

ONE LINE DIAGRAM
N.T.S.

SERVICE: 1-PH, 2#6, 1#6(N) & 1#6(G)
VOLTAGE: 240/120V

MAN: 2P-60A M.C.B.
LOCATION: CONTROL PANEL

VA	POLE	TRIP	COND.	WIRE	REMARKS	1	2	3	4	5	6	7	8	9	10	11	12	13	VA
540	1	20	3/4"	2#12 & (G)	PUMP CONTROL	1	2	3	4	5	6	7	8	9	10	11	12	13	180
750	1	20	1"	2#12 & (G)	SCADA RTU PANEL	1	2	3	4	5	6	7	8	9	10	11	12	13	1200
180	1	20	3/4"	2#12 & (G)	PANEL EXT. GFCI RECEPTACLE	1	2	3	4	5	6	7	8	9	10	11	12	13	180
180	1	20	3/4"	2#12 & (G)	INTRINSICALLY SAFE RELAY	1	2	3	4	5	6	7	8	9	10	11	12	13	500
1200	1	20	1"	2#12 & (G)	DRY WELL FAN	1	2	3	4	5	6	7	8	9	10	11	12	13	900
1000	1	20	1"	2#12 & (G)	AIR EXHAUST FAN	1	2	3	4	5	6	7	8	9	10	11	12	13	1000
1000	1	20	-	-	SPARE	1	2	3	4	5	6	7	8	9	10	11	12	13	
4850	TOTAL				TOTAL CONNECTED LOAD: 8810 VA @ 240/120 VOLTS														3960

SERVICE: 1-PH, 2#6, 1#6(N) & 1#6(G)
VOLTAGE: 240/120V

MAN: 2P-60A M.C.B.
LOCATION: CONTROL PANEL

VA	POLE	TRIP	COND.	WIRE	REMARKS	1	2	3	4	5	6	7	8	9	10	11	12	VA
400	1	20	3/4"	2#12 & (G)	INSIDE LIGHTS	1	2	3	4	5	6	7	8	9	10	11	12	1500
720	1	20	3/4"	2#12 & (G)	RECEPTACLES	1	2	3	4	5	6	7	8	9	10	11	12	1720
1200	1	20	3/4"	2#12 & (G)	EXHAUST FAN	1	2	3	4	5	6	7	8	9	10	11	12	1400
960	1	20	3/4"	2#12 & (G)	DAY TANK PUMP	1	2	3	4	5	6	7	8	9	10	11	12	1800
100	1	20	-	-	SPARE	1	2	3	4	5	6	7	8	9	10	11	12	100
100	1	20	-	-	SPARE	1	2	3	4	5	6	7	8	9	10	11	12	100
3480	TOTAL				TOTAL CONNECTED LOAD: 7100 VA @ 240/120 VOLTS													3620

BREAKERS, WIRING AND CONDUIT SCHEDULE

VOLTS & PHASE	MOTOR HP	MOTOR AMP CODE	START SIZE	MOTOR CIRCUIT PROTECT. AMPS	MOTOR WIRE THWN CU. NOTE 13 ON E-5	SIZED FOR TWO PUMP STATIONS	
						MAIN & STAND-BY BREAKERS	SERVICE
240-1φ	5	28	2	60	3#8 IN 1 1/2" C	100	#6 3#2, IN 1-1/2" C
240-1φ	7.5	40	2	80	2#6 & 1#8G. IN 1-1/2" C	150	#6 3#1/0, IN 2" C
240-3φ	5	15.2	1	30	4#10 IN 1 1/2" C	100	#6 4#2, IN 1-1/2" C
240-3φ	7.5	22	2	50	4#8 IN 1 1/2" C	100	#6 4#2, IN 1-1/2" C
240-3φ	10	28	2	50	3#6 & 1#8G. IN 1-1/2" C	100	#6 4#2, IN 1-1/2" C
240-3φ	15	42	3	100	3#4 & 1#8G. IN 2" C	150	#6 4#1/0, IN 2" C
480-3φ	5	7.6	1	15	4#12 IN 1 1/2" C	70	#6 4#3, IN 1-1/2" C
480-3φ	7.5	11	1	30	4#12 IN 1 1/2" C	70	#6 4#3, IN 1-1/2" C
480-3φ	10	14	2	30	4#10 IN 1 1/2" C	70	#6 4#3, IN 1-1/2" C
480-3φ	15	21	2	50	4#10 IN 1 1/2" C	70	#6 4#3, IN 1-1/2" C
480-3φ	20	27	2	50	4#8 IN 2" C	125	#6 4#1, IN 2" C
480-3φ	25	34	3	50	3#6 & 1#8G. IN 2" C	150	#6 4#1/0, IN 2" C
480-3φ	30	40	3	100	3#6 & 1#8G. IN 2" C	200	#4 4#3/0, IN 2" C
480-3φ	40	52	3	100	3#4 & 1#6G. IN 2" C	200	#4 4#3/0, IN 2" C
480-3φ	50	65	4	100	3#3 & 1#6(G) IN 2" C	200	#4 4#3/0, IN 2" C
480-3φ	60	77	4	150	3#2 & 1#6(G) IN 2" C	225	#2 4#4/0, IN 2 1/2" C

LOAD CALCULATION

2- H.P. SEWAGE PUMPS	_____ AMPS.
MISCELLANEOUS BASE LOAD	_____ AMPS.
25% OF LARGEST MOTOR	_____ AMPS.
TOTAL	_____ AMPS.

PROVIDE SERVICE SIZE: "___" AMP. "___" VOLT, 3φ, 4W

CALCULATIONS BASED ON FORMULAS OF NFPA 70E / IEEE 1584, AS FOLLOWS:

ARCING FAULT CURRENT I_a CALCULATION

K	I _{bf}	V(kV)	GAP (mm)	log (I _a)	I _a
-0.097			25		

log (I_a) = K + 0.662 LOG (I_{bf}) + 0.0966 x V + 0.000526 x G + 0.5588 x V x LOG (I_{bf}) - 0.00304 G x LOG (I_{bf})
 K = -0.153 FOR OPEN CONFIGURATION AND -0.097 FOR BOX CONFIGURATIONS AS IN PANELS AND MCCs
 I_{bf} = BOLTED FAULT CURRENT FOR 3-PHASE FAULTS AT APPLICABLE ELECTRICAL EQUIPMENT IN KA
 V = SYSTEM VOLTAGE IN KV
 G = BUS BAR GAP BETWEEN CONDUCTORS:
 15KV SWGR: 152mm
 5KV SWGR: 104mm
 LV SWGR: 32mm
 PANEL/MCC: 25mm
 CABLE: 13mm

NORMALIZED INCIDENT ENERGY (E_n) CALCULATION

K1	K2	I _a	GAP (mm)	log (E _n)	E _n
-0.555	-0.113		25		

log E_n = K1 + K2 + 1.081 LOG I_a + 0.0011 x G
 E_n = INCIDENT ENERGY IN J/cm² NORMALIZED FOR 0.2s ARCING DURATION AND 610mm WORKING DISTANCE
 G = GAP BETWEEN BUS BAR CONDUCTORS 25mm *TABLE D.8.2 ASSUMPTION
 K1 = -0.792 FOR OPEN CONFIGURATIONS AND -0.555 FOR BOX CONFIGURATIONS
 K2 = 0 FOR UNGROUNDED AND HIGH RESISTANCE GROUNDED SYSTEMS; -0.113 FOR GROUNDED SYSTEMS
 I_a = ARCING FAULT CURRENT

INCIDENT ENERGY (E) CALCULATION

C _f	E _n	t	D (mm)	X	E (J/cm ²)	E (cal/cm ²)
1.5			455	1.641		

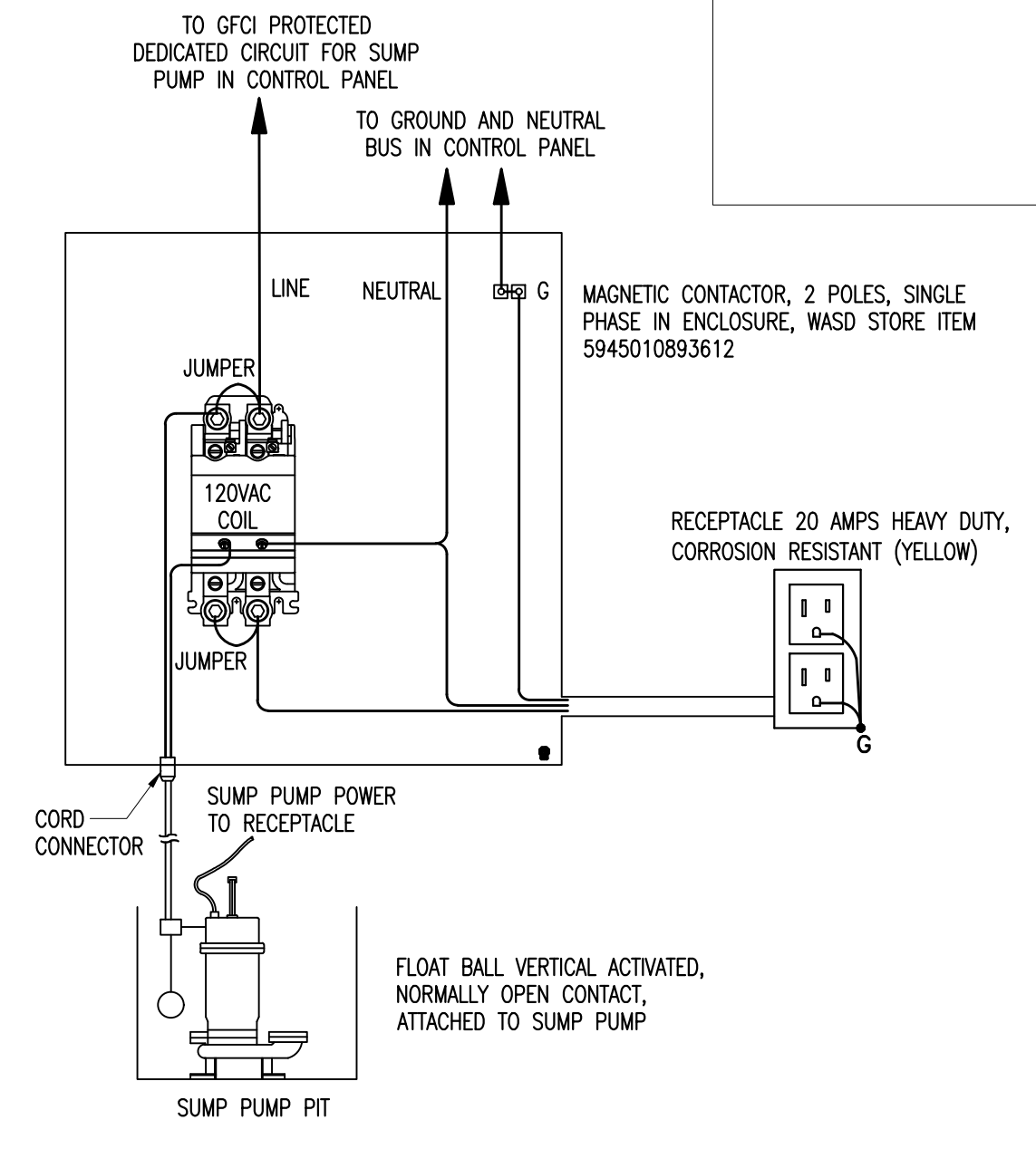
E = (4.184) (C_f) (E_n) (t/0.2) (610²/D²)
 C_f = 1.5 FOR VOLTAGES AT OR BELOW 1KV AND 1.0 FOR VOLTAGES ABOVE 1KV
 t = ARCING DURATION IN SECONDS
 X = DISTANCE EXPONENT, 1.473 FOR SWGR <=1KV, 0.973 FOR SWGR >1KV AND 1.641 FOR PANELS <=1KV
 D = WORKING DISTANCE 455mm = 18 IN PER NFPA 70E

FLASH BOUNDARY IN MM AT INCIDENT ENERGY OF 5.0 J/cm²

C _f	E _n	t	X	E _b	D _b (mm)	D _b (inches)
1.5			1.641	5.0		

D_b = [(4.184) (C_f) (E_n) (t/0.2) (610²/E_b)]^{1/2} *0.85 EMPIRICALLY DERIVED
 E_b = INCIDENT ENERGY SET AT 5.0 J/cm²
 C_f = 1.5 FOR VOLTAGES AT OR BELOW 1KV AND 1.0 FOR VOLTAGES ABOVE 1KV
 t = ARCING DURATION IN SECONDS
 X = DISTANCE EXPONENT, 1.473 FOR SWGR <=1KV, 0.973 FOR SWGR >1KV AND 1.641 FOR PANELS <=1KV

ARC FLASH HAZARD ANALYSIS



NOTES:
 1- NEMA CONTACTOR 2 POLE, SIZE 1, 120VAC COIL IN METAL ENCLOSURE.
 2- CORROSION RESISTANCE RECEPTACLE IN PVC BOX OR CORROSION REST. 2" BY 4" ELECT. BOX WITH W/HL IN USE COVER.
 3- VERTICAL ACTIVATED FLOAT BALL CABLE SECURED AND PROTECTED.
 4- INSTALL CONTACTOR ENCLOSURE AND RECEPTACLE 6 FT ABOVE DRY WELL FLOOR. SPACE FROM WALL WITH 1/4 INCH CHANNEL.

SUMP PUMP CONTROL

THE LABELS FOR EACH APPLICABLE EQUIPMENT ON THIS PLAN ARE FROM A PRELIMINARY STUDY PERFORMED BY THE ENGINEER OR RECORD. CONTRACTOR SHALL PROVIDE FINAL LABELS ACCORDING TO SECTION 26 05 73.19

! DANGER !

Arc - Flash Hazard and Shock Hazard

in - Arc Flash Protection Boundary
 cal/cm² - Incident Energy Flash Hazard at 18 inches

CLASS

Appropriate PPE Required for both Arc-Flash and Shock Hazards:
 Safety Glasses/Goggles, Hard Hat, Flash Suit Hood, Leather Gloves, Leather Work Shoes, Hearing Protection, FR clothing system with an ATPV rating >= X cal/cm², Class 00 Voltage Rated Gloves, Voltage Rated Tools

480 VAC -- Shock Hazard with covers/doors open
 3' - 6" -- Limited Approach Boundary
 1' - 0" -- Restricted Approach Boundary
 0' - 1" -- Prohibited Approach Boundary

Shock Hazard

LOCATION: PS-0XXX PROTECTIVE DEVICE: XXXXXX
 MAX FAULT CURRENT BY FPL: _____
 STUDY DONE BY: XXXXX DATE: XX/XX/XX FILE NAME: XXXXX

NOTES:
 1- LABEL BACKGROUND SHALL BE WHITE COLOR.
 2- LABEL LETTERING SHALL BE BLACK COLOR.
 3- 'DANGER' WORD SHALL BE WHITE COLOR WITH RED BACKGROUND.
 4- LABEL SIZE SHALL BE 4 X 6 INCHES.
 5- INFORMATION PRINTED ON LABEL SHALL CONFORM TO THE REQUIREMENTS OF SECTION 26 05 73.19, SUB SECTIONS 3.04 AND 3.07 AND SHALL BE VERIFIED AND PROVIDED BY CONTRACTOR.
 6- THE LABEL FOR EACH OF THE APPLICABLE EQUIPMENT SHALL BE LOCATED SO AS TO BE CLEARLY VISIBLE TO QUALIFIED PERSONS BEFORE EXAMINATION, ADJUSTMENT, SERVICING, OR MAINTENANCE OF THE EQUIPMENT NEC 110.16.
 7- SEE NOTE #24, ELECTRICAL GENERAL NOTES SHEET E-1.

ARC FLASH LABEL

ABBREVIATIONS:

- MCB MAIN CIRCUIT BREAKER
- MPC MOTOR CIRCUIT PROTECTION
- GCB GENERATOR CIRCUIT BREAKER
- RTU REMOTE TERMINAL UNIT

THESE ARE NOT CONSTRUCTION DRAWINGS. THE INFORMATION HEREIN CONTAINED SHALL ONLY BE USED AS GENERAL GUIDELINE OF THE INTENDED OPERATION AND FUNCTIONS AND SHALL NOT BE CONSTRUED AS ALL INCLUSIVE. ENGINEERS OF RECORD AND CONSULTANTS USING THESE GUIDELINES SHALL VERIFY AND MODIFY ANY REQUIREMENT NOT NECESSARILY SHOWN AS MAY BE REQUIRED BY ANY AND ALL APPLICABLE CODES AND STANDARDS.

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 MIAMI, FL 33133
 786-552-4440

PCTS 0000/CONTRACT X-000 or RPQ/ERX0000
 PUMPING STATION No. 0000 (STD. UPDATE 2021)
 DRY WELL PUMPING STATION WITH GENERATOR
 PROJECT OFFICIAL ADDRESS

ELECTRICAL ONE-LINE DIAGRAM

DRAWING HISTORY

RELEASED FOR	DATE	BY
X REVIEW 00%	xx/xx/xx	xxx
X REVIEW 00%		
PERMIT		
BID		
AS-BUILT		

REVISIONS

No.	DESCRIPTION	DATE	BY
Δ XXXXXX	XXXXXXXX	xx/xx/xx	xxx
Δ XXXXXX	XXXXXXXX		

APPROVALS

DESIGNED: X.X.X. DRAWN: X.X.X.
 UNIT HEAD: X.X.X.
 PROJECT MGR.: X.X.X.

Xxxx Xxxxx, P.E.
 Xxxxx Engineer
 State of Florida-License No.00000
 Date: _____

FILE NAME: XXXXXE03.DWG
 DATE: XX/XX/20XX SCALE: AS NOTED

SHEET **E-3**
 DWG. No. S-00000-D