
+ 5 — BLK
– 6 — WHT
7
B

CALCIUM THIOSULFITE PUMP SPEED

WASH WATER FLOW DISPLAY

BACKWASH FLOW CONTROL VALVE POSITION (P-17-4A)

BACKWASH FLOW CONTROL VALVE POSITION (P-17-4B)

SHIELDS GROUNDED AT RACK

LAST STATE OUTPUT
MIN

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RESERVED
SLOT
RACK 1
SLOT 2
CHASSIS **F3**

ELECTRIC VALVE ACTUATOR NETWORK MODULE SUPPLIED BY OTHERS

LEGEND

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● – DENOTES FIELD EQUIPMENT
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– – – – FIELD WIRING
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Commerce Controls Incorporated
BUILDERS OF SPECIAL ELECTRICAL CONTROL SYSTEMS

Job Title: CITY OF ANN ARBOR
WATER UTILITIES DEPARTMENT
FILTER OPERATION CONTROLS PROJECT

Sub Title: CHASSIS F3 RACK 1, SLOT 1,
ANALOG OUTPUT MODULE
& RACK 1, SLOT 2, SPARE SLOT

Designed by:	Drawn By:	Date:	Job No.	Sheet No.
M.A.K.	A.V.C.	12/02	4921	29

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Commerce Controls Incorporated JOB No. – 4921

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MARK	DATE	DESCRIPTION	BY
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CITY OF ANN ARBOR, MICHIGAN
WATER TREATMENT PLANT FILTER BACKWASH IMPROVEMENTS
CONTROL PANEL UPGRADES

Project No.:	200-31537-19003
Designed By:	WAP
Drawn By:	VLM
Checked By:	GCJ

I-705