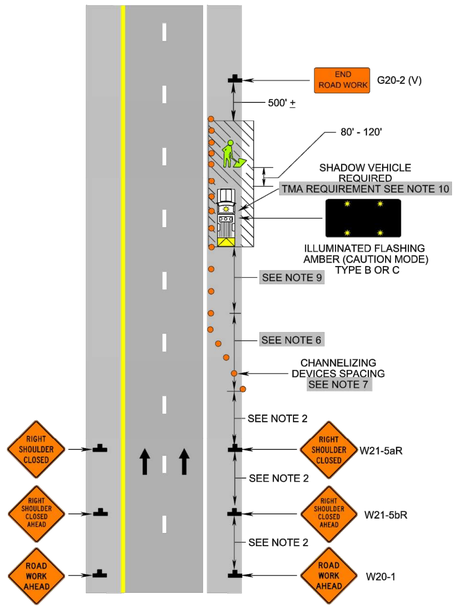
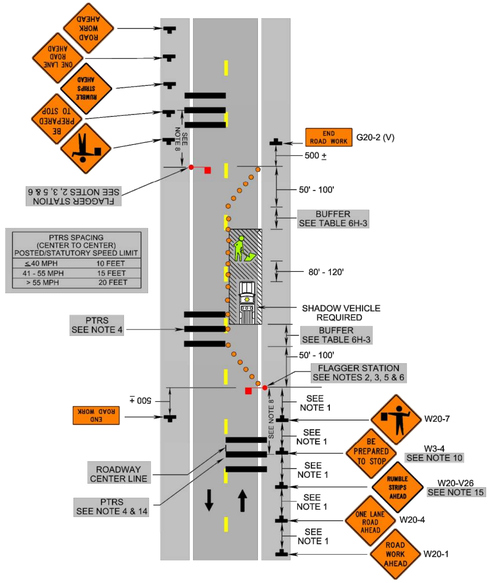
Stationary Operation on a Shoulder
(Figure TTC-4.2)



1: Revision 1 – 4/1/2015
2: Revision 2 – 9/1/2019

Lane Closure on a Two-Lane Roadway Using Flaggers
(Figure TTC-23.2)



1: Revision 1 – 4/1/2015
2: Revision 2 – 9/1/2019

Typical Traffic Control
Stationary Operation on a Shoulder
(Figure TTC-4.2)
NOTES

Standard

1. **For long-term stationary work (more than 3 days) on divided highways having a median wider than 8', sign assemblies on both sides of the roadway shall be required as shown (ROAD WORK AHEAD (W20-1), RIGHT SHOULDER CLOSED AHEAD (W21-5bR), RIGHT SHOULDER CLOSED (W21-5aR)[1]), even though only one shoulder is being closed. For operations less than 3 days in duration, sign assemblies will only be required on the side where the shoulder is being closed.**

Guidance

2. *Sign spacing should be 1300'-1500' for Limited Access highways. For all other roadways, the sign spacing should be 500'-800' where the posted speed limit is greater than 45 mph, and 350'-500' where the posted speed limit is 45 mph or less.*

Option:

3. The SHOULDER WORK (W21-5) sign on an intersecting roadway may be omitted where drivers emerging from that roadway will encounter another advance warning sign prior to this activity area.
4. For short duration operations of 60 minutes or less, all signs and channelizing devices may be eliminated if a vehicle with activated high-intensity amber rotating, flashing, or[1] oscillating lights is used.

Standard:

5. **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity amber rotating, flashing, or[1] oscillating lights. Vehicle hazard warning signals can be used to supplement high-intensity amber rotating, flashing, or[1] oscillating, lights.**
6. **Taper length (L) shall be at the following:**

Taper Length L

Speed Limit (mph)	Lane Width (Feet) 9	10	11	12	Remarks	Speed Limit (mph)	Lane Width (Feet) 9	10	11	12	Remarks
25	95	105	115	125	L=S²W/60	50	450	500	550	600	L=SW
30	135	150	165	180	L=S²W/60	55	495	550	605	660	L= SW
35	185	205	225	245	L=S²W/60	60	540	600	660	720	L=SW
40	240	270	295	320	L=S²W/60	65	585	650	715	780	L=SW
45	405	450	495	540	L=SW	70	630	700	770	840	L=SW

Limited Access highways shall use a 1000' merging taper regardless of the posted speed, for shifting taper see Table 6H.2[2]

Shoulder Taper = ½ L Minimum

7. **Channelizing device spacing shall be at the following:**

Channelizing Device Spacing

Location Spacing	Speed Limit (mph) 0 -35	36 +	Location Spacing	Speed Limit (mph) 0 -35	36 +	Location Spacing	Speed Limit (mph) 0 -35	36 +
Transition	20'	40'	Travelway	40'	80'	*Construction Access	80'	120'

*Construction access spacing may be increased to this distance, but shall not exceed one access per ¼ mile.

8. **On roadways with paved shoulders having a width of 8 feet or more, channelizing devices shall be used to close the shoulder in advance of the merging taper to direct vehicular traffic to remain within the traveled way.**
9. **The buffer space length shall be as shown in Table 6H-3 on Page 6H-5 for the posted speed limit.**
10. **A truck-mounted attenuator (TMA) shall be used on the shadow vehicle on Limited Access highways and multi-lane roadways with posted speed limit equal to or greater than 45 mph for operations with a duration greater than 60 minutes.**
11. **When a side road intersects the highway within the temporary traffic control zone, additional traffic control devices shall be placed as needed.**

1: Revision 1 – 4/1/2015
2: Revision 2 – 9/1/2019

Typical Traffic Control
Lane Closure on a Two-Lane Roadway Using Flaggers
(Figure TTC-23.2)
NOTES

Guidance:

1. *Sign spacing distance should be 350'-500' where the posted speed limit is 45 mph or less, and 500'-800' where the posted speed limit is greater than 45 mph.*
2. *Care should be exercised when establishing the limits of the work zone to insure maximum possible sight distance in advance of the flagger station and transition, based on the posted speed limit and at least equal to or greater than the values in Table 6H-3. Generally speaking, motorists should have a clear line of sight from the graphic flagger symbol sign to the flagger.*
3. *To maintain efficient traffic flow in a flagging operation on a two-lane roadway, the maximum time motorists should be stopped at a flagger station is 8 minutes for high volume roadways (average daily traffic of 500 or more vehicles per day) to a maximum of 12 minutes for low volume roadways (less than 500 vehicles per day). For additional information see Section 6E.07.[2]*

Standard:

4. **Portable Temporary Rumble Strips (PTRS) shall be used as noted in Section 6F.99.**
5. **Flagging stations shall be located far enough in advance of the work space to permit approaching traffic to reduce speed and/or stop before passing the work space and allow sufficient distance for departing traffic in the left lane to return to the right lane before reaching opposing traffic (see Table 6H-3 on Page 6H-5).**
6. **All flaggers shall be state certified and have their certification card in their possession when performing flagging duties (see Section 6E.01, Qualifications for Flaggers).**
7. **Cone spacing shall be based on the posted speed and the values in Table 6H-4 on Page 6H-6.[1]**
8. **A shadow vehicle with at least one high intensity amber rotating, flashing, or[1] oscillating light shall be parked 80'-120' in advance of the first work crew.**

Option:

8. A SLOW (W21-V10) sign[2] may be required in this area to give advance warning of the operation ahead by slowing approaching traffic prior to reaching the flagger station or queued traffic.

Guidance:

9. *If the queue of traffic reaches the BE PREPARED TO STOP (W3-4) sign then the signs, and if used the PTRS[1] should be readjusted at greater distances.*
10. *When a highway-rail crossing exists within or upstream of the transition area and it is anticipated that queues resulting from the lane closure might extend through the highway-rail grade crossing, the temporary traffic control zone should be extended so that the transition area precedes the highway-rail crossing (see Figure TTC-56 for additional information on highway-rail crossings).*

Standard:

11. **At night, flagger stations shall be illuminated, except in emergencies (see Section 6E.08).**

Option:

12. Cones may be eliminated when using a pilot vehicle operation or when the total roadway width is 20 feet or less.
13. For low-volume situations with short work zones on straight roadways where the flagger is visible to road users approaching from both directions, a single flagger, positioned to be visible to road users approaching from both directions, may be used (see Chapter 6E).

Standard:[1]

14. **When used[2], three portable temporary rumble (PTRS) strips shall be installed across the entire travel lane adjacent to the BE PREPARED TO STOP (W3-4) sign. The portable temporary rumble strips shall be monitored and adjusted as necessary during the work shift to ensure proper placement on the roadway. When the PTRS are installed, the RUMBLE STRIPS AHEAD (W20-V26) sign shall also be utilized.**

1: Revision 1 – 4/1/2015
2: Revision 2 – 9/1/2019

NARRATIVE

GENERAL NOTES

1. Estimate 12 week(s) required to complete the work within VDOT right of way.
2. Contractor is responsible for notifying Regional Traffic Operations Center at (540) 375-0170 upon entering and exiting the roadway.
3. VDOT Land Use Regulations require that work within the right of way be performed during non-peak hours of 9:00 AM to 3:30 PM Monday – Friday on all public roads classified as "arterial" or "collector", unless otherwise approved by VDOT.
4. All public roads classified as "local" roads are allowed unrestricted work hours and days.
5. Permitted nonemergency work will not be allowed on public roads classified as "arterial" or "collector" from noon on the preceding weekday through the following state observed holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day.
6. Provisions shall be taken to ensure the safe passage of emergency vehicles at all times.
7. Work zones requiring flagging operations at signalized intersections shall involve coordination with law enforcement agencies and VDOT prior to work commencing.
8. All traffic control devices used shall conform to:
   a. The latest version of the 2011 Virginia Work Area Protection Manual,
   b. The 2009 Manual on Uniform Traffic Control Devices (MUTCD), and the 2011 Virginia Supplement to the 2009 Manual on Uniform Traffic Control Devices for Streets and Highways 2011 Edition
   c. The National Cooperative Highway Research Program (NCHRP) Report 350.

PUBLIC COMMUNICATIONS PLAN**

**This section only necessary if detour is proposed, or if significant impacts to traffic are expected.

TRANSPORTATION OPERATIONS PLAN

1. The process to notify the Regional Traffic Operations Center (TOC) of planned lane closures on Virginia Traffic Information Management System (VaTraffic) is:
   a. The Contractor shall notify the TOC at (540) 375-0170 of all planned lane closure information by 8:00 a.m. of the Thursday prior to the week the lane closure is to be executed.
   b. The Contractor shall submit planned lane closure information to VDOT Permit Specialist Daniel Newland at (434) 841-6863 by 8:00 a.m. of the Thursday prior to the week the lane closure is to be executed.
   c. The Contractor shall notify the TOC, by a method or system specified by VDOT, thirty (30) minutes before a planned or approved lane, road, or shoulder closure is installed and within thirty (30) minutes after the closure is removed.
   d. The TOC operator will enter closure data in VaTraffic and monitor lane closure information.
   e. The Contractor shall notify the TOC at (540) 375-0170 of all traffic backups related to the lane closure.

INCIDENT RESPONSE

The following is a list of local emergency contact agencies:

- Emergency: 911
- Virginia State Police: 1 (800) 552-0962 or (434) 946-7101
- Campbell County Sheriff: (434) 332-9580
- Haz-Mat Center (if spill involved): 911

Procedures to respond to traffic incidents that may occur in the Work Zone:

- Contractor to notify Virginia State Police (VSP).
- Contractor to notify VDOT Permit Specialist Daniel Newland, at (434) 841-6863.
- Depending upon severity of incident, Contractor may be required to shut down work.
- Upon arrival on scene, VSP will take control of the incident and direct its clearing and restoration to normal traffic conditions.
- VDOT Permit Specialist will notify the Traffic Operations Center, Appomattox Assistant Resident Engineer, District Work Zone Safety Coordinator and District Safety Manager of incident and take pictures as necessary, especially pictures of work zone to document the setup.

Process of notification of incident, to be followed by VDOT Permit Specialist, is to notify:

- Appomattox Assistant Resident Engineer: Daniel Brown (434) 215-9162
- District Work Zone Safety Coordinator: Danny Cruff (434) 856-8160
- District Safety Manager: Amanda Wilmink (434) 841-4225
- District Traffic Engineer: Donald Logan (540) 607-6427
- District Communications Manager: Len Stevens (434) 856-8176

The State Police Report of the incident will be reviewed by the District Work Zone Safety Coordinator to determine if any modification of the Temporary Traffic Control Plan is necessary. If it is determined that it is necessary to alter the plan, then a meeting will be called with the Responsible Charge Engineer, District Safety Manager, District Traffic Engineering representatives and the State Police (if necessary) to discuss modification and implementation of an improved traffic control plan.

TABLE 6H-3

BUFFER SPACE/FLAGGER DISTANCE FROM WORK AREA	
POSTED SPEED LIMIT (MPH)	DISTANCE (FEET)
0 – 20	115 – 120
25	155 – 165
30	200 – 210
35	250 – 260
40	305 – 325
45	360 – 380
50	425 – 445
55	500 – 530
60	570 – 600
65	645 – 675
70	730 – 760

SIGN SPACING DISTANCE		
POSTED SPEED LIMIT (MPH)	0–45	46 +
SIGN SPACING DISTANCE	350'–500'	500'–800'
CONE SPACING DISTANCE		
POSTED SPEED LIMIT (MPH)	0–35	36 +
LOCATION		
TRANSITION SPACING	20'	40'
TRAVELWAY SPACING	40'	80'

MAINTENANCE OF TRAFFIC NARRATIVE
THIS MAINTENANCE OF TRAFFIC PLAN IS INTENDED TO PROVIDE A BASIC OVERVIEW OF THE TYPES OF TRAFFIC CONTROL MEASURES NECESSARY FOR THE MAJOR WORK ZONES ON THE PROJECT. THIS PLAN IS NOT INTENDED TO SHOW EVERY FEATURE OF THE TRAFFIC CONTROL PLAN. THE CONTRACTOR SHALL ULTIMATELY BE RESPONSIBLE FOR ENSURING SAFE TRAVEL AROUND ALL WORK AREAS.

THE MAINTENANCE OF TRAFFIC CONTROL DEVICES SHALL BE IN ACCORDANCE WITH THE VIRGINIA DEPARTMENT OF TRANSPORTATION'S WORK AREA PROTECTION MANUAL, FHWA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, AND AASHTO'S LATEST DESIGN MANUAL.

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TRAFFIC CONTROL DETAILS

FOR

MARTIN DRIVE REGIONAL W.W.P.S.

CAMPBELL COUNTY, VIRGINIA

PROJECT NO.	20230622
LAT.	37.313701
LONG.	-79.260669
DATE:	03/05/2025
DRAWN BY:	MSF
CHECKED BY:	MDW

COMMONWEALTH OF VIRGINIA
MICHAEL D. WILSON
Lic. No. 044203
03/05/2025
PROFESSIONAL ENGINEER

BID SET

CCUSA # 80-2304

HURT&PROFFITT

SHEET NO.	REV.
C-601	----

April 1, 2017

VDOT Virginia Department of Transportation

LAND USE PERMIT
LUP-OC
Open-Cut Pavement Restoration Requirements

Any of the following provisions that may apply, shall apply:

1. The permittee shall be responsible for the restoration of pavement on state maintained highways in accordance with all applicable sections of the VDOT Road and Bridge Specifications, VDOT Road and Bridge Standards and this document.

2. Whenever existing pavement is permitted to be cut, not over one-half of the roadway width shall be disturbed at one time and the first open cut trench section shall be satisfactorily restored to allow for the passage of traffic prior to the second half of the roadway surface can be disturbed.

3. All trench backfill material shall be Select Material Type I having a minimum CBR of 30 and free from any wood, decaying material, asphalt, concrete, ice, frost, large clods, stone or debris.

4. Trench backfill material shall be compacted to a minimum of 95% of the theoretical maximum density at optimum moisture content, as determine by VDOT testing procedures (VTM1), using mechanical tamping throughout the depth of the trench in 6-inch lifts to ensure that the adequate support is provided for the aggregate sub-base layer is adequately supported.

5. For roadways with a bituminous concrete asphalt pavement section the compacted trench backfill shall be capped with 10 inches (10") of Type I, Size 21-A or 21-B aggregate compacted to 100% of the theoretical maximum density at optimum moisture content covering the entire trench width and a minimum six inch (6") bench on each side of the excavated trench or as determined by the district administrator's designee.

6. A bituminous concrete asphalt base course (BM-25) having a minimum thickness of six inches (6"), or matching the existing base course thickness, shall be placed over the benched aggregate sub-base to the bottom elevation of the existing asphalt concrete surface course.

7. All sides of the excavated trench shall be saw-cut trimmed to neat straight lines and a tack coat of RC-250 liquid asphalt applied at a rate of 0.1 gallon per square yard (or as determined by the district administrator's designee) prior to placing the bituminous concrete asphalt base course (BM-25.0) and/or replacement of the bituminous concrete asphalt surface course (SM-9.5A or SM-9.5D).

8. The existing pavement surface course adjacent to the excavated trench shall be milled and repaved with bituminous concrete asphalt (SM-9.5A or SM-9.5D) having of a minimum thickness of 1-1/2 inches (1.5"). This operation shall cover the entire trench width and extend 12 inches (12") beyond the edge of the trench on longitudinal open cuts and 25 feet (25') beyond the trench centerline on perpendicular open cuts, or as determined by the district administrator's designee.

9. Open cuts in surface treated roadway sections with an aggregate base course shall be replaced with the same layer(s) as roadway sections with a bituminous concrete asphalt pavement structure except the sub-base layer (Type I, Size 21-A or 21-B) may be reduced to six inches (6") and the bituminous concrete asphalt base layer (BM-25.0) may be reduced to four inches (4") while maintaining the required six inch (6") bench on both sides of the excavated trench. The surface course restoration material and thickness shall match the existing surface.

10. Replacement of all bituminous concrete asphalt and surface treated courses shall be rolled with equipment having a manufacturer's rating of ten (10) tons until the aggregate is keyed into the bitumen. Where rolling is not possible, a mechanical tamper shall be utilized.

11. Full depth aggregate stone may be placed in the trench daily up to maximum length of 500 feet, at which time either temporary or permanent pavement restoration procedures must be implemented.

12. Should the application of the bituminous concrete asphalt surface course be delayed due to adverse weather conditions, the contractor shall provide and maintain a temporary pavement section that is acceptable to the district administrator's designee until such time as the appropriate permanent pavement restoration can be achieved.

13. The permittee shall be responsible for any settlement in the backfill or pavement for a period of two (2) years after the completion date of permit and for the continuing maintenance of the facilities placed within the highway right-of-way.

14. A one-year restoration warranty period may be considered, provided the permittee adheres to the following criteria:

    - The permittee retains the services of a professional engineer (or certified technician under the direction of the professional engineer) to observe the placement of all fill embankments, pavement, and storm sewer and utility trench backfill.
    - The professional engineer (or certified technician under the direction of the professional engineer) performs any required inspection and testing in accordance with all applicable sections of VDOT's Road and Bridge Specifications.
    - The professional engineer submits all testing reports for review and approval, and provides written certification that all restoration procedures have been completed in accordance with all applicable sections of VDOT's Road and Bridge Specifications prior to completion of the work authorized by the permit.

15. The district administrator's designee may request and review the backfill compaction test results and/or authorize an inspector to monitor the trench backfill and compaction operations.

16. The use of steel plates to provide a temporary riding surface will not be allowed between November 1 and April 1. The use of steel plates between April 2 and October 31 shall be in accordance with VDOT standards and specifications.

17. Traffic shall be maintained at all times in accordance with the Virginia Work Area Protection Manual and a VDOT approved Maintenance of Traffic (MOT) plan.

18. The permittee shall notify the district administrator's designee a minimum of 72 hours prior to initiating any pavement open cutting operations.

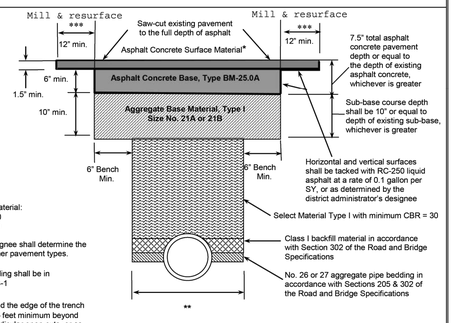
19. The trench to be backfilled shall be made as dry as practicable at the time of backfilling by pumping, bailing, draining, or other approved dewatering method.

20. All asphalt pavement restoration activities shall be in accordance with the Asphalt Pavement Restoration Detail for Open Cut Utility Installations contained herein.

VDOT Virginia Department of Transportation

LAND USE PERMIT
LUP-OC
Open-Cut Pavement Restoration Requirements

Asphalt Pavement Restoration Detail for Open Cut Utility Installations



NOTES:

* Asphalt Concrete Surface Material:
SM-9.5A for ADT < 10,000
SM-9.5D for ADT > 10,000

The district administrator's designee shall determine the restoration requirements for other pavement types.

** Trench width and pipe bedding shall be in accordance with VDOT Std. PB-1

*** 12 inches minimum beyond the edge of the trench on longitudinal open cuts, or 25 feet minimum beyond the trench centerline on perpendicular open cuts, or as determined by the district administrator's designee.

Date: August 27, 2014

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GEOTECHNICAL • CONSTRUCTION TESTING & INSPECTION • CULTURAL RESOURCES

PAVEMENT RESTORATION
FOR
MARTIN DRIVE REGIONAL W.W.P.S.
CAMPBELL COUNTY, VIRGINIA

PROJECT NO.	20230622
LAT.	37.313701
LONG.	-79.260669
DATE:	03/05/2025
DRAWN BY:	MSF
CHECKED BY:	MDW

COMMONWEALTH OF VIRGINIA
MICHAEL D. WILSON
Lic. No. 044203
03/05/2025
PROFESSIONAL ENGINEER

BID SET

CCUSA # 80-2304

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SHEET NO.	REV.
C-602	----

ABBREVIATIONS

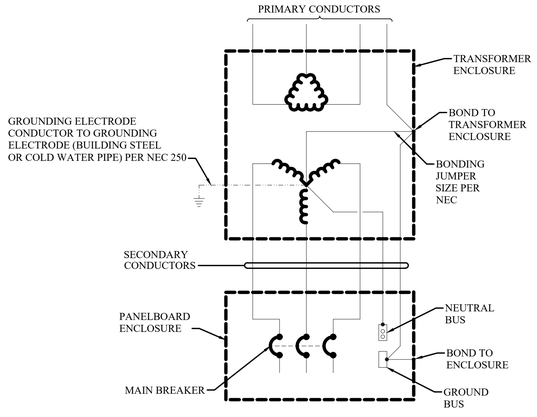
A,AMP	AMPERES
AEP	AMERICAN ELECTRIC POWER
AF	AMPERE FRAME
AFF	ABOVE FINISH FLOOR
AFG	ABOVE FINISH GRADE
AHU	AIR HANDLING UNIT
AIC	AMPERES INTERRUPTING CAPACITY
APPROX	APPROXIMATELY
AS	AMPERE SENSOR
AT	AMPERE TRIP
BAS	BUILDING AUTOMATION SYSTEM
BCSD	BARE COPPER SOFT DRAWN
BKR	BREAKER
C	CONDUIT
CKT	CIRCUIT
COMPR	COMPRESSOR
CONN	CONNECTED
CPT	CONTROL POWER TRANSFORMER
CT	CURRENT TRANSFORMER
CU	COPPER
CWB	COLD WEATHER BALLAST
D	DEEP
DISC	DISCONNECT
DIV	DIVISION
DWG	DRAWING
EGC	EQUIPMENT GROUNDING CONDUCTOR
EL,ELEV	ELEVATION
EMT	ELECTRICAL METALLIC TUBING
EQPT	EQUIPMENT
EWC	ELECTRIC WATER COOLER
EXIST	EXISTING
FDR	FEEDER
FLA	FULL LOAD AMPERES
FRACT	FRACTIONAL
FVNR	FULL VOLTAGE NON-REVERSING
GFI	GROUND FAULT INTERRUPTER
GND	GROUND
GRS	GALVANIZED RIGID STEEL
H	HIGH
HAL	HALOGEN
HD	HEAVY DUTY
H-O-A	HAND-OFF-AUTO
HP	HORSEPOWER
HPS	HIGH PRESSURE SODIUM
INTER	INTERMEDIATE
kcmil	THOUSANDS OF CIRCULAR MILS
KV	KILOVOLTS
KVA	KILOVOLT AMPERE
KW	KILOWATTS
L	LONG
LED	LIGHT EMETTING DIODE
LBS	LOAD BREAK SWITCH
MAX	MAXIMUM
MCC	MOTOR CONTROL CENTER
MCCB	MOLDED CASE CIRCUIT BREAKER
MCP	MOTOR CIRCUIT PROTECTOR
MH	METAL HALIDE
MIN	MINIMUM
NEMA	NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION
NEUT	NEUTRAL
OL	OVERLOAD
P	POLES
PH	PHASE
PT	POTENTIAL TRANSFORMER
PVC	POLYVINYL CHLORIDE
R	RADIUS
RCPT(S)	RECEPTACLE(S)
RM	ROOM
RMS	ROOT MEAN SQUARE
RSC	RIGID STEEL CONDUIT
SCH	SCHEDULE
SQ FT	SQUARE FEET
SPKR	SPEAKER
SUB	SUBSTATION
SWBD	SWITCHBOARD
SYM	SYMMETRICAL
TWSP	TWISTED SHIELDED PAIR
TYP	TYPICAL
UG	UNDERGROUND
UH	UNIT HEATER
UL	UNDERWRITERS LABORATORIES, INC.
UON	UNLESS OTHERWISE NOTED
V	VOLT
VA	VOLT AMPERES
VFD	VARIABLE FREQUENCY DRIVE
W	WATT(S), WIRE, WIDE, (AS APPLICABLE)
WP	WEATHERPROOF
XFMR	TRANSFORMER
ϕ, PH	PHASE
ΔC	ONE CONDUCTOR
Y	DELTA CONNECTED
Y	GROUNDED WYE CONNECTED

LEGEND

- CONDUIT RUN EXPOSED
- CONDUIT RUN UNDER CONCRETE FLOOR OR CONCEALED IN WALL
- CONDUIT TURNING UP
- CONDUIT TURNING DOWN
- TICK MARKS: INDICATE NUMBER OF CONDUCTORS IN A CONDUIT IN ADDITION TO EGC. NO TICK MARKS INDICATE TWO CONDUCTORS IN ADDITION TO EGC
- HOMERUN TO PANELBOARD
- DIRECT BURIED GROUND CONDUCTOR
- FLEXIBLE CONDUIT
- LED LIGHTING FIXTURE
- LIGHTING FIXTURE, WALL MOUNTED
- S — SINGLE POLE SWITCH
- OCCUPANCY SENSOR
- NEMA 5-20R DUPLEX RECEPTACLE, 18" AFF UON
- NEMA 5-20R DUPLEX RECEPTACLE, 18" AFF UON
- MOTOR
- JUNCTION BOX
- NON-FUSED DISCONNECT SWITCH
- COMBINATION MAGNETIC STARTER/DISCONNECT SWITCH W/ HOA ON COVER
- MANUAL STARTER
- 208/120 VOLT PANELBOARD, SURFACE MOUNTED
- 480/277 VOLT PANELBOARD, SURFACE MOUNTED
- PANEL OR CABINET AS INDICATED
- TRANSFORMER
- GROUND ROD, 3/4" DIA x 10' COPPER CLAD
- B — EXOTHERMIC BOND CONDUCTOR TO CONDUCTOR
- C — EXOTHERMIC BOND CONDUCTOR TO COLUMN OR TANK
- G — BOLTED GROUND CONNECTION
- 1600A — MOLDED CASE CIRCUIT BREAKER, TRIP RATING AS INDICATED
- TRANSFORMER
- GROUND
- CURRENT TRANSFORMER
- POTENTIAL TRANSFORMER
- NORMALLY OPEN CONTACTS
- M — STARTER COIL

CONDUCTOR COLOR CODE

CONDUCTOR	120/240V	480/277V
PH A	BLACK	BROWN
PH B	RED	ORANGE
PH C	-	YELLOW
NEUTRAL	WHITE	GRAY
GROUND	GREEN	GREEN



DRY TYPE TRANSFORMER WIRING DIAGRAM

SCALE: NONE

GENERAL NOTES:

1. THESE DRAWINGS MAY NOT INDICATE ALL FITTINGS, PARTS AND ACCESSORIES THAT ARE REQUIRED FOR A COMPLETE AND FUNCTIONAL SYSTEM. NO EXCLUSION FROM OR LIMITATION IN THE SYMBOLISM USED ON THE DRAWINGS FOR THE WORK, OR THE LANGUAGE USED IN THE SPECIFICATIONS FOR THE WORK SHALL BE INTERPRETED AS A REASON FOR OMITTING THE APPURTENANCES OR ACCESSORIES NECESSARY TO COMPLETE AND REQUIRED WORK, SYSTEM, OR ITEM OF EQUIPMENT.
2. ALL ELECTRICAL WORK ON THIS PROJECT SHALL BE INSTALLED IN ACCORDANCE WITH THE 2018 VIRGINIA UNIFORM STATEWIDE BUILDING CODE AND THE NFPA 70-2018 (NATIONAL ELECTRICAL CODE).
3. MATERIALS, EQUIPMENT, AND SYSTEMS SHALL MEET ALL PERTINENT REQUIREMENTS OF THE AMERICAN SOCIETY FOR TESTING MATERIALS (ASTM), THE UNDERWRITERS LABORATORY (UL), THE NATIONAL ELECTRIC MANUFACTURER'S ASSOCIATION (NEMA), NATIONAL FIRE PROTECTION ASSOCIATION (NFPA), AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI), AND OTHER NATIONALLY RECOGNIZED AGENCIES.
4. COORDINATE ARRANGEMENT, MOUNTING, AND SUPPORT OF ELECTRICAL EQUIPMENT TO AVOID INTERFERENCES WITH ELECTRICAL AND OTHER TRADES. COORDINATE WORK WITH EXISTING CONDITIONS INCLUDING BEAMS, COLUMNS, SITE FEATURES, AND OTHER CONSTRUCTION WHETHER OR NOT SUCH IS SHOWN ON THE DRAWINGS. COORDINATE AMPACITY, VOLTAGE, PHASING, OVERCURRENT PROTECTION, AND LOCAL DISCONNECT REQUIREMENTS WITH ACTUAL EQUIPMENT PROVIDED.
5. MAINTAIN A SET OF AS-BUILT RED-LINE MARKUPS INDICATING ACTUAL INSTALLATION. DELIVER TO OWNER AT CONCLUSION OF PROJECT.
6. PROVIDE PRODUCT DATA SUBMITTALS FOR THE FOLLOWING EQUIPMENT: MOTOR CONTROL CENTER BUCKETS, CIRCUIT BREAKERS, PULL BOXES, AND DEVICES. MATERIALS INSTALLED PRIOR TO OBTAINING AN APPROVED SUBMITTAL ARE AT CONTRACTOR'S RISK.
7. CONTRACTOR SHALL ADVISE A/E IMMEDIATELY OF DISCREPANCIES WITHIN DRAWINGS. MINOR DEVIATIONS FROM THE PLANS MAY BE MADE TO AVOID MINOR CONFLICTS. WHERE MAJOR CONFLICTS ARE ENCOUNTERED, THE AFFECTED WORK SHALL NOT BE INSTALLED UNTIL THE CONFLICT HAS BEEN RESOLVED. THE A/E IS NOT RESPONSIBLE FOR THE CONSEQUENCES OF PROCEEDING WITH WORK BASED ON CONTRACTOR INTERPRETATION OR ON DIRECTION FROM OTHER PARTIES.

ELECTRICAL SPECIFICATIONS:

RACEWAYS AND BOXES

A. MATERIALS:
RSC - ANSI C80.1, THREADED COUPLINGS ONLY, MIN SIZE 3/4-INCH
PVC COATED RSC - ANSI C80.1, THREADED COUPLINGS ONLY, MIN SIZE 1".
LFMC - MIN SIZE 3/4".
RNC - NEMA TC2 WITH TC3 FITTINGS, MIN SIZE 3/4".
WIREWAYS - SHEET METAL WITH SCREW COVERS
SET SCREW FITTINGS SHALL NOT BE USED

B. INDOOR RACEWAY APPLICATIONS:
EXPOSED OR CONCEALED: PVC COATED RSC, UON
EMBEDDED IN CONCRETE: SCHEDULE 40 RNC
BOXES AND ENCLOSURES: NEMA 250, TYPE 1, UON

C. OUTDOOR RACEWAY APPLICATIONS:
ABOVEGROUND: PVC COATED RSC.
BOXES AND ENCLOSURES: NEMA 250 TYPE 3R, UON

D. UNDERGROUND RACEWAY APPLICATIONS: USE DIRECT BURIED SCHEDULE 80 TYPE DB RNC. MINIMUM DEPTH IS 24 INCHES OR GREATER AS REQUIRED BY NATIONAL ELECTRICAL CODE. USE FABRICATED LONG RADIUS RSC ELBOWS FOR TURNS APPROACHING 90 DEGREES. TRANSITION TO RSC BEFORE TURNING UP TO COME OUT OF GROUND.

E. LEAVE 1-INCH MINIMUM CONCRETE COVER FOR EMBEDDED RACEWAY. USE MANUFACTURED RSC ELBOW TO TURN OUT OF CONCRETE.

F. USE UP TO 72 INCHES OF LFMC FOR CONNECTION TO VIBRATING EQUIPMENT INCLUDING MOTOR-DRIVEN EQUIPMENT.

G. PROVIDE 65-LB TEST PULL STRING TIED OFF AT EACH END IN ALL EMPTY CONDUITS.

WIRING METHODS

A. SINGLE CONDUCTORS SHALL BE COPPER, #12 MINIMUM CONDUCTOR SIZE, SOLID FOR #10 AWG AND SMALLER, STRANDED FOR #8 AWG AND LARGER. FOR ABOVE-GROUND APPLICATIONS USE THHN-THWN, 600VAC INSULATION. FOR CIRCUITS WHERE ANY PART OF THE CIRCUIT IS BELOW GRADE USE CONDUCTORS WITH XHHW-2, 600 VAC RATED INSULATION.

B. RACEWAY APPLICATIONS:
FEEDER CONDUCTORS: SINGLE CONDUCTORS IN RACEWAY, UON
BRANCH CIRCUITS: SINGLE CONDUCTORS IN RACEWAY, UON
CLASS 2 CONTROL CIRCUITS: SINGLE CONDUCTORS IN RACEWAY, UON.

C. MINIMIZE SPLICES AND PLACE ONLY IN ACCESSIBLE JUNCTION BOXES AND ENCLOSURES THAT ARE SIZED AND RATED FOR SUCH. NO BELOW GRADE SPLICES.

ELECTRICAL IDENTIFICATION

A. EQUIPMENT IDENTIFICATION: PROVIDE LABELS FOR PANELBOARDS, ELECTRICAL CABINETS, MOTOR STARTERS, AND AS ADDITIONALLY INDICATED. LABELS SHALL BE LAMINATED ACRYLIC, WITH 1/2-INCH ENGRAVED BLACK LETTERING ON 1-1/2-INCH WHITE STOCK ATTACHED WITH SCREWS.

B. MARK EACH DISCONNECTING MEANS TO INDICATE ITS CIRCUIT SOURCE. MARK DISCONNECTING MEANS TO INDICATE WHAT LOAD IS SERVED.

C. RACEWAY AND CABLE LABELS: PROVIDE PRE-TENSIONED, PRE-PRINTED, WRAPAROUND PLASTIC SLEEVES THAT ARE SIZED TO SUIT THE DIAMETER OF THE ITEM IDENTIFIED.

D. USE VINYL OR VINYL-CLOTH, SELF-ADHESIVE, WRAPAROUND TYPE TAPE MARKERS FOR WIRE. FOLLOW THESE WIRE COLOR CODING CONVENTIONS.

PENETRATIONS AND SLEEVES

A. MASONRY WALLS AND FLOORS: IN CONCRETE SLABS AND WALLS, INSTALL SLEEVES FOR PENETRATIONS UNLESS CORE-DRILLED HOLES OR FORMED OPENINGS ARE USED. INSTALL SLEEVES DURING ERECTION OF SLABS AND WALLS. EXTEND SLEEVES INSTALLED IN FLOORS 2 INCHES ABOVE FINISHED FLOOR LEVEL. SELECT SLEEVE SIZE TO ALLOW FOR 1/2-INCH ANNULAR CLEAR SPACE BETWEEN RACEWAY AND SLEEVES.

B. BELOW-GRADE EXTERIOR WALL PENETRATIONS: SEAL PENETRATIONS USING SLEEVES AND MECHANICAL SLEEVE SEALS.

C. ABOVE-GRADE EXTERIOR WALL PENETRATIONS: SEAL PENETRATIONS USING SLEEVES AND CAULK, UON.

D. ROOF PENETRATIONS: SEAL PENETRATIONS OF INDIVIDUAL RACEWAYS AND CABLES WITH FLEXIBLE BOOT-TYPE FLASHING UNITS OR PITCH POCKETS APPLIED IN COORDINATION WITH ROOFING.

SUPPORT AND ANCHORAGE

A. PROVIDE SUPPORT AND ANCHORAGE THAT ARE ADEQUATE IN TENSION, SHEAR, AND PULLOUT FORCE TO RESIST MAXIMUM LOADS CALCULATED OR IMPOSED WITH A MINIMUM STRUCTURAL SAFETY FACTOR OF FIVE.

B. STEEL SLOTTED SUPPORT SYSTEMS: COMPLY WITH MFMA-3 FACTORY FABRICATED COMPONENTS FOR FIELD ASSEMBLY WITH FINISH SUITABLE FOR THE ENVIRONMENT.

C. FOR ATTACHMENT TO CONCRETE AND SOLID MASONRY, USE WEDGE-TYPE, ZINC-COATED STEEL EXPANSION ANCHOR FASTENERS. DRILL HOLES AT LOCATIONS AND DEPTHS THAT AVOID REINFORCING BARS. FOR CONNECTIONS TO HOLLOW MASONRY USE ALL-STEEL SPRINGHEAD TYPE TOGGLE BOLTS.

D. FOR CLAMPING TO STEEL STRUCTURAL ELEMENTS USE WELDED STEEL STUDS, BEAM CLAMPS OR SPRING-TENSION CLAMPS.

E. FOR CONNECTIONS TO WOOD USE LAG SCREWS OR THROUGH BOLTS.

F. HANGER RODS TO BE THREADED STEEL.

G. FOR CONNECTIONS TO LIGHT STEEL USE SHEET METAL SCREWS.

H. FASTEN HANGERS AND SUPPORTS SECURELY IN PLACE WITH PROVISIONS FOR STRUCTURAL AND THERMAL MOVEMENT.

I. SEPARATE DISSIMILAR METALS AND METAL PRODUCTS FROM CONTACT WITH WOOD OR CEMENTITIOUS MATERIALS BY PAINTING EACH METAL SURFACE IN AREA OF CONTACT WITH A BITUMINOUS COATING OR BY OTHER PERMANENT SEPARATION.

J. RSC MAY BE SUPPORTED BY OPENINGS THROUGH STRUCTURAL MEMBERS AS PERMITTED IN NFPA-70.

K. RACEWAY SUPPORT INTERVALS SHALL BE PER THE NATIONAL ELECTRICAL CODE.

ENCLOSED SWITCHES

A. NEMA KS 1, TYPE HD, WITH LOCKABLE HANDLE, INTERLOCKED WITH COVER. IF INDICATED, PROVIDE SPECIFIED ENCLOSED CIRCUIT BREAKERS.

PANELBOARDS

A. PANELBOARDS SHALL BE MANUFACTURED BY EATON, SQUARE-D, CUTLER HAMMER OR GENERAL ELECTRIC.

B. PROVIDE CIRCUIT BREAKERS AS SCHEDULED.

C. PROVIDE TYPED PANELBOARDS INDEXES.

DIESEL STANDBY GENERATORS

A. SEE SPECIFICATION SECTION 263213.

AUTOMATIC TRANSFER SWITCHES

A. SEE SPECIFICATION SECTION 263600.

PUMP STATION CONTROL PANEL

SEE SPECIFICATION SECTION 262420.

GROUNDING

A. PROVIDE GROUNDING IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE AND ADDITIONALLY AS INDICATED.

EXCAVATIONS

A. CONTACT MISS UTILITY AT 811, 1-800-552-7001, OR HTTP://WWW.MISSUTILITYOFVIRGINIA.COM NO LESS THAN 72 HOURS PRIOR TO EXCAVATION AND DO NOT DISTURB THE SOIL UNTIL THE DIG TICKET HAS BEEN PROCESSED.

B. MISS UTILITY WILL NOT MARK PRIVATE UTILITIES WHICH MAY BE PRESENT ON THIS SITE. ENSURE THAT ALL UTILITIES, PUBLIC AND PRIVATE, ARE MARKED PRIOR TO EXCAVATION.

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LEGEND, ABBREVIATIONS, AND GENERAL NOTES

FOR

MARTIN DRIVE REGIONAL W.W.P.S.

CAMPBELL COUNTY, VIRGINIA

PROJECT NO.	20230622
LAT.	37.313701
LONG.	-79.260669
DATE:	03/05/2025
DRAWN BY:	MSF
CHECKED BY:	WKH / MDW

COMMONWEALTH OF VIRGINIA
MICHAEL D. WILSON
Lic. No. 044203
03/05/2025
PROFESSIONAL ENGINEER

BID SET

CCUSA # 80-2304 *

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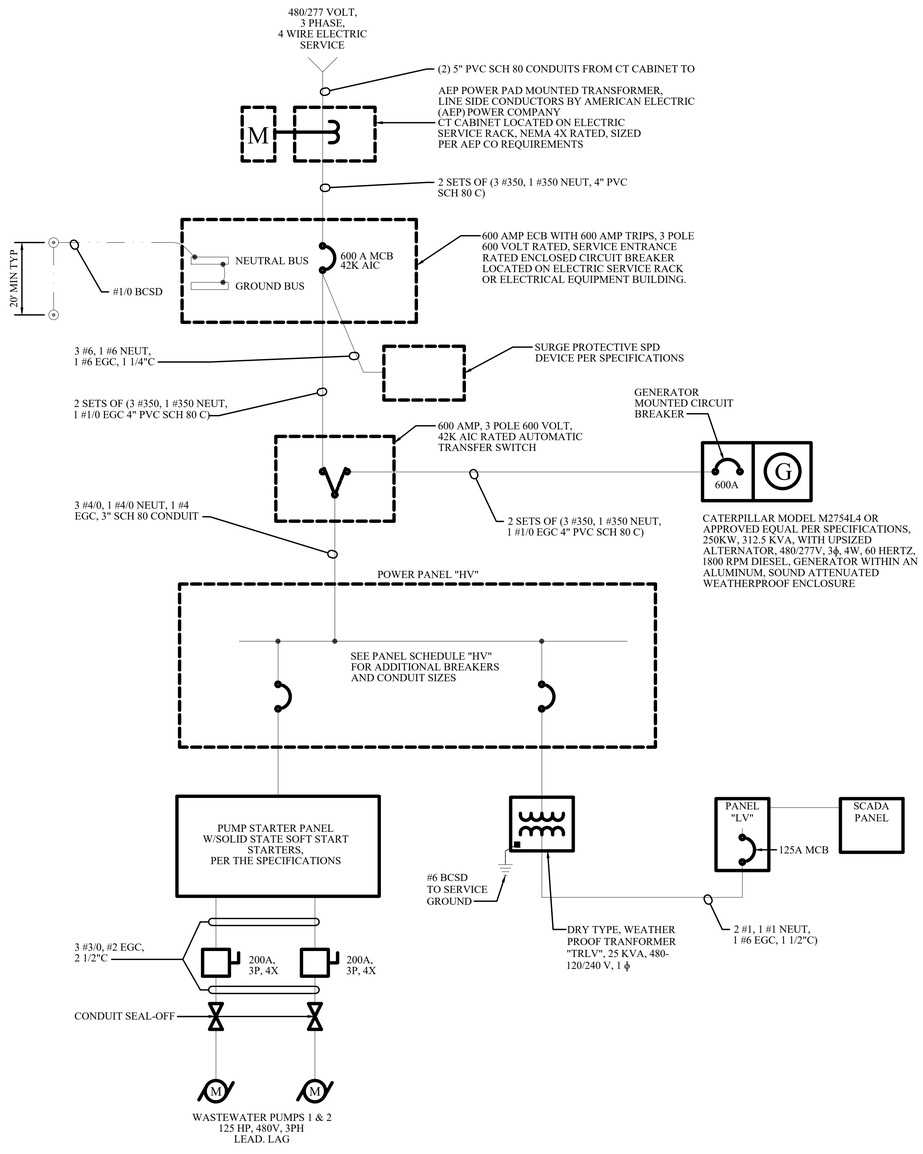
SHEET NO.	REV.
E-001	---

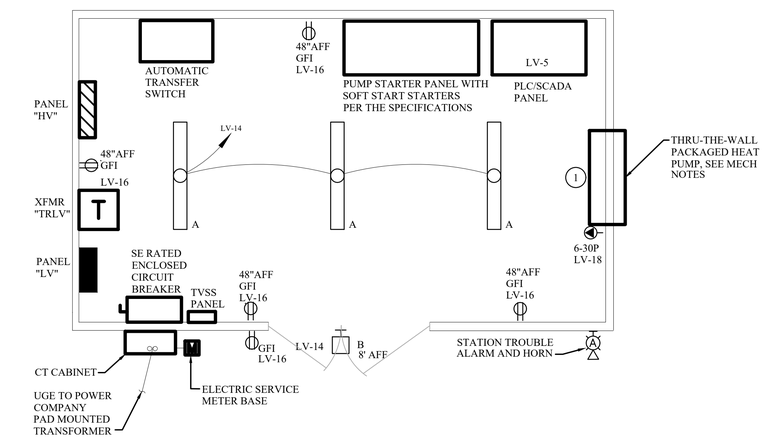


SERVICE AND DISTRIBUTION SINGLE LINE DIAGRAM

SCALE: NONE

(XX) MECHANICAL NOTES:

1. THRU-THE-WALL PTAC UNIT SHALL BE MANUFACTURED BY FRIEDRICH, MODEL #PDE07K3SG, 13.0 EER OR APPROVED EQUAL. PROVIDE COMPLETE WITH WALL SLEEVE AND PER MANUFACTURER'S INSTRUCTIONS. VERIFY LOCATION OF UNIT WITH ALL OTHER UTILITIES PRIOR TO ROUGHING IN FOR UNIT.



NORTH

PUMP STATION CONTROL BUILDING PLAN

SCALE: 3/8"=1'-0"

0 6" 1' 2' 3' 4' 5'

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POWER DISTRIBUTION DIAGRAM AND PLAN

FOR

MARTIN DRIVE REGIONAL W.W.P.S.

CAMPBELL COUNTY, VIRGINIA

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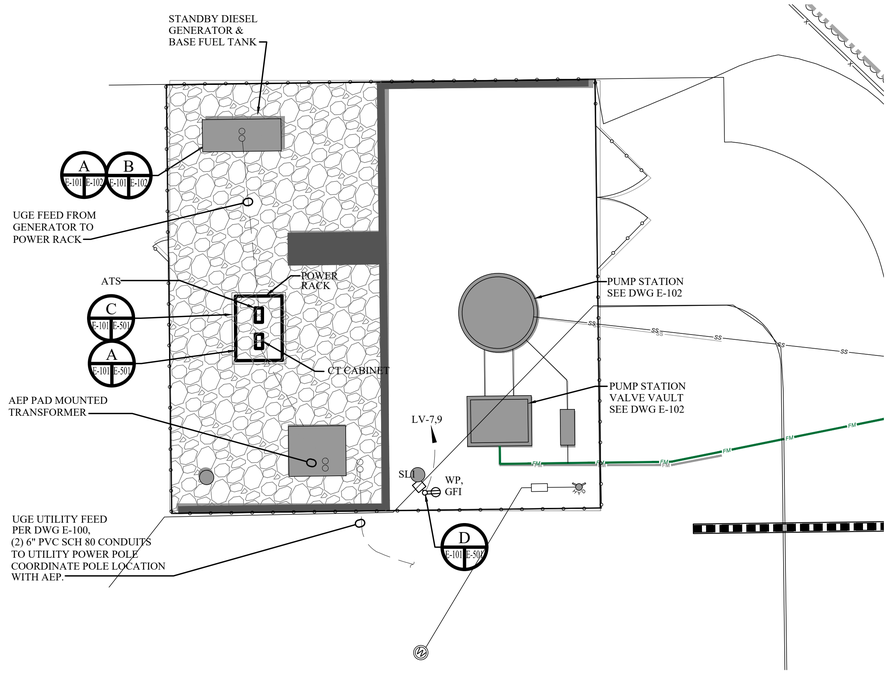
E-100	---

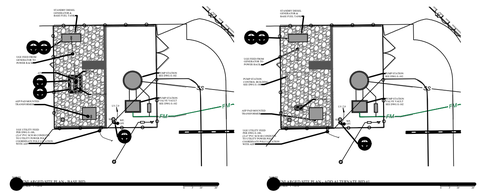


NORTH

ENLARGED SITE PLAN - BASE BID

SCALE: 1"=10'-0"

0 5' 10' 20'



ENLARGED SITE PLANS

FOR

MARTIN DRIVE REGIONAL W.W.P.S.

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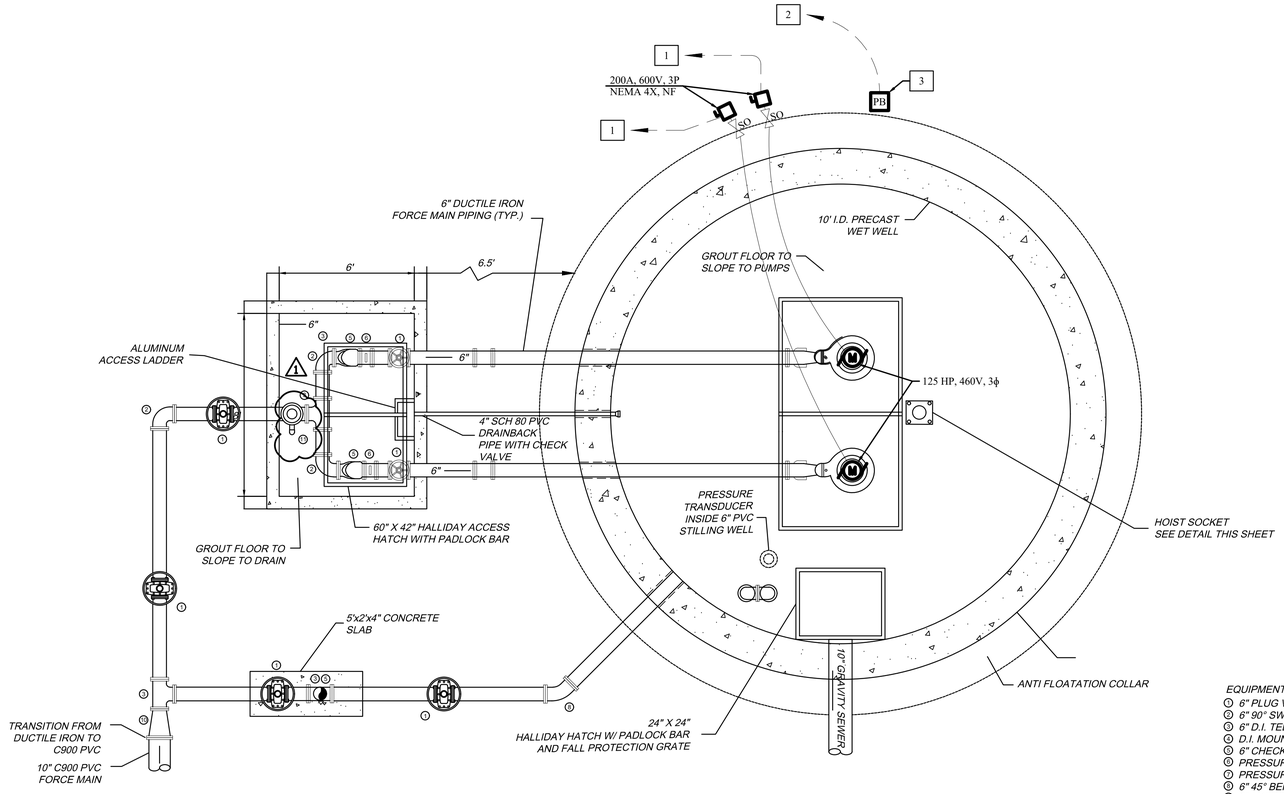
SHEET NO.	REV.
E-101	---



NORTH

PUMP STATION PLAN - SEE CIVIL DWGS FOR EXACT LAYOUT

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

0 1' 5' 10'

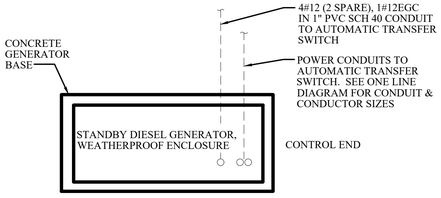
EQUIPMENT LEGEND

1. 6" PLUG VALVE ASSEMBLY
2. 6" 90° SWEEP
3. 6" D.I. TEE
4. D.I. MOUNTING BRACKET
5. 6" CHECK VALVE ASSEMBLY
6. PRESSURE GAUGE WITH BALL VALVE
7. PRESSURE SWITCH WITH BALL VALVE
8. 6" 45° BEND
9. 6" x 4" REDUCER
10. 6"x 10" REDUCER
11. COMBINATION AIR / VACUUM VALVE A.R.I. D-025 OR EQUAL

CONSTRUCTION NOTES:

XX

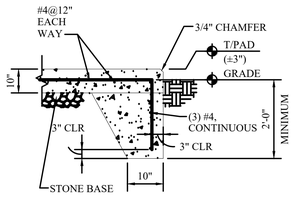
1. PROVIDE UGE PER DRAWING E-100.
2. PROVIDE 2" PVC SCH 80 CONDUIT TO PUMP STARTER PANEL FOR WET WELL LEVEL CONTROL CABLES.
3. 12"x12"x6"D NEMA 4X PULL BOX INSTALLED 24" AFG FOR WET WELL LEVEL CONTROL CABLES.



B GENERATOR PLAN

E-102 E-102

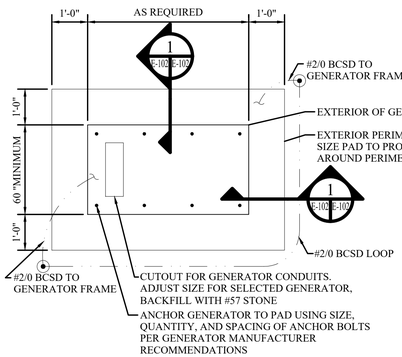
SCALE: NONE



1 GENERATOR PAD SECTION

E-102 E-102

SCALE: NONE



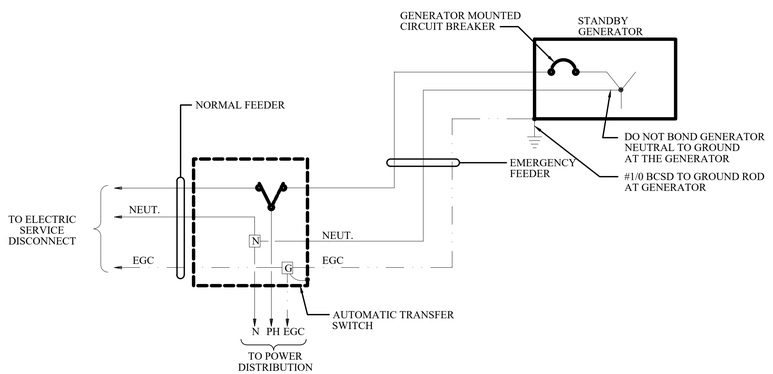
A GENERATOR PAD DETAIL

E-102 E-102

SCALE: NONE

CONCRETE AND REINFORCEMENT NOTES:

1. GENERATOR PAD SOIL BEARING CAPACITY SHALL BE A MINIMUM 1,500 PSF. CONTRACTOR SHALL ENGAGE INSPECTOR TO VERIFY SOIL BEARING CAPACITY AND REINFORCEMENT PLACEMENT PRIOR TO CONCRETE PLACEMENT. SUBMIT INSPECTION REPORT TO A/E FOR REVIEW.
2. CONCRETE SHALL BE NORMAL WEIGHT 145 PCF WITH A MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI AT 28 DAYS.
3. REINFORCING BARS SHALL BE ROLLED FROM NEW BILLET STEEL CONFORMING WITH ASTM A615/A615M, GRADE 60, UNLESS OTHERWISE NOTED.
4. THE FOLLOWING MINIMUM CONCRETE COVER SHALL BE PROVIDED FOR ALL REINFORCEMENT, UNLESS OTHERWISE NOTED:
   A. CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH: 3"
   B. CONCRETE EXPOSED TO EARTH OR WEATHER: #5 BAR AND SMALLER: 1 1/2"
5. LAP ALL REINFORCING SPLICES AT LEAST 48 BAR DIAMETERS (24" MINIMUM) UNLESS OTHERWISE NOTED.
6. ALL REINFORCING SHALL BE SECURELY WIRED TOGETHER IN FORMS AS CALLED FOR IN "PLACING REINFORCING BARS" BY CRSI.
7. STONE BASE SHALL BE 4" THICK, #57 STONE.



CONNECTION DIAGRAM - NEUTRAL & GROUND CONDUCTORS

SCALE: NONE

1	03/03/2025	ADDENDUM No. 1

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PUMP STATION PLANS AND DETAILS

FOR

MARTIN DRIVE REGIONAL W.W.P.S.

CAMPBELL COUNTY, VIRGINIA

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MICHAEL D. WILSON
Lic. No. 044203
03/05/2025
PROFESSIONAL ENGINEER

BID SET

CCUSA # 80-2304

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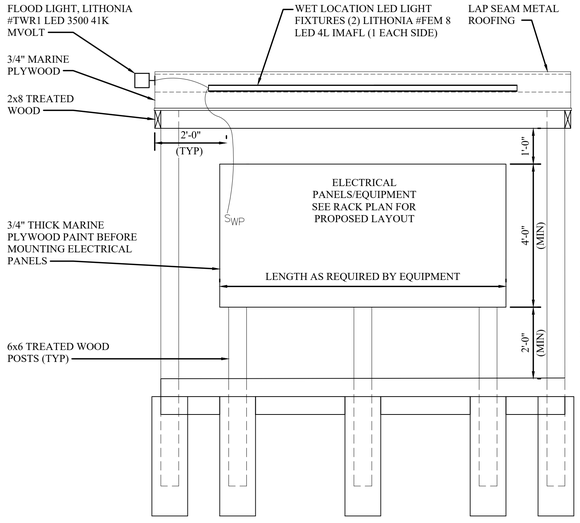
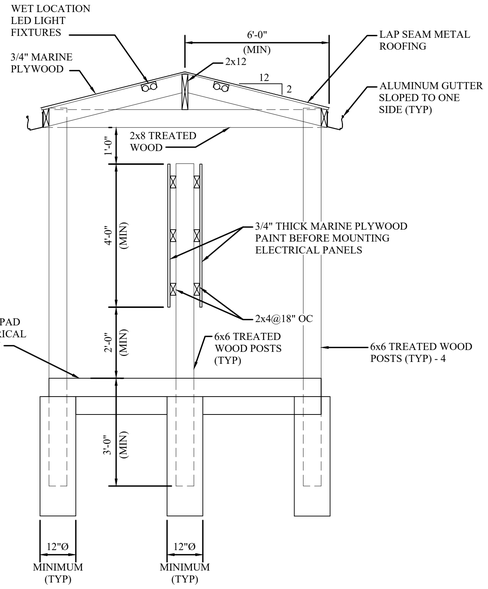
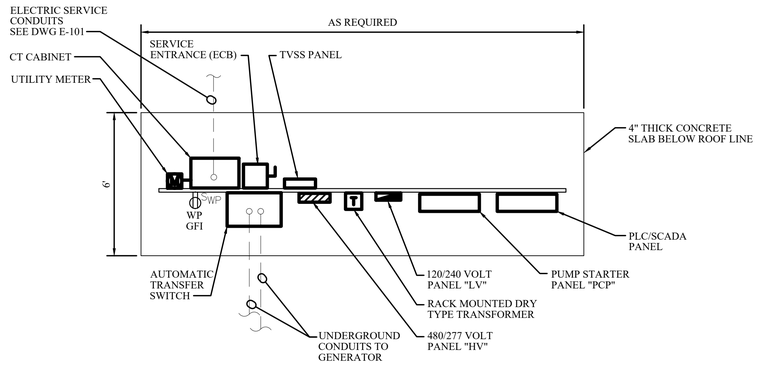
SHEET NO.	REV.
E-102	---



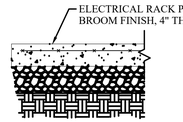


A E-101 E-501 ELECTRICAL SERVICE RACK - ELEVATIONS (BASE BID)
SCALE: NONE

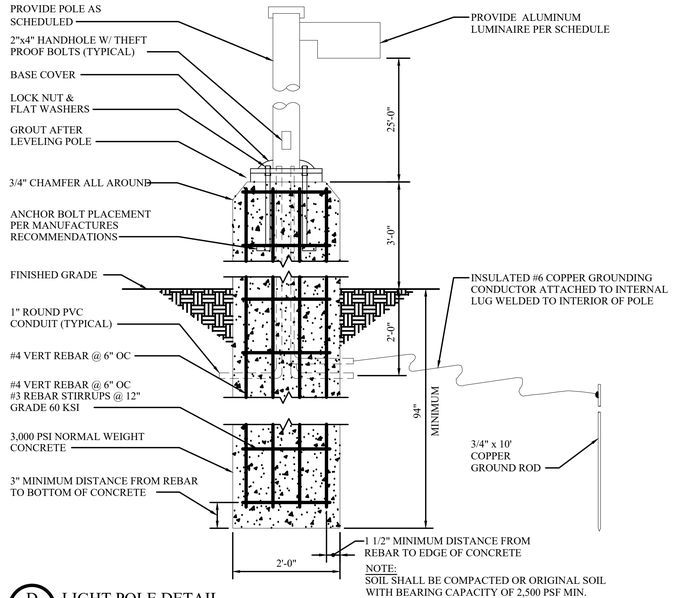


NOTES:
1. ALL ELECTRICAL EQUIPMENT ENCLOSURES ON RACK SHALL BE NEMA 4X RATED UNLESS OTHERWISE INDICATED IN THE SPECIFICATIONS.

B E-101 E-501 ELECTRICAL POWER RACK PLAN VIEW - DETAIL
SCALE: NONE

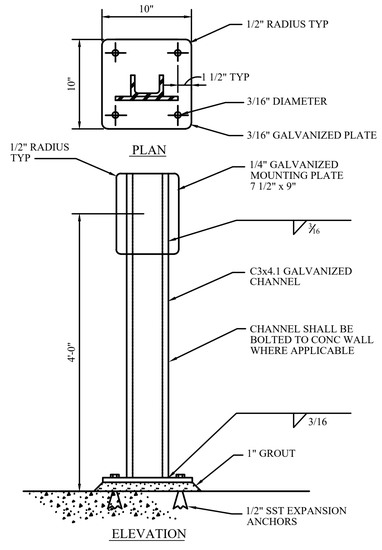


C E-101 E-501 ELECTRICAL SERVICE RACK - CONCRETE BASE DETAIL
SCALE: NONE



NOTE:
SOIL SHALL BE COMPACTED OR ORIGINAL SOIL WITH BEARING CAPACITY OF 2,500 PSF MIN.

D E-101 E-501 LIGHT POLE DETAIL
SCALE: NONE



E E-101 E-501 LOCAL DISCONNECT MOUNTING DETAIL
SCALE: NONE

SITE LIGHTING FIXTURE "SL1"
SCALE: NONE

1	03/03/2025	ADDENDUM No. 1

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DETAILS
FOR
MARTIN DRIVE REGIONAL W.W.P.S.
CAMPBELL COUNTY, VIRGINIA

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BID SET

CCUSA # 80-2304

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SHEET NO.	REV.
E-501	---

LIGHTING FIXTURE SCHEDULE

TYPE	MANUFACTURER	CATALOG NUMBER	FIXTURE VOLTAGE	LAMPS		MOUNTING	REMARKS
				WATTS/LUMENS	TYPE		
A	LITHONIA	VAP LED 4000LM PLC WD 120 GZ10 4OK 80CRI	120	33/4000	LED	CEILING	INTERIOR VAPOR RESISTANT
B	LITHONIA	MRW LED P3 40K SR4 PE PIR DDBXD	120	40/4600	LED	WALL	WALL MOUNTED, MOTION AND PE CONTROLLED
SL1	LITHONIA	LIGHT FIXTURE: DSX1 LED P4 40K T4M 240 SPA PIRH PER HS DF DDBXD	240	125/14,100	LED	POLE	AREA LIGHTING, MOTION AND PE CONTROLLED
SL1	LITHONIA	POLE: SSS 25 4G DM19AS DDBXD	-	-	-	CONCRETE BASE	25' TALL POLE

PANEL "HV" SCHEDULE

PANELBOARD CHARACTERISTICS:
VOLTS: 480/277
PHASES: 3
WIRES: 4
SOLID NEUTRAL, GROUND BAR

PHASE TO PHASE VOLTS: 480
PHASE TO NEUT. VOLTS: 277

600 AMP MAIN LUGS ONLY
MINIMUM SHORT CIRCUIT RATING 42,000 RMS SYM AMPS
NEMA 4X ENCLOSURE, DOOR IN DOOR CONSTRUCTION

CKT. NO.	POLE NO.	DESCRIPTION	LOAD TYPE	CONN. KVA	CONN. AMPS A	CONN. AMPS B	CONN. AMPS C	BREAKER P	BREAKER AT	NO. & WIRE SIZE PHASE	NEUT.	GND	COND. SIZE
1	1	SPARE						1	20				
3	3	SPARE						1	20				
7	5	PUMP STARTER PANEL FOR (2) 125HP PUMPS	E	248.0	312.0		312.0	3	400	500	500	2	4"
	7									500			
	9	PUMPS WITH SOFT START STARTERS				312.0				500			
13	11	SPARE						3	225				
	13												
	15												
17	17	SPACE						1					
19	19	SPACE						1					
21	21	SPACE						1					
23	23	SPACE						1					
25	25	SPACE						1					
27	27	SPACE						1					
29	29	SPACE						1					
2	2	PANEL "LV" TRANSFORMER "TRLV"	E	25.0		52.1		2	70	6	-	8	1 1/4"
	4						52.1			6			
6	6	SPARE						2	70				
	8												
10	10	SPACE						1					
12	12	SPACE						1					
14	14	SPACE						1					
16	16	SPACE						1					
18	18	SPACE						1					
20	20	SPACE						1					
22	22	SPACE						1					
24	24	SPACE						1					
26	26	SPACE						1					
28	28	SPACE						1					
30	30	SPACE						1					
		TOTALS			273.0	312.0	364.1	364.1					

PANEL "LV" SCHEDULE

PANELBOARD CHARACTERISTICS:
VOLTS: 120/240
PHASES: 1
WIRES: 3
SOLID NEUTRAL, GROUND BAR

PHASE TO PHASE VOLTS: 240
PHASE TO NEUT. VOLTS: 120

125 AMP MAIN CIRCUIT BREAKER
MINIMUM SHORT CIRCUIT RATING: 14,000 RMS SYM AMPS
NEMA 4X ENCLOSURE, DOOR IN DOOR CONSTRUCTION

CKT. NO.	POLE NO.	DESCRIPTION	LOAD TYPE	CONN. KVA	CONN. AMPS A	CONN. AMPS B	BREAKER P	BREAKER AT	NO. & WIRE SIZE PHASE	NEUT.	GND	COND. SIZE
1	1	RACK LIGHTING	L	0.5	4.2		1	20	10	10	10	1"
3	3	RACK RECEPTACLE	R	0.4		3.3	1	20	10	10		
5	5	PLC /PUMP CONTROL PANEL	E	0.5	4.2		1	20	10	10	10	3/4"
7	7	LIGHT POLE RECEPTACLES	R	0.4		3.3	1	20	10	10		
9	9	SITE AREA LIGHTING	L	0.2	0.8		2	20	10	-	10	1 1/4"
	11					0.8			10			
13	13	SPARE					2	20				
15	15											
17	17	SPARE					2	30				
	19											
21	21	SPARE					1	20 GFCI				
23	23	SPARE					1	20 GFCI				
2	2	GENERATOR BATTERY CHARGER	E	1.2	10.0		1	20	10	10		
4	4	GENERATOR BLOCK HEATER	E	6.0		25.0	2	40	8	-	8	2"
	6				25.0				8			
8	8	SPARE					2	30				
	10											
12	12	SPARE					1	20				
14	14	CONTROL BUILDING LIGHTING	L	1.0	8.3		1	20	12	12	12	3/4"
16	16	CONTROL BUILDING RECEPTACLES	R	0.4		3.3	1	20	12	12		
18	18	THRU THE WALL HVAC UNIT	M	3.4	14.2		2	30	10	10	10	1"
	20					14.2			10			
22	22	SPARE					1	20				
24	24	SPARE					1	20				
		TOTALS		14	66.7	50.0						

MARTIN DRIVE WWPS			K24006
18-Jun-24			WKH
SHORT CIRCUIT CALCULATIONS - BUSSMANN METHOD			
Overall Service Size	600		AMPS
Estimated Utility Transformer Size	300		kVA

Service Transformer	LL Calc	LN Calc	Comments
Secondary Voltage (Vsp)	480		V
Transformer Size (kVA)	300		kVA
Transformer Impedance (%Z)	4.00		
Minimum Impedance (%Zmin)	2.00	0.00	
Multiplier = 100/%Zmin	50	#DIV/0!	
Transformer Ifla	451	451	A
Transformer Isca = Ifla * Multiplier	22550	#DIV/0!	A
L-N Multiplier (Bussmann)	1.5		
Adjusted Transformer Isc	33825.0	#DIV/0!	A
Estimated Motor Amperage	325		A
Motor Multiplier	6		
Total Motor Contribution	1950	0	A
Isc Total	35775	#DIV/0!	A

At the Facility	LL	LN	Comments
Isc from line side source	35775		A
Voltage Line to Line (VLL)	480		V
Distance from source (L) in feet	20		FT
Raceway	PVC		
Conductor	300		
Conductors per Phase (N)	2		
C (from tables)	29,036		
f = (1.732 x L x Isca) / (VLL x N x C)	0.044		
f = (2 x L x Isca) / (VLL x N x C)	0.051		
f = (2 x L x Isca) / (VLL x N x C)	0.051	#DIV/0!	
M= 1 / (1 + f)	0.951	#DIV/0!	
Isc from line (Iscl) = M x Isca	34028	#DIV/0!	A
Largest of LLL, LL, and LN			A
Suggested Minimum Rating	42000		AIC

Voltage Drop Calculation

Project Name:	MARTIN DRIVE PUMP STATION	
Commission Number:	K24006	
Date:	June 1, 2024	
Calculated by:	WKH	
Circuit Name/Number:	PUMP FEEDERS FROM STARTER PANEL	

Circuit Data:

System Voltage (V):	480Y/277	
Circuit Voltage (V):	480	
Circuit Length (feet):	50.0	
Number of Phases:	3	
Circuit Amps:	936.0	STARTING
Conductor Size:	3/0 AWG	
Number of Sets of Conductors:	1	
Power Factor (%):	90	
Conduit Type:	nonmagnetic	
Max. Allowable Voltage Drop (%)	5	ALLOW 10% ON STARTING

Voltage Drop Data:

Max. Allowable Voltage Drop (V):	24	48	
Actual Voltage Drop (V):	7.0	GOOD	
Actual Voltage Drop (%):	1.5	GOOD	

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SCHEDULES AND CALCULATIONS
FOR
MARTIN DRIVE REGIONAL W.W.P.S.
CAMPBELL COUNTY, VIRGINIA

PROJECT NO.	20230622
LAT.	37.313701
LONG.	-79.260669
DATE:	03/05/2025
DRAWN BY:	MSF
CHECKED BY:	WKH / MDW

COMMONWEALTH OF VIRGINIA
MICHAEL D. WILSON
Lic. No. 044203
03/05/2025
PROFESSIONAL ENGINEER

BID SET

CCUSA # 80-2304

HURT&PROFFITT

SHEET NO.	REV.
E-601	---

ELECTRICAL SYMBOLS

	LIMIT SWITCH NORMALLY CLOSED
	LIMIT SWITCH HELD CLOSED
	LIMIT SWITCH NORMALLY OPEN
	LIMIT SWITCH HELD OPEN
	FLOAT SWITCH NORMALLY OPEN
	PRESSURE SWITCH NORMALLY OPEN
	TEMPERATURE SWITCH NORMALLY OPEN
	TIME SWITCH (OFF DELAY) NORMALLY OPEN
	TIME SWITCH (OFF DELAY) NORMALLY CLOSED
	TIME SWITCH (ON DELAY) NORMALLY OPEN
	TIME SWITCH (ON DELAY) NORMALLY CLOSED
	FLOW SWITCH NORMALLY OPEN
	PUSH BUTTON NORMALLY CLOSED
	PUSH BUTTON NORMALLY OPEN
OFF ON 0X	SELECTOR SWITCH 2 POSITION
H O A X00 0OX	SELECTOR SWITCH 3 POSITION
H L O A X000 0X00 0OOX	SELECTOR SWITCH 4 POSITION
	CONTACT NORMALLY CLOSED
	CONTACT NORMALLY OPEN
	SWITCH
R	PILOT LIGHT (W/ LENS COLOR)
	SOLENOID
	COIL
	HORN
	CIRCUIT BREAKER
	FUSE
	CHASSIS GROUND
	THERMAL OVERLOAD
	120 VAC RECEPTACLE
	TRANSFORMER

	TRANSFORMER
	CURRENT TRANSFORMER
	THERMOCOUPLE
	RTD SENSOR
	MOTOR
	MUSHROOM PUSH BUTTON NORMALLY OPEN
#	REVISION REFERENCE
#	ITEM REFERENCE
#	NOTE REFERENCE
######	TERMINAL NUMBER
	BREAK
	PANEL WIRING
	FIELD WIRING
	SHIELDED CABLE
	WIRES CROSSING
	WIRES CONNECTING
	3 PHASE HEATER (DELTA)
	3 PHASE HEATER (WYE)
	3-POLE CIRCUIT BREAKER
	MOTOR PROTECTOR
	3-POLE CONTACTOR
	3-POLE DISCONNECT

PANEL NOTES

1) INCLUDE A DRAWING POCKET INSIDE THE PANEL LARGE ENOUGH TO STORE A COMPLETE SET OF SYSTEM DIAGRAMS, AND DRAWINGS.

2) ANALOG CABLES: 2-CONDUCTOR WITH SHIELD. BELDEN #8760 OR EQUAL.

3) LEAVE FREE SPACE ABOVE PLC FOR VENTILATION.

4) IDENTIFY ALL WIRES AS SPECIFIED BY THE NATIONAL ELECTRICAL CODE HANDBOOK AND THE FOLLOWING:

POWER DISTRIBUTION WIRES.....BLACK NEUTRAL WIRES.....WHITE AC CONTROL CIRCUIT WIRES.....RED DC CONTROL CIRCUIT WIRES.....BLUE DC COMMON WIRES.....WHITE W/BLUE STRIPE GROUND WIRES.....GREEN W/YELLOW STRIPE WIRES THAT MAY REMAIN.....ORANGE ENERGIZED WHEN THE MAIN DISCONNECT IS IN THE OFF POSITION

5) SIZE ALL WIRE IN ACCORDANCE WITH NEC CODES. SINGLE CONDUCTORS: STRANDED COPPER WITH THWN INSULATION, RATED FOR 600 VAC, AND UL LISTED AS MTW, UNLESS NOTED OTHERWISE. MINIMUM CONDUCTOR SIZE: #14AWG. #16 AWG MAY BE USED ONLY FOR THE INDIVIDUAL WIRES CONNECTING DIRECTLY TO AN I/O TERMINAL ON THE PLC SWING ARM. THE HOT AND NEUTRAL CONDUCTOR SUPPLYING EACH SWING ARM SHALL REMAIN #14 AWG. GROUND CONDUCTOR SIZE: AS INDICATED ON THE DRAWINGS. WHERE NOT INDICATED, THEY SHALL BE #14 AWG OR LARGER.

6) BOND PLC CHASSIS, PANEL DOORS, SIDE PANELS, BACK PANELS AND GROUND BUS TOGETHER WITH WIRES SIZED AS SHOWN ON THE DRAWING.

7) TAG ALL WIRES AT EVERY TERMINATION POINT. SHORT WIRE LENGTHS, (LESS THAN 8") WHERE THE ENTIRE CONDUCTOR IS VISIBLE MAY BE TAGGED AT JUST ONE END. WIRE LABELS FOR WIRES SMALLER THAN NO. 4. SHALL BE VINYL, SELF ADHESIVE, WRAPAROUND, WITH MACHINE PRINTED NUMBERS AND LETTERS. WIRE SIZES NO. 4 AND LARGER AND MULTI CONDUCTOR CABLES SHALL BE MARKED WITH ONE-PIECE, NYLON LOCKING MACHINE PRINTED MARKER TIES EQUAL TO PANDUIT PLM SERIES. WIRE TAG NUMBER SHALL BE AS INDICATED ON THE DRAWINGS

8) DO NOT ROUTE ANY COMMUNICATION CABLES IN WIREWAYS WITH 120 VAC WIRING. ROUTE ALL THESE CABLES AWAY FROM 120 VAC WIRING. WHERE 120 VAC CONDUCTORS MUST BE CROSSED, DO SO AT RIGHT ANGLES AND PROVIDE AT LEAST 1" SEPARATION.

9) CONNECT NO MORE THAN TWO WIRES TO ANY ONE TERMINAL. PROVIDE TERMINAL BLOCKS WITH A SAFETY COVER OR BE FINGER SAFE TO PROTECT PERSONNEL FROM SHOCK. MOUNT ALL TERMINAL BLOCKS ON DIN RAILS. SUPPLY ALL HARDWARE NEEDED TO PROVIDE A COMPLETE TERMINAL STRIP ASSEMBLY, INCLUDING BUT NOT LIMITED TO: MISCELLANEOUS SEPARATORS, TOP JUMPER BARS, SIDE JUMPER BARS, MACHINE PRINTED TERMINAL BLOCK TAGS, FASTENERS, BRACKETS FOR RAISING 35MM RAIL, ETC

10) RAISE AND CENTER ALL TERMINAL STRIPS SET BETWEEN WIRE WAYS TO FACILITATE WIRING, UNLESS OTHERWISE NOTED. PROVIDE A MINIMUM OF 1-1/2 INCH BETWEEN TERMINALS AND WIRE WAY ON BOTH SIDES OF TERMINAL STRIP. INSTALL END BARRIERS FOR EACH STYLE OF TERMINAL. INSTALL END STOPS ON EACH SECTION OF TERMINALS OR RELAYS. USE MACHINE PRINTED TAGS TO MARK TERMINAL STRIPS. WHEREVER POSSIBLE, MAKE ALL TERMINAL BLOCK CONNECTIONS FOR THE PANEL WIRING ON THE TOP OR RIGHT SIDE OF THE TERMINAL STRIP AND LEAVE THE BOTTOM OR LEFT SIDE FREE FOR FIELD TERMINATIONS, UNLESS NOTED OTHERWISE.

11) PROVIDE ENGRAVED PLASTIC NAMEPLATES. EITHER PAINT FILLED ENGRAVINGS OR 2 COLOR LAMINATIONS ARE ACCEPTABLE.

12) ALL OPERATOR CONTROL DEVICES (BUTTONS, SWITCHES, METERS, DISPLAYS, ETC.) SHALL HAVE NAMEPLATES.

13) PROVIDE A SET OF AS-BUILT DRAWINGS WITH THE PANEL. THESE SHALL BE COMPLETE, ALLOWING ENGINEER TO PRODUCE A SET OF "RECORD" DRAWINGS SHOWING ALL WIRE NUMBERS WITHIN THE PANEL AND THE DEVICE TERMINAL NUMBERS TO WHICH THEY CONNECT. REQUIRED INFORMATION SHALL INCLUDE BUT NOT BE LIMITED TO:
   A. ALL WIRE TAG NUMBERS.
   B. TERMINAL CONNECTION POINTS FOR POWER AND NEUTRAL FEEDS.
   C. ANY DEVIATIONS FROM THE EQUIPMENT LOCATIONS SHOWN ON THE DRAWINGS. PRIOR APPROVAL SHOULD BE OBTAINED BEFORE MAKING SUCH CHANGES.

14) SAVE ALL MATERIAL DATA SHEETS AND LITERATURE. WHERE PRODUCT DATA IS PROVIDED ON THE PACKAGE, MAKE A CLEAR COPY OF THE DATA AND INCLUDE WITH OTHER DATA SHEETS. INCLUDE ALL THIS MATERIAL WITH THE PANEL DURING DELIVERY.

15) EQUIPMENT LOCATIONS SHALL BE AS SHOWN ON THE DRAWINGS. THE PANEL BUILDER SHALL NOTIFY ENGINEER OF ANY PHYSICAL CONFLICTS OR OTHER PROBLEMS THAT COULD CAUSE PROBLEMS WITH THE INSTALLATION OR OPERATION OF THE PANEL BEFORE ASSEMBLING THE PANEL. RESOLUTION OF SUCH CONFLICTS SHALL BE APPROVED BY ENGINEER PRIOR TO PANEL ASSEMBLY.

16) PROVIDE ALL EQUIPMENT AS SHOWN ON THE BILL OF MATERIALS INCLUDED IN THIS DRAWING PACKAGE. SUBMIT ANY DEVIATION FROM THE BILL OF MATERIALS FOR APPROVAL IN WRITING PRIOR TO FABRICATION.

NOTE: EVERY EFFORT HAS BEEN MADE TO PROVIDE ACCURATE DIMENSIONS AND A COMPREHENSIVE BILL OF MATERIALS FOR THE CONSTRUCTION OF THIS CONTROL PANEL, BASED ON THE MANFUFACTURERS RECOMMENDATIONS. HOWEVER, IT IS THE RESPONSIBILITY OF THE CONTROL PANEL BUILDER TO VERY THAT THE PANEL IS PROPERLY SIZED AND CONSTRUCTED IN ACCORDANCE WITH BOTH THE MANUFACTURER'S GUIDELINES AND THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE (NEC).

MISCELLANEOUS SYMBOLS

FIELD NOTES

1) TAKE CARE WHEN CONDUIT ENTRY PENETRATIONS ARE MADE INTO ENCLOSURE TO PREVENT SCATTERING OF DRILL CHIPS & KNOCK-OUT SLUGS. DE-BUR PENETRATIONS AND REMOVE DEBRIS. SEAL ALL CONDUIT ENTRIES INTO ENCLOSURE FROM LIQUIDS & CONTAMINANTS. AVOID CONDUIT ENTRIES OVER CRITICAL COMPONENTS, SUCH AS PLCs AND DRIVES.

2) ANALOG CABLES: 2 CONDUCTOR WITH SHIELD. BELDEN #8760 OR EQUAL.

3) IDENTIFY ALL WIRES AS SPECIFIED BY THE NATIONAL ELECTRICAL CODE HANDBOOK AND THE FOLLOWING:

460 VAC	120/208 VAC
(L1).....BROWN (L2).....ORANGE (L3).....YELLOW (NEUT)....GREY	(L1).....BLACK (L2).....RED (L3).....BLUE (NEUT)....WHITE
24 VDC	**INTRINSICALLY SAFE**
(ALL).....BLUE	(ALL).....LIGHT BLUE

4) SIZE ALL WIRES IN ACCORDANCE WITH NEC CODES. SINGLE CONDUCTORS SHALL BE STRANDED COPPER WITH THWN INSULATION, RATED FOR 600 VAC, AND UL LISTED AS MTW, UNLESS NOTED OTHERWISE. MINIMUM CONDUCTOR SIZE SHALL BE #14 AWG. GROUND CONDUCTOR SIZE SHALL BE AS INDICATED ON THE DRAWINGS. WHERE NOT INDICATED, IT SHALL BE #14 AWG OR LARGER.

5) LOCATE CONDUIT ENTRIES INTO ENCLOSURES TO ASSURE ADEQUATE WIRE BENDING SPACE. ROUTE WIRING SO THAT DOOR MOUNTED EQUIPMENT WILL NOT INTERFERE WITH IT WHEN THE DOOR IS CLOSED.

6) LOCATE INTRINSICALLY SAFE WIRING CONDUIT ENTRIES INTO ENCLOSURE AS CLOSE AS POSSIBLE TO THE WIREWAY PROVIDED FOR INTRINSICALLY SAFE FIELD WIRING SO THAT ALL INTRINSIC WIRING IS ISOLATED (AT LEASED 2") FROM ALL OTHER FIELD AND PANEL WIRING AND SECURED. ROUTE INTRINSICALLY SAFE FIELD WIRING THROUGH THE WIREWAY PROVIDED EXCLUSIVELY FOR INTRINSICALLY SAFE WIRING. ALL WIRING SHALL BE IN COMPLIANCE WITH THE NATIONAL ELECTRICAL CODE ARTICLE 504. OTHER APPLICABLE ARTICLES INCLUDE 501 & 515.

7) ENGINEER HAS IDENTIFIED AS MANY OF THE PLC INPUTS AND OUTPUTS AS POSSIBLE THAT WILL BE NEEDED TO MAKE THE CONTROL PROGRAM OPERATE AS REQUIRED. ADDITIONAL I/O MAY BE IDENTIFIED WHEN THE CONTROL PROGRAM IS WRITTEN AND REQUIRE WIRING. THESE SHALL BE CONSIDERED PART OF THESE SHOP DRAWINGS. THE INSTALLING CONTRACTOR SHALL INSTALL 10% SPARE CONDUCTORS TERMINATED ON TERMINAL BLOCKS ON BOTH ENDS TO MEET ADDITIONAL I/O REQUIREMENTS.

8) TAG ALL WIRES AT EVERY TERMINATION POINT. SHORT WIRE LENGTHS, (LESS THAN 8") WHERE THE ENTIRE CONDUCTOR IS VISIBLE MAY BE TAGGED AT JUST ONE END. WIRE LABELS FOR WIRES SMALLER THAN NO. 4. SHALL BE VINYL, SELF ADHESIVE, WRAPAROUND, WITH MACHINE PRINTED NUMBERS AND LETTERS. WIRE SIZES NO. 4 AND LARGER AND MULTI CONDUCTOR CABLES SHALL BE MARKED WITH ONE-PIECE, NYLON LOCKING MACHINE PRINTED MARKER TIES EQUAL TO PANDUIT PLM SERIES. WIRE TAG NUMBER SHALL BE AS INDICATED ON THE DRAWINGS.

9) DO NOT ROUTE ANY COMMUNICATION CABLES IN WIREWAYS WITH 120 VAC WIRING. ROUTE ALL THESE CABLES AWAY FROM 120 VAC WIRING. WHERE 120 VAC CONDUCTORS MUST BE CROSSED, DO SO AT RIGHT ANGLES AND PROVIDE AT LEAST 1" SEPARATION.

10) DO NOT CONNECT MORE THAN TWO WIRES TO ANY ONE TERMINAL.

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LEGEND AND NOTES

FOR

MARTIN DRIVE REGIONAL W.W.P.S.

CAMPBELL COUNTY, VIRGINIA

PROJECT NO.	20230622
FILE NO.	-
LAT.	
LONG.	
DATE:	2/5/2025
DRAWN BY:	KRC
CHECKED BY:	MWB

COMMONWEALTH OF VIRGINIA
MARSHALL BOWLING
Lic. No. 0402064247
2/5/2025
PROFESSIONAL ENGINEER
Marshall Bowling

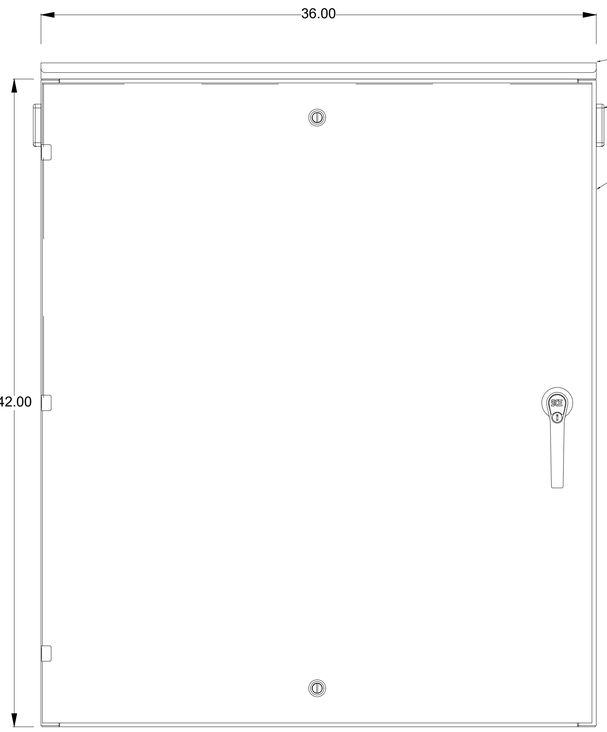
BID SET

CCUSA # 80-2304

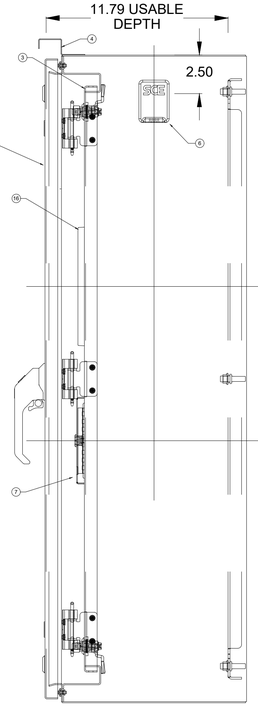
HURT & PROFFITT

SHEET NO.	REV.
I-001	0

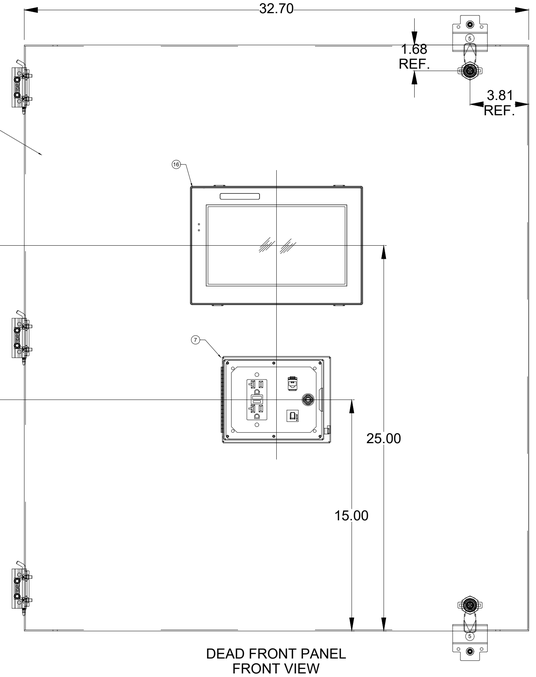
NOTE: EVERY EFFORT HAS BEEN MADE TO PROVIDE ACCURATE DIMENSIONS AND A COMPREHENSIVE BILL OF MATERIALS FOR THE CONSTRUCTION OF THIS CONTROL PANEL, BASED ON THE MANUFACTURERS RECOMMENDATIONS. HOWEVER, IT IS THE RESPONSIBILITY OF THE CONTROL PANEL BUILDER TO VERIFY THAT THE PANEL IS PROPERLY SIZED AND CONSTRUCTED IN ACCORDANCE WITH BOTH THE MANUFACTURER'S GUIDELINES AND THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE (NEC).



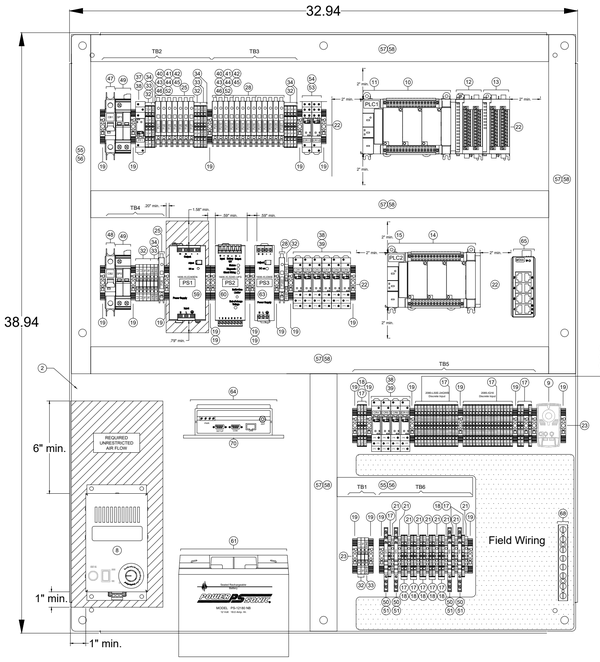
FRONT VIEW



RIGHT SIDE
VIEW



DEAD FRONT PANEL
FRONT VIEW



SUBPANEL

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SCADA CONTROL PANEL LAYOUT

FOR

MARTIN DRIVE REGIONAL W.W.P.S.

CAMPBELL COUNTY, VIRGINIA

PROJECT NO.	20230622
FILE NO.	-
LAT.	
LONG.	
DATE:	2/5/2025
DRAWN BY:	KRC
CHECKED BY:	MWB

COMMONWEALTH OF VIRGINIA
MARSHALL BOWLING
Lic. No. 0402064247
2/5/2025
PROFESSIONAL ENGINEER
Marshall Bowling

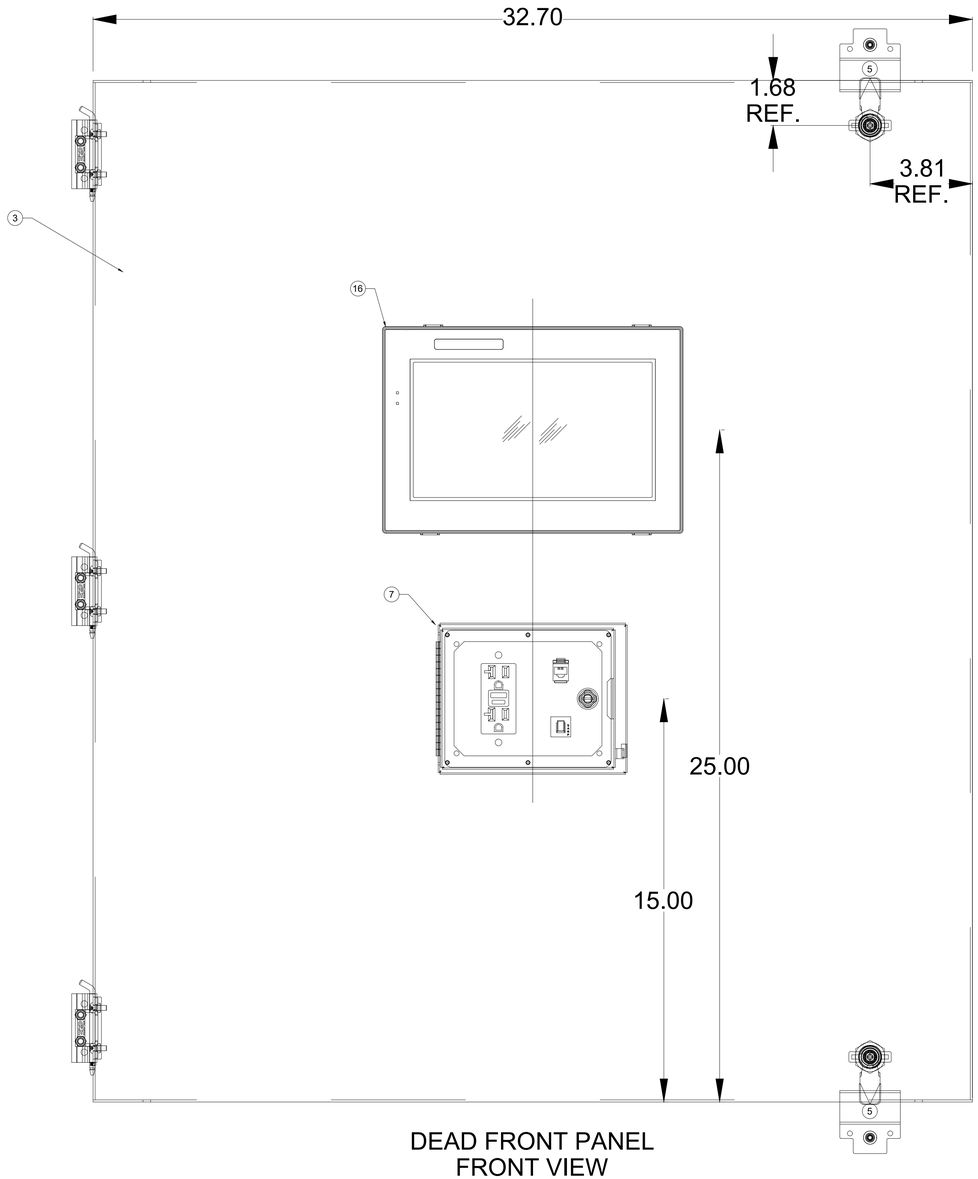
BID SET

CCUSA # 80-2304

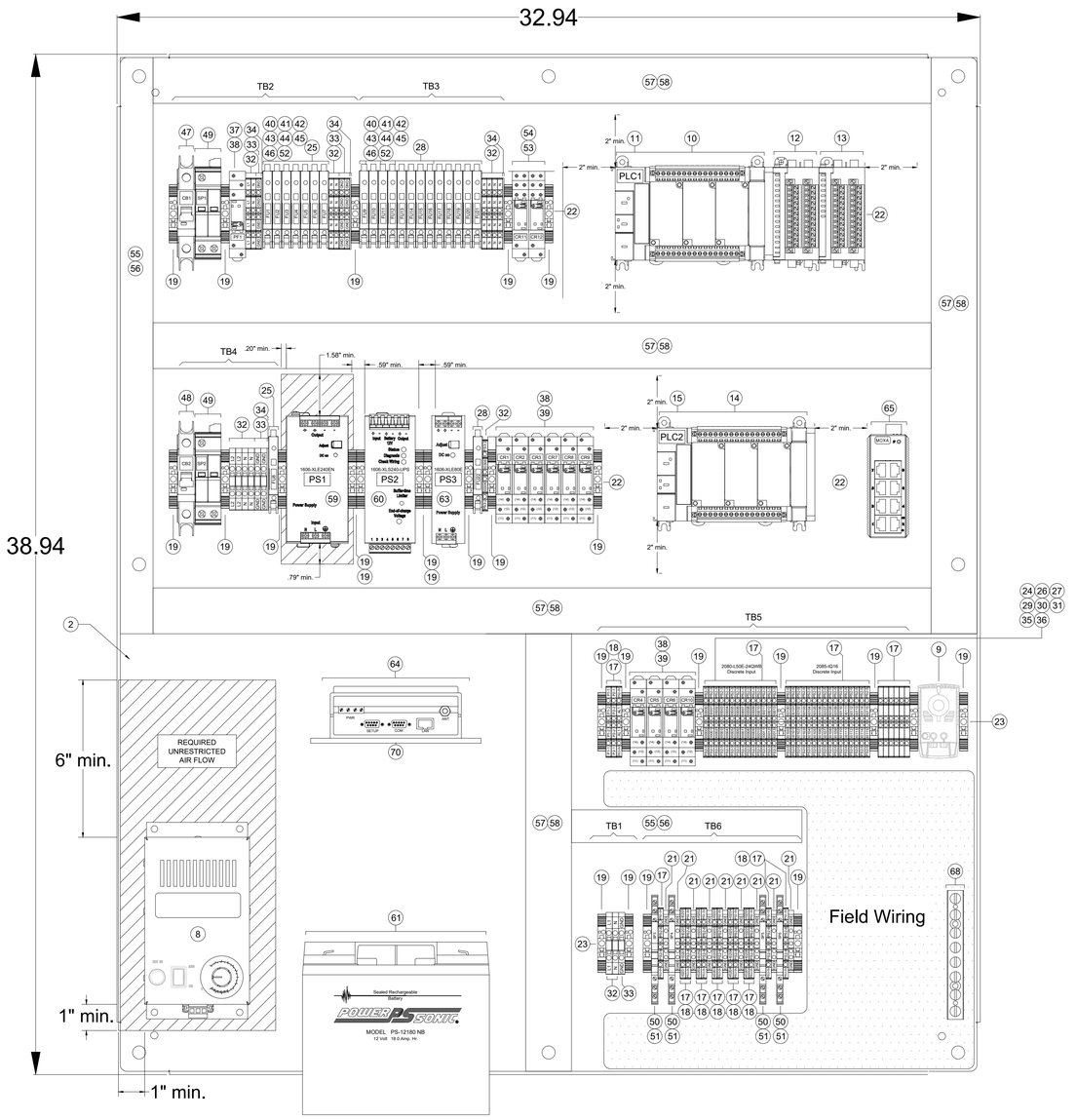
HURT&PROFFITT

SHEET NO.	REV.
I-100.1	0

NOTE: EVERY EFFORT HAS BEEN MADE TO PROVIDE ACCURATE DIMENSIONS AND A COMPREHENSIVE BILL OF MATERIALS FOR THE CONSTRUCTION OF THIS CONTROL PANEL, BASED ON THE MANFUFACTURERS RECOMMENDATIONS. HOWEVER, IT IS THE RESPONSIBILITY OF THE CONTROL PANEL BUILDER TO VERY THAT THE PANEL IS PROPERLY SIZED AND CONSTRUCTED IN ACCORDANCE WITH BOTH THE MANUFACTURER'S GUIDELINES AND THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE (NEC).



DEAD FRONT PANEL
FRONT VIEW



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DESIGN BUILD • PLC PROGRAMMING
VALIDATION • INSTALLATION & SERVICE

FOR
MARTIN DRIVE REGIONAL W.W.P.S.
CAMPBELL COUNTY, VIRGINIA

PROJECT NO.	20230622
FILE NO.	-
LAT.	
LONG.	
DATE:	2/5/2025
DRAWN BY:	KRC
CHECKED BY:	MWB

COMMONWEALTH OF VIRGINIA
MARSHALL BOWLING
Lic. No. 0402064247
2/5/2025
PROFESSIONAL ENGINEER
Marshall Bowling

BID SET

CCUSA # 80-2304

HURT&PROFFITT

SHEET NO.	REV.
I-100.2.	0

BILL OF MATERIALS

ITEM	QTY	MANUFACTURER	CATALOG	DESCRIPTION	TAG
1	1	Saginaw Controls	SCE-42EL3612SSLPPL	S.S. LPPL Enclosure	
2	1	Saginaw Controls	SCE-42P36	Subpanel, Bent, Galvanized	
3	1	Saginaw Controls	SCE-DF42EL36LP	Dead Front	
4	1	Saginaw Controls	SCE-DS36SS	Drip Shield	
5	1	Saginaw Controls	SCE-ELMFK4SS6-OS	Foot Kit	
6	2	Saginaw Controls	SCE-BVK	Breather Vent	
7	1	Hoffman	HGF5ETH	InterSafe Data Interface Port for Ethernet/ProfiNet, GFCI, Black, Steel	
8	1	Pfannenberg	PN: 17040015407	Enclosure, Heater, 400 Watt with Thermostat (FLH-TF400)	
9	1	Pfannenberg	PN: 17111000010	Temperature Switch	
10	2	Allen Bradley	2080-L70E-24QWB	Micro870 EtherNet/IP Controller, 14 24 VDC/VAC Inputs, 10 Relay Output, 24 DC Power (MAIN PLC)	PLC1
11	2	Allen Bradley	2080-MEMBAK-RTC2	2080 Micro800 System, Memory Plug In Module, With 4 MB RTC Plug-In	
12	1	Allen Bradley	2085-IQ16	2080 Micro800 System, Micro850 Input Module, Digital, 16 Point, 12/24VDC, Sink/Source , IEC	
13	1	Allen Bradley	2085-IF8	2080 Micro800 System, Micro850 Input Module, Analog, Voltage/Current, 8 Channels, Bipolar, +-10V, 0-20mA	
14	1	Allen Bradley	2080-L50E-24QWB	Micro 850 PLC, 24VDC, 14 Digital In / 10 Relay Out (BACKUP PLC)	PLC 2
15	1	Allen Bradley	2080-MEMBAK-RTC2	PLC Memory Backup & High Accuracy RTC	
16	1	Automation Direct	EA9-T10WCL	C-more Operator Interface (OIT), 24VDC	
17	46	Allen Bradley	1492-JD3	Terminal Block 2 Tier	
18	13	Allen Bradley	1492-EBJD3	1492 Terminal Block Accessories End Barrier , Grey (Standard), Qty. 20	
19	8	Allen Bradley	1492-EAJ35	1492 Terminal Block Accessories End Anchor, End Anchor	
20	2	Allen Bradley	1492-CJJ5-10	1492 Terminal Block Accessories Plug-In Center Jumper , 5 mm Center to Center , 10 Pole , Gray ,	
21	9	Allen Bradley	1492-JG3	1492-J IEC Terminal Block, One-Circuit Feed-Through Ground Block, 2.5 mm (# 24 AWG - # 12 AWG), Standard Feedthrough, Green / Yellow Stripe (Standard),	
22	1	Allen Bradley	199-DR1	DIN Mounting Rail, Zinc Plated, Chromated Steel, 35mm x 7.5mm DIN Rail, 1 Meter (Pkg. Qty. 10)	
23	2	Allen Bradley	1492-DR6	DIN Mounting Rail, Aluminum, 35mm x 7.5mm x 57.4mm Raised DIN Rail, 1 Meter (Pkg. Qty. 2)	
24	1	Allen Bradley	1492-M5X12	1492 Terminal Block Accessories Snap-In Individual Marker Card5 mm x 12 mmNo Text	
25	8	Allen Bradley	1492-H4	1492-H Finger-Safe Terminal Blocks, H-Block,Single Circuit Fuse Block, Code 4,Neon Blown Fuse Indicator, #30 - #10 AWG, Black (Standard),No Bulk Pack (Single Block) 300V AC	
26	2	Allen Bradley	1492-N49	Side Jumper, 9 mm center-to-center, 10 Pole, Pkg. Qty. of 10	
27	2	Allen Bradley	1492-SJS	Side Jumper Insulating Sleeve, Pkg. Qty. of 10	
28	14	Allen Bradley	1492-H5	1492-H Finger-Safe Terminal Blocks, H-Block,Single Circuit Fuse Block, Code 5,LED Blown Fuse Indicator, #30 - #10 AWG, Black (Standard),No Bulk Pack (Single Block) 57VDC	
29	5	Allen Bradley	1492-N37	1492 Terminal Block Accessories End Barrier , Grey (Standard)	
30	1	Allen Bradley	1492-MS8X12	1492 Terminal Block Accessories Snap-In Individual Marker Card5 mm x 12 mmNo Text	
31	2	Allen Bradley	1492-M5X8	1492 Terminal Block Accessories Snap-In Individual Marker Card5 mm x 8 mmNo Text	
32	5	Allen Bradley	1492-J4	1492-J IEC Terminal Block, One-Circuit Feed-Through Block, 4 mm (# 22 AWG - # 10 AWG) or 2.5 mm (# 22 AWG - # 12 AWG), Standard Feedthrough, Gray (Standard),	
33	3	Allen Bradley	1492-JG4	1492-J IEC Terminal Block, One-Circuit Feed-Through Ground Block, 4 mm (# 22 AWG - # 10 AWG) or 2.5 mm (# 22 AWG - # 12 AWG), Standard Feedthrough, Green / Yellow Stripe (Standard),	
34	3	Allen Bradley	1492-EBJ3	1492 Terminal Block Accessories End Barrier , Grey (Standard), Qty. 50	
35	1	Allen Bradley	1492-M6X12	1492 Terminal Block Accessories Snap-In Individual Marker Card6 mm x 12 mmNo Text	
36	2	Allen Bradley	1492-CJJ6-2	1492 Terminal Block Accessories Plug-In Center Jumper , 6 mm Center to Center , 2 Pole , Gray ,	
37	1	Allen Bradley	700-HK36A1-4	700-HK General Purpose Slim Line Relay, 16 Amp Contact, SPDT, 120V 50/60Hz, Pilot Light	PF1
38	11	Allen Bradley	700-HN121	700-H General Purpose Accessories, Mini 5-Blade Base Socket, Screw Terminals, Guarded Touch Safe Terminal Construction (Pkg. Qty. 10, hence minimum order quantity is 10 pcs and must be ordered in multiples of 10 pcs) , 700-HN121	
39	10	Allen Bradley	700-HK36Z24-4	700-HK General Purpose Slim Line Relay, 16 Amp Contact, SPDT, 24V DC, Pilot Light	CR1, CR2, CR3, CR4, CR5, CR6
40	10	Bussmann	AGC-3-R	3 Amp, 250V, Fast Acting Glass Tube Fuse	
41	18	Bussmann	AGC-1-R	1 Amp, 250V, Fast Acting Glass Tube Fuse	
42	2	Bussmann	AGC-2-R	2 Amp, 250V, Fast Acting Glass Tube Fuse	
43	2	Bussmann	MDL-5-R	5 Amp, 250V, Time-Delay Glass Tube Fuse	
44	2	Bussmann	MDL-7-R	7 Amp, 250V, Time-Delay Glass Tube Fuse	
45	2	Bussmann	AGC-15	15 Amp, 250V, Fast Acting Glass Tube Fuse	
46	4	Bussmann	MDL-3-R	3 Amp, 250V, Time-Delay Glass Tube Fuse	
47	1	Allen Bradley	1489-M1C200	Bulletin 1489-M Thermal-magnetic Circuit Breakers, Standard configuration, AC, 1 Pole Configuration, Trip Curve C, UL/CSA Max. Voltage: 277V AC, 48V DC ; IEC/EN Max. Voltage: 230V AC,20A	
48	1	Allen Bradley	1489-M1C050	Bulletin 1489-M Thermal-magnetic Circuit Breakers, Standard configuration, AC, 1 Pole Configuration, Trip Curve C, UL/CSA Max. Voltage: 277V AC, 48V DC ; IEC/EN Max. Voltage: 230V AC,5A	
49	3	Phoenix Contact	2905348	Type 2 Surge Arrestor, 250VAC, 125VDC, (VAL-SEC-T2-1S-175-FM)	
50	5	Phoenix Contact	2906798	Analog Surge Protection Device, 24VDC, (TTC-6-1X2-24DC-UT)	
51	1	Phoenix Contact	808710	Blank Terminal Marking Strip for Analog Surge Protection Device	
52	2	Bussmann	MDL-3-R	3 Amp, 250V, Time-Delay Glass Tube Fuse	
53	2	Allen Bradley	700-HK32Z24-4	700-HK General Purpose Slim Line Relay, 8 Amp Contact, DPDT, 24V DC, Pilot Light	CR11, CR12
54	2	Allen Bradley	700-HN122	700-H General Purpose Accessories, Mini 8-Blade Base Socket with 5A rating, Screw Terminals, Guarded Touch Safe Terminal Construction (Pkg. Qty. 10, hence minimum order quantity is 10 pcs and must be ordered in multiples of 10 pcs) , 700-HN122	CR11, CR12
55	6	Panduit	F1X4LG6	Panduct 1"x4" Wiring Duct	
56	6	Panduit	C1LG6	Panduct 1" Flush Duct Cover	
57	12	Panduit	F1.5X4LG6	Panduct 1.5"x4" Wiring Duct	
58	12	Panduit	C1.5X4LG6	Panduct 1.5" Flush Duct Cover	
59	1	Allen Bradley	1606-XLE240EN	1606-XLE240EN: Essential Power Supply, 24-28V DC, 240 W, 120V AC Input Voltage	PS1
60	1	Allen Bradley	1606-XLS240-UPS	1606-XLS240-UPS: Performance Power Supply w/ UPS, 22.5-30V DC, 240W, 22.5-30V DC Input Voltage	PS2
61	1	Powersonic	PS-12180F2	Sealed Rechargeable Lead-Acid Battery, 12V, 18.0AH	PS3
62	2	Amp	4-520448-2	Faston .250 Series Crimp-On Insulated Receptacle Type Lug	
63	1	Allen Bradley	1606-XLE80E	1606-XLE80E: Essential Power Supply, 24-28V DC, 80 W, 120/240V AC Input Voltage	
64	1	Cal/Amp	140-5028-504	215-240 MHZ Viper SC+200 Licensed IP Router Radio Modem	
65	1	MOXA	EDS-208	Ethernet Switch, 8 Port Unmanaged	ES1
66	3	Blackbox	EVNSL641-0003	CAT6 Ethernet Standard Patch Cord Length 3Ft.	
67	1	Blackbox	EVNSL641-0007	CAT6 Ethernet Standard Patch Cord Length 7Ft.	
68	1	Panduit	UGB2/0-414-6	Ground Bar	
69	1	Panel Fabricator		Lot Phenolic Nameplates	
70	1	Panel Fabricator		Radio Support Shelf	
71	1	EMEDCO	QS3743	Warning Label "Arc Flash and Shock Hazard	
72	1	EMEDCO	SQS110	Warning Label "Device Powered From Several Sources"	
73	1	Edwards Signaling	51XBRFA24D	Beacon with Horn (Supply Loose, Shall be Installed in the Field)	Supply Loose, Shall be Installed in the Field

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SCADA PANEL BILL OF MATERIALS
FOR
MARTIN DRIVE REGIONAL W.W.P.S.
CAMPBELL COUNTY, VIRGINIA

PROJECT NO.	20230622
FILE NO.	-
LAT.	
LONG.	
DATE:	2/5/2025
DRAWN BY:	KRC
CHECKED BY:	MWB

COMMONWEALTH OF VIRGINIA
MARSHALL BOWLING
Lic. No. 0402064247
PROFESSIONAL ENGINEER
2/5/2025
Marshall Bowling

BID SET

CCUSA # 80-2304

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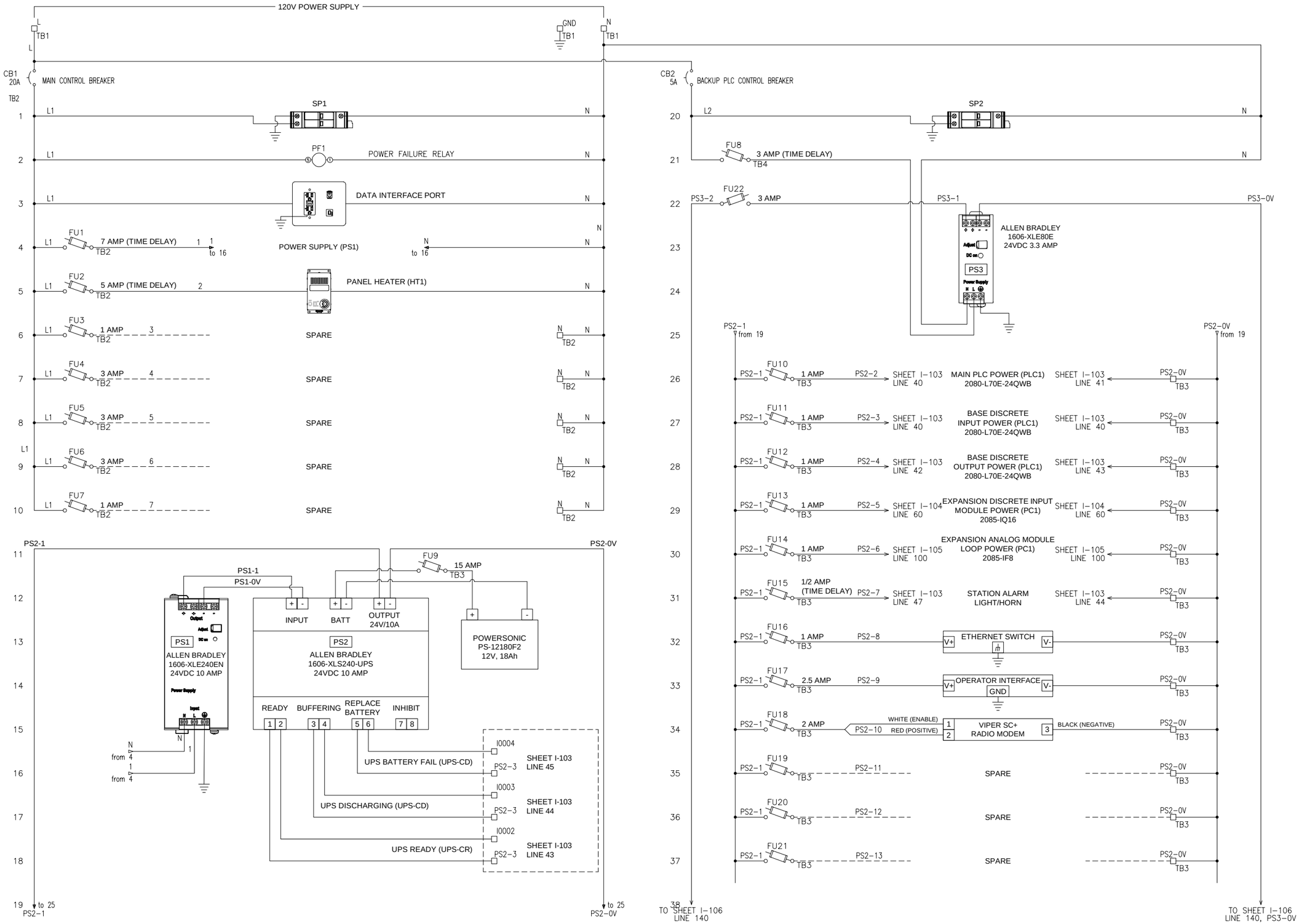
SHEET NO.	REV.
I-101	0



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SCADA PANEL POWER DISTRIBUTION
FOR
MARTIN DRIVE REGIONAL W.W.P.S.
CAMPBELL COUNTY, VIRGINIA

PROJECT NO.	20230622
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MARSHALL BOWLING
Lic. No. 0402064247
2/5/2025
PROFESSIONAL ENGINEER
Marshall Bowling

BID SET

CCUSA # 80-2304

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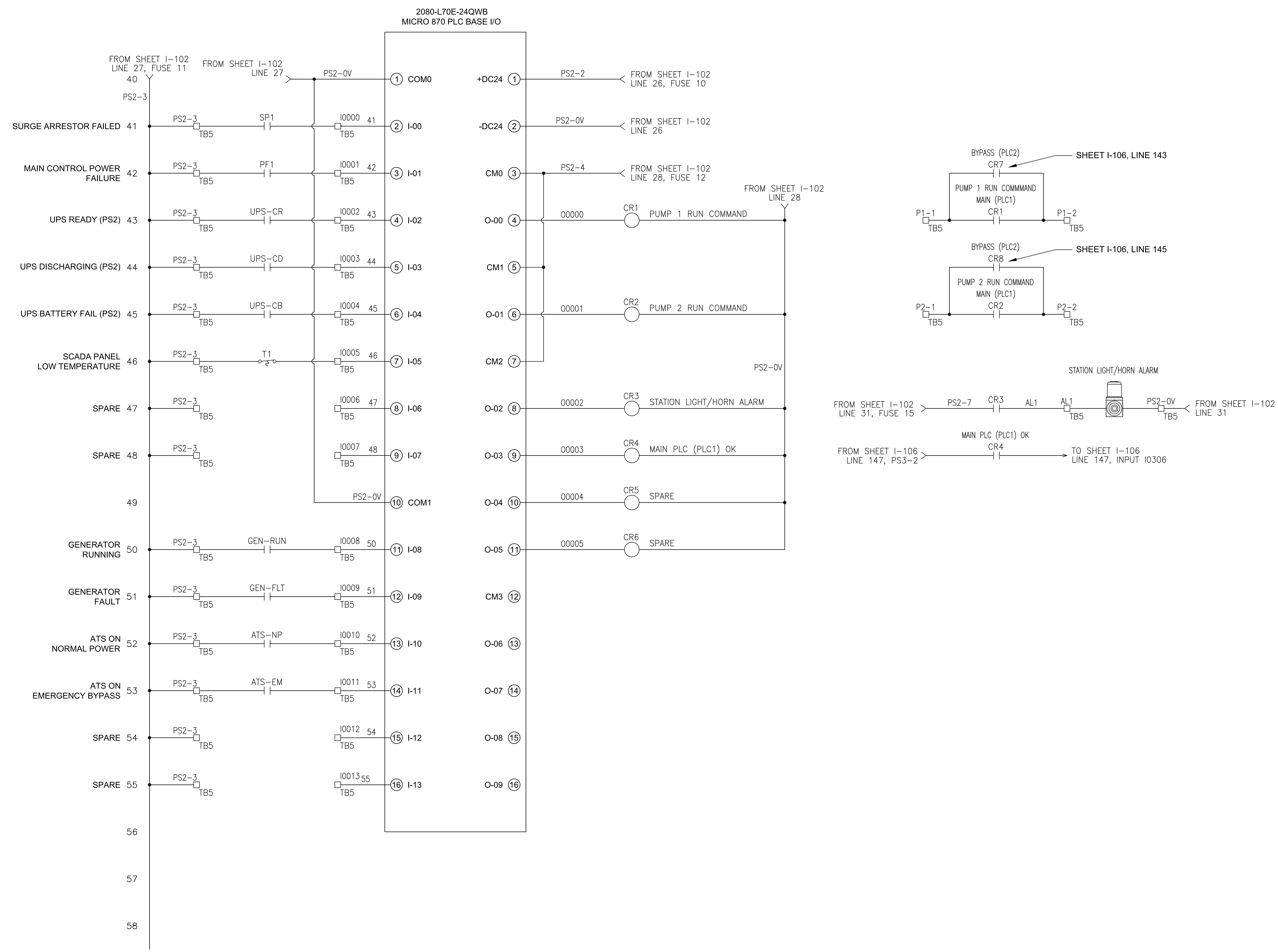
SHEET NO.	REV.
I-102	0



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MAIN PLC BASE I/O (PLC1)
FOR
MARTIN DRIVE REGIONAL W.W.P.S.
CAMPBELL COUNTY, VIRGINIA

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MARSHALL BOWLING
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2/5/2025
PROFESSIONAL ENGINEER

BID SET

CCUSA # 80-2304

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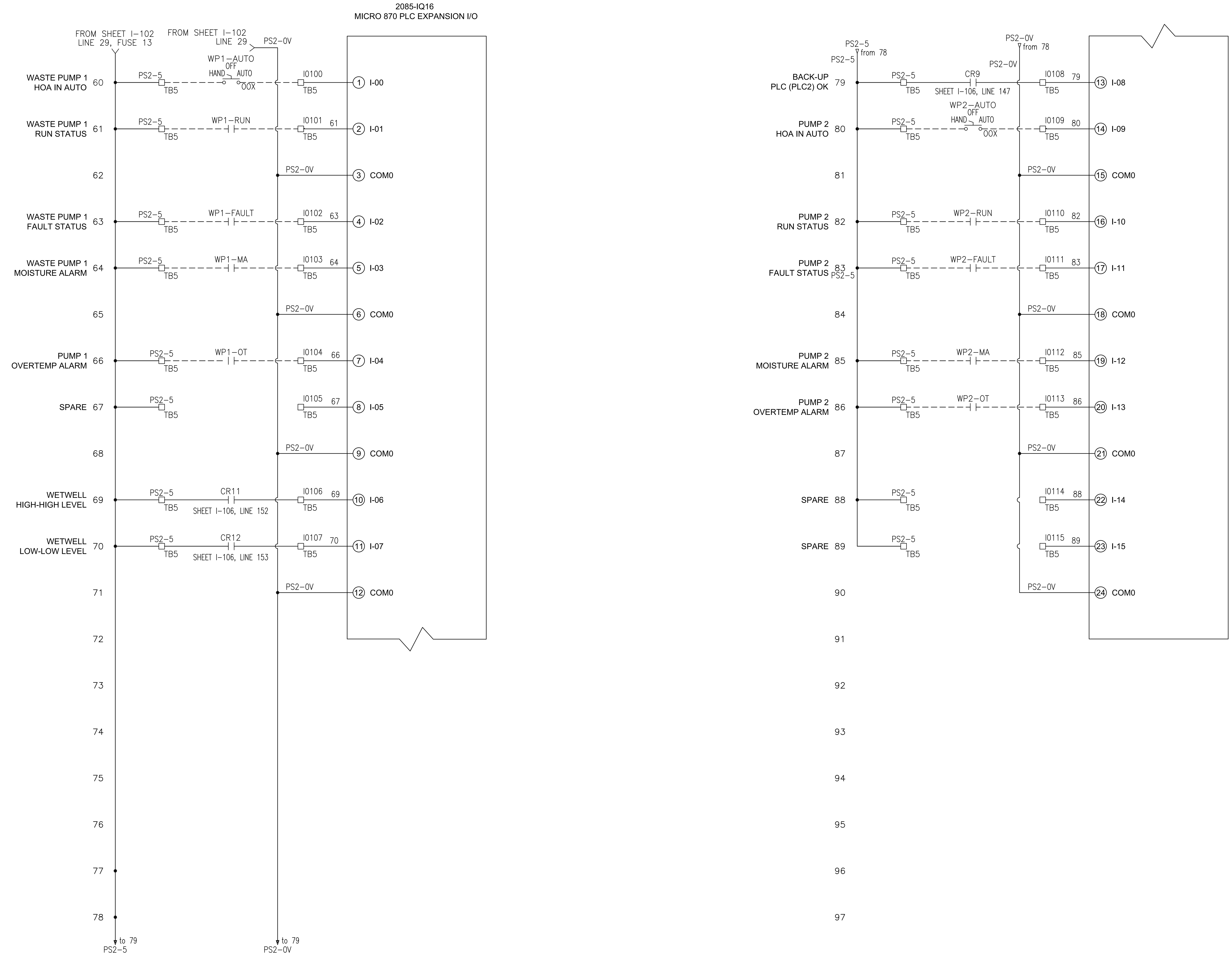
SHEET NO.	REV.
I-103	0



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DISCRETE INPUT EXPANSION MODULE

FOR

MARTIN DRIVE REGIONAL W.W.P.S.
CAMPBELL COUNTY, VIRGINIA

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MARSHALL BOWLING
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PROFESSIONAL ENGINEER
Marshall Bowling

BID SET

CCUSA # 80-2304

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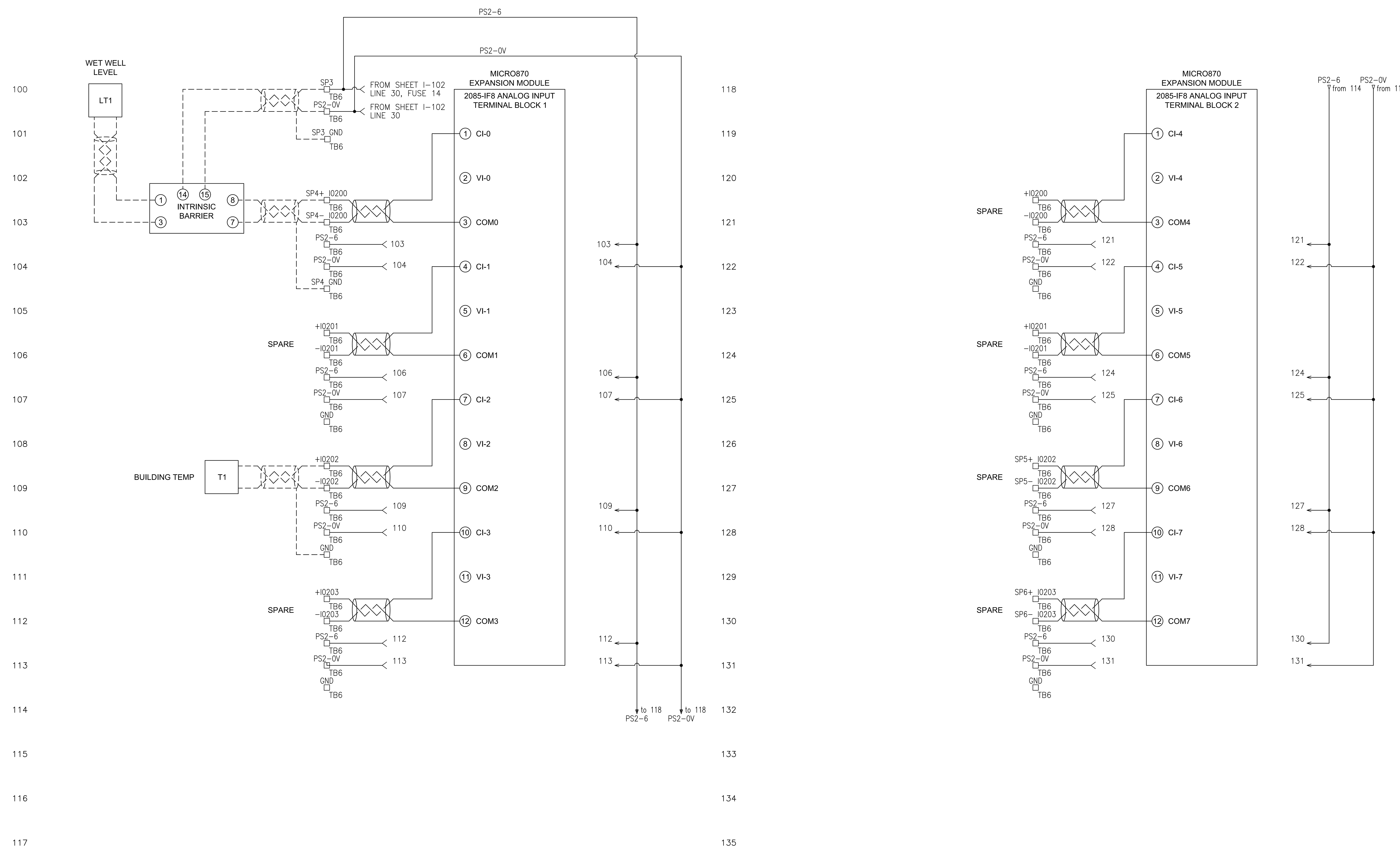
SHEET NO.	REV.
I-104	0



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ANALOG I/O EXPANSION MODULE
FOR
MARTIN DRIVE REGIONAL W.W.P.S.
CAMPBELL COUNTY, VIRGINIA

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PROFESSIONAL ENGINEER
Marshall Bowling

BID SET

CCUSA # 80-2304

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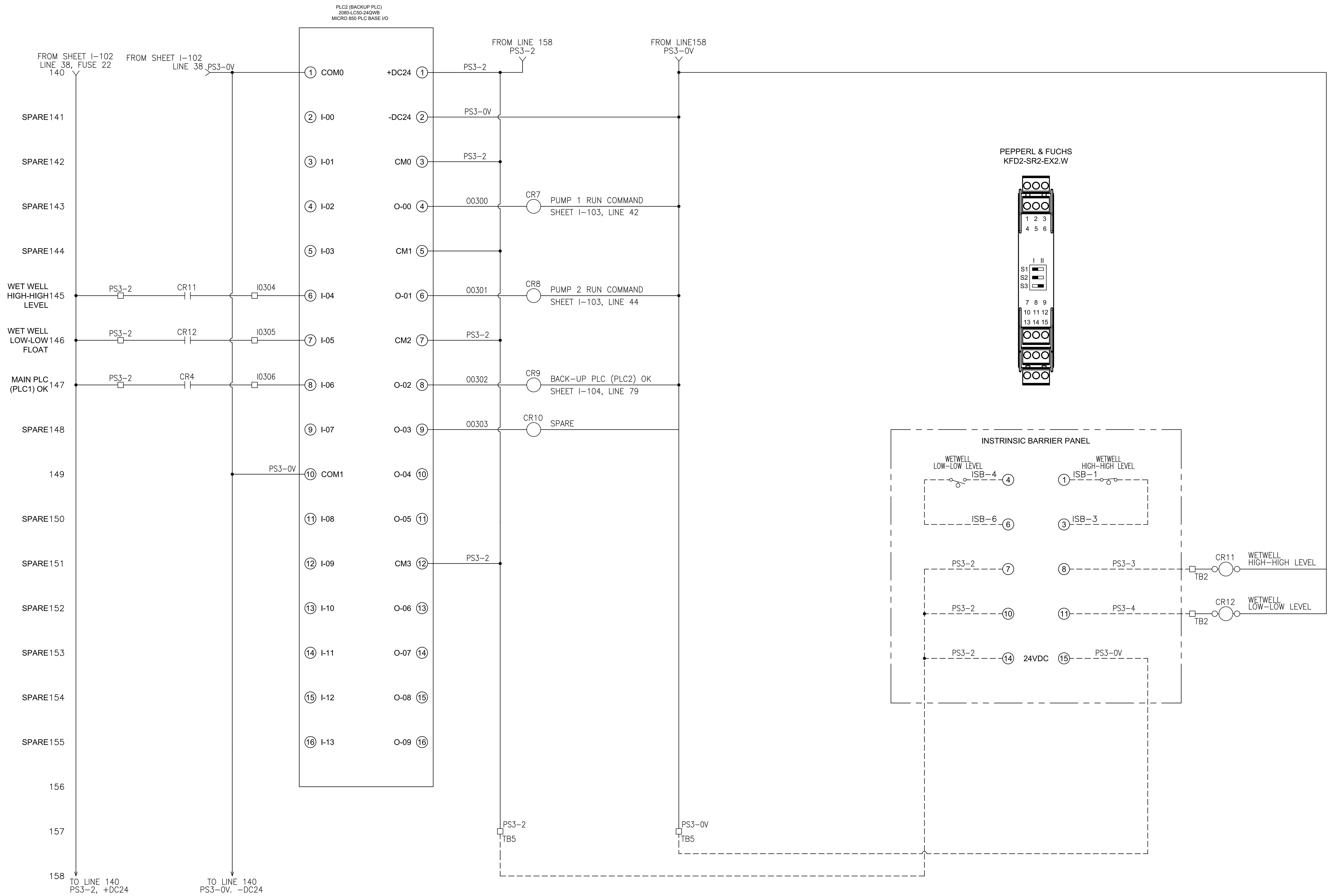
SHEET NO.	REV.
I-105	0



"THIS SHEET IS INTENDED TO BE REPRODUCED AT 24"X36". REPRODUCTION OF THIS SHEET AT A DIFFERENT SIZE THAN INTENDED SHALL VOID THE SCALE SHOWN ON THE SHEET

Backup Base I/0 (PLC2) & Intrinsic Barrier

FOR

MARTIN DRIVE REGIONAL W.W.P.S.
CAMPBELL COUNTY, VIRGINIA

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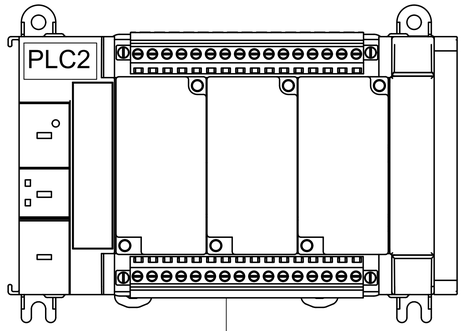
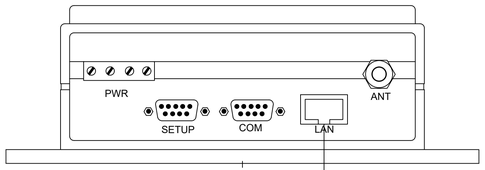
I-106	0

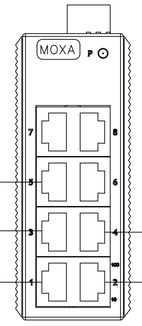
Micro 850 PLC, 24VDC, 14 Digital In / 10 Relay Out (BACKUP PLC)



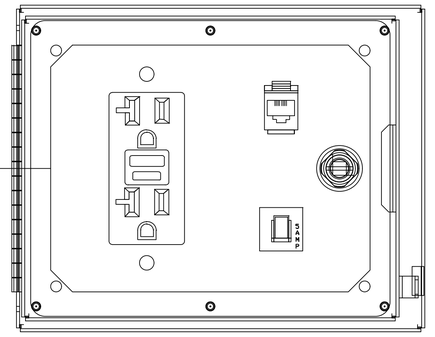
CAL/AMP 15-240 MHZ Viper SC+200 Licensed IP Router Radio Modem



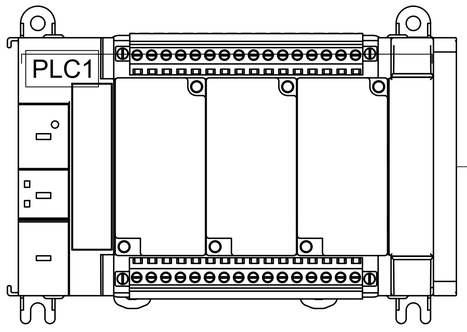
BLACKBOX CAT6 Ethernet Standard Patch Cord
(Typical all Ethernet Connections)



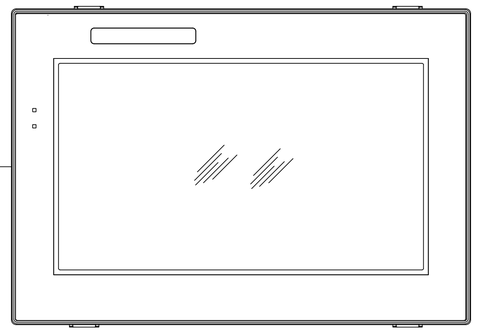
MOXA Ethernet Switch, 8 Port Unmanaged



Hoffmann InterSafe Data Interface Port for Ethernet/ProfiNet, GFCI, Black, Steel



Micro 850 PLC, 24VDC, 14 Digital In / 10 Relay Out



AUTOMATION DIRECT C-more Operator Interface (OIT)

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NETWORK COMMUNICATIONS

FOR

MARTIN DRIVE REGIONAL W.W.P.S.

CAMPBELL COUNTY, VIRGINIA

PROJECT NO.	20230622
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MARSHALL BOWLING
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2/52025
PROFESSIONAL ENGINEER
Marshall Bowling

BID SET

CCUSA # 80-2304

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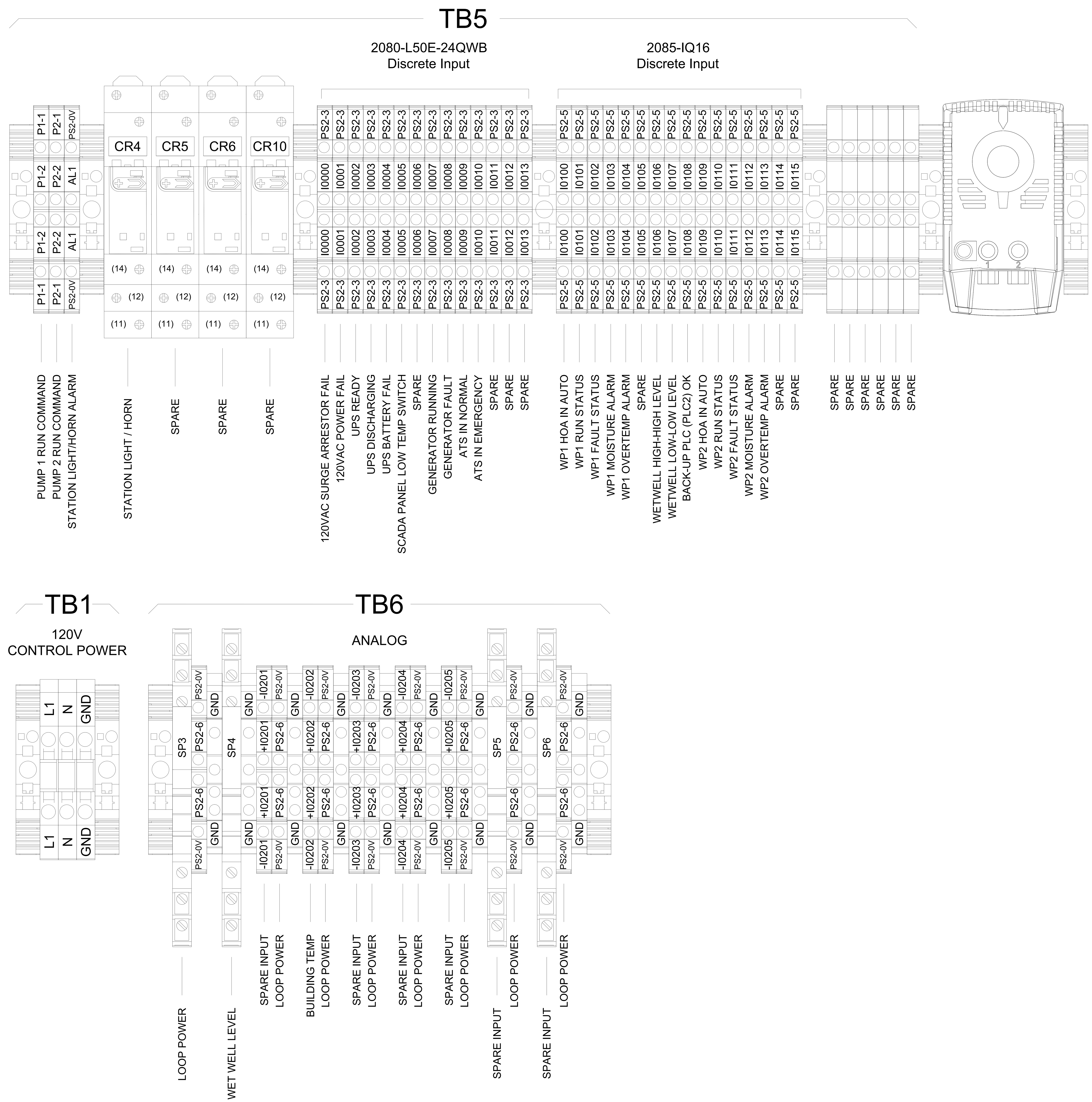
SHEET NO.	REV.
I-107	0



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FIELD TERMINATIONS
FOR
MARTIN DRIVE REGIONAL W.W.P.S.
CAMPBELL COUNTY, VIRGINIA

PROJECT NO.	20230622
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CCUSA # 80-2304

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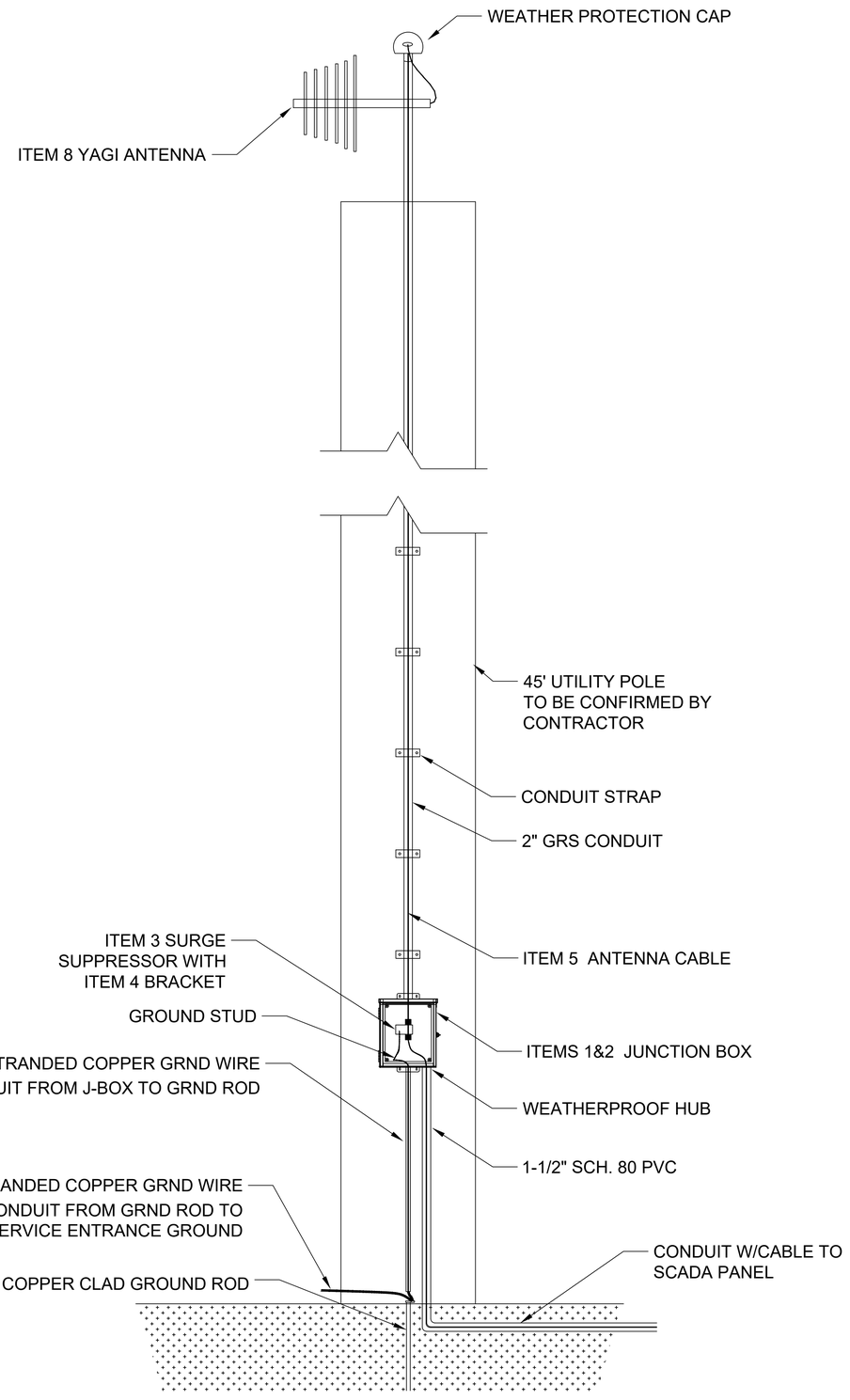
SHEET NO.	REV.
I-108	0

ANTENNA INSTALLATION & GROUNDING NOTES

INSTALL ANTENNA AND RELATED EQUIPMENT ACCORDING TO THE FOLLOWING GUIDLINES AND PER "ANTENNA MOUNTING & GROUNDING DETAIL ON THIS SHEET. DETAILS IS SHOWN AS A GUIDE ONLY. ACTUAL INSTALLATION MAY VARY DEPENDING ON SITE CONDITIONS, NATIONAL AND LOCAL CODES. SITE SHALL BE EVALUATED, CONDITIONS VERIFIED, AND ADJUSTMENTS MADE ACCORDINGLY

1. RUN ANTENNA CABLE THROUGH THE WEATHER CAP ON GALVANIZED STEEL CONDUIT TO THE JUNCTION BOX AND CONNECT IT TO "POLYPHASER" SURGE SURPRESSOR. SECURE "POLYPHASER" TO THE INSIDE OF THE JUNCTION BOX AND GROUND IT WITH #6 COPPER GROUND WIRE. #6 GROUND WIRE SHALL EXIT JUNCTION BOX THROUGH $\frac{3}{4}$" GRS CONDUIT AND BOND TO A DRIVEN GROUND ROD OR OTHER ACCEPTABLE GROUNDING GRID. CONNECT A #6 COPPER GROUND WIRE FROM THE GROUND ROD TO THE ELECTRICAL SERVICE ENTRANCE GROUND. WRAP ANTENNA CABLE CONNECTION AT THE ANTENNA IN ALL-WEATHER INSULATION TAPE. (#3 PART #SUPER33+ OR APPROVED EQUAL) PROVIDE GUY WIRES ON ANTENNA MAST AS NECESSARY FOR STABILITY. NOTE: ALL COMPONENTS FROM ANTENNA TO CONTROL PANEL SHALL BE BONDED ACCORDING NATIONAL ELECTRICAL CODE REQUIREMENTS AS STATED IN ARTICLE 810. LOCAL CODES MAY ALSO APPLY.
2. THE FOLLOWING COMPONENTS PROVIDED BY ELECTRICAL CONTRACTOR:
   - 2.1. ALL CONDUIT AND WIRING
   - 2.2. WEATHER PROTECTION CAP (HEAD)
   - 2.3. #6 STRANDED GROUND WIRE
   - 2.4. $\frac{3}{4}$" x 10' COPPER GROUND ROD
   - 2.5. ALL RELATED HARDWARE FOR ABOVE ITEMS
3. COORDINATE WITH OWNER PRIOR TO INSTALLING GROUND ROD



ANTENNA BILL OF MATERIALS

ITEM	QTY	MANUFACTURER	CATALOG	DESCRIPTION	TAG
1	1	HOFFMANN	A12R106HCR	NEMA 3R W/PADLOCK PROVISION JUNCTION BOX, 12" x 10" x 6"	
2	1	HOFFMANN	A12N10P	JUNCTION BOX SUBPANEL	
3	1	POLYPHASER	VHF50HN-B	ANTENNA SURGE SUPRESSOR	
4	1	LCOM	HGX-LPMOUNT01	ANTENNA SURGE SUPRESSOR MOUNTING BRACKET	
5	100'	TIMES FIBER COMM	LMR-400	ANTENNA CABLE	
6	3	TIMES FIBER COMM	EZ-400-NMH-X	TYPE N MALE CONNECTOR FOR LMR-400 CABLE	
7	1	TIMES FIBER COMM	EZ-400-TM-RA-X	TYPE N MALE CONNECTOR FOR LMR-400 CABLE	
8	1	MOBILE MARK	Y3313A-C	YAGI 6db ANTENNA 156-162 MHz	

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ANTENNA INSTALLATION
FOR
MARTIN DRIVE REGIONAL W.W.P.S.
CAMPBELL COUNTY, VIRGINIA

PROJECT NO.	20230622
FILE NO.	-
LAT.	
LONG.	
DATE:	2/5/2025
DRAWN BY:	CTH
CHECKED BY:	MWB

COMMONWEALTH OF VIRGINIA
MARSHALL BOWLING
Lic. No. 0402064247
2/5/2025
PROFESSIONAL ENGINEER
Marshall Bowling

BID SET

CCUSA # 80-2304

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SHEET NO.	REV.
I-109	0