ELECTRICAL SPECIFICATIONS

1. CODES:
   ALL WORK SHALL COMPLY WITH THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE (NEC) 2014 EDITION, ALL STATE AND LOCAL BUILDING CODES, ALL ADOPTED ORDINANCES, AND ALL REQUIREMENTS OF THE UTILITY COMPANY.

2. RACEWAY:
   A. INDOOR:
      (1) EMT (ELECTRICAL METALLIC TUBING)
      (2) IMC (INTERMEDIATE METALLIC CONDUIT)

   B. OUTDOOR:
      (1) ABOVE GROUND: GRC (GALVANIZED RIGID CONDUIT)

   C. FLEXIBLE: LIQUIDTIGHT FLEXIBLE METAL CONDUIT SHALL BE USED IN ALL APPLICATIONS WHERE FLEXIBILITY IS REQUIRED. FLEXIBILITY METAL CONDUIT IS NOT ACCEPTABLE UNLESS IT IS A PART OF A PRE-WIRED ASSEMBLY. FLEXIBLE NONMETALLIC CONDUIT SHALL NOT BE USED.

   D. CONDUIT RUNS INSIDE BUILDING SHALL BE CONCEALED WHERE POSSIBLE. CONDUIT BELOW FLOOR SLAB SHALL BE INSTALLED WITHIN OR BELOW SLAB AND INSTALLED PRIOR TO POUR. RUNS TO BE AS STRAIGHT AS POSSIBLE FROM POINT OF OUTLET TO POINT OF OUTLET.

   E. FURNISH 1/2" CONDUIT FOR ALL TEMPERATURE SENSORS FROM SENSOR TO APPROPRIATE MECHANICAL EQUIPMENT. PROVIDE 4" SQUARE BOX AT 48" AFF.

   F. SUPPORTING DEVICES:
      (1) CHANNEL AND ANGLE SUPPORT SYSTEMS, HANGERS, ANCHORS, PRIOR BRACKETS, FABRICATED ITEMS, AND FASTENERS SHALL PROVIDE SECURE SUPPORT FROM THE BUILDING STRUCTURE FOR ELECTRICAL COMPONENTS. ALL SUPPORTS SHALL CONFORM TO SEISMIC ZONE REQUIREMENTS OF THE LOCAL AUTHORITY HAVING JURISDICTION. LIGHT FIXTURES SHALL BE SUPPORTED IN ACCORDANCE WITH NEC 410.

      (2) MATERIAL: ALL STEEL, PROTECTED FROM CORROSION WITH ZINC COATING (GALVANIZED) OR TREATMENT OF EQUIVALENT CORROSION-RESISTANT ALTERNATIVE FINISH.

   G. FIRESTOPPING: APPLY TO CABLE AND RACEWAY PENETRATIONS OF FIRE-RATED FLOOR AND WALL ASSEMBLIES. PERFORM FIRESTOPPING TO RE-ESTABLISH THE ORIGINAL FIRE-RESISTANCE RATING OF THE ASSEMBLY AT THE PENETRATION.

   H. INSTALL RACEWAYS LEVEL AND SQUARE AND AT PROPER ELEVATIONS. PROVIDE ADEQUATE HEADROOM. USE TEMPORARY CLOSURES TO PREVENT FOREIGN MATTER FROM ENTERING RACEWAY. KEEP RACEWAYS AT LEAST 6" AWAY FROM PARALLEL RUNS OF FLUES AND HOT WATER PIPES. INSTALL HORIZONTAL RACEWAY RUNS ABOVE WATER PIPING.

   I. MINIMUM CONDUIT SIZE: 3/4" BELOW GRADE, 1/2" ABOVE GRADE

3. WIRE (50 TO 600 VOLTS)
   ALL WIRE SHALL COMPLY WITH THE FOLLOWING REQUIREMENTS:

   A. INSULATING RATING:
      (1) VOLTAGE: 600 VOLTS
      (2) TEMPERATURE: 90°C (THHN OR THWN)

   B. STRANDED COPPER WITH ONE EXCEPTION:
   SOLID WIRE (SIZES #12 AND #10) MAY BE USED FOR OUTLETS AND LIGHTING.

   C. MINIMUM SIZE:
      (1) POWER WIRING - #12 AWG
      (2) CONTROL WIRING - #14 AWG

   D. WIRING INSTALLATION
      (1) ALL FEEDERS, BRANCH CIRCUITS AND VOLTAGE DROP REQUIREMENTS SHALL CONFORM TO NEC 210 AND 220.
      (2) ALL WIRING SHALL BE INSTALLED IN AN APPROVED RACEWAY SYSTEM IN ACCORDANCE WITH NEC AND LOCAL ORDINANCES.

4. ENCLOSURES:
   A. FOR STARTERS, DISCONNECTS AND PANELBOARDS:
      (1) INDOOR: NEMA 1
      (2) OUTDOOR: NEMA 3R

   B. CONTROL PANELS (FULL PIANO HINGED):
      (1) INDOOR: NEMA 1
      (2) OUTDOOR: NEMA 3R

   C. CONTROL STATIONS:
   (1) INDOOR AND OUTDOOR: NEMA 4 OILTIGHT

   D. REFER TO N.E.C. IN AREAS WHERE CERTAIN CONDITIONS MUST BE MET.

   E. MOUNTING HEIGHTS:
      (1) MOUNT TOP OF PANELS AND SWITCHES 66" AFF.
      (2) MOUNT TOP OF RECEPTACLE BOXES 15" AFF UON
      (3) OUTLET MOUNTING HEIGHTS FOR RECEPTACLES, SWITCHES, SYSTEM INITIATING DEVICES, AND INDICATING DEVICES SHALL COMPLY WITH REQUIREMENTS OF THE AMERICANS WITH DISABILITIES ACT (ADA)

5. GROUNDING:
   A. ELECTRICAL SERVICE AND BUILDING GROUNDING SHALL BE INSTALLED PER THE NEC AS SHOWN IN THE CONTRACT DRAWINGS AND SPECIFICATIONS.

   B. ALL METALLIC STRUCTURES, METALLIC ENCLOSURES, AND ELECTRICAL EQUIPMENT SHALL BE PERMANENTLY AND EFFECTIVELY GROUNDED AND GROUND CONNECTIONS SHALL BE MADE TO THE BUILDING GROUND. SIZE GROUND WIRE PER NEC 250.

6. WIRING DEVICES AND COMPONENTS:
   A. STARTERS AND CONTACTORS: TO BE NEMA OR IEC RATED (NO GENERAL PURPOSE).

   B. ALL PANELS SHALL BE OF COPPER BUS CONSTRUCTION.

   C. ALL RECEPTACLES AND SWITCHES SHALL BE COMMERCIAL GRADE WITH 20A RATING.

   D. ALL RECEPTACLE AND SWITCH COVERS SHALL BE WHITE AND STANDARD COMMERCIAL GRADE.

   E. EQUIPMENT STARTERS AND RELATED CONTROL AND WIRING SHALL BE SUPPLIED AND INSTALLED BY THE ELECTRICAL CONTRACTOR. OVERLOAD HEATERS SHALL BE INSTALLED IN ACCORDANCE WITH NAMEPLATE DATA ON EQUIPMENT. STARTERS SHALL BE INSTALLED AS DIRECTED BY THE POOL CONTRACTOR.

   F. ALL DISCONNECT SWITCHES SHALL BE HEAVY-DUTY WITH DUAL ELEMENT TIME DELAY FUSES AS NOTED ON THE ONE-LINE DIAGRAM. FUSE SIZE TO BE AS SHOWN OR AS REQUIRED TO MATCH LOAD CONDITIONS.

7. MISCELLANEOUS AND GENERAL
   A. THE ELECTRICAL DRAWINGS ARE NOT TO BE USED FOR ROOM DIMENSIONS AND EQUIPMENT PLACEMENT. REFERENCE THE APPROPRIATE ARCHITECTURAL, STRUCTURAL OR MECHANICAL PLANS, DRAWINGS OR SCHEMATIC. VERIFY ALL LOCATIONS WITH ENGINEER BEFORE INSTALLING CONDUIT, EQUIPMENT, ETC.

   B. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO FAMILIARIZE HIMSELF WITH THE INSTALLATION AND TO ENSURE IT IS PROPER FOR ANY GIVEN SITUATION WHICH MAY VARY FROM THE DETAILS OR THE DRAWINGS. CONTRACTORS ARE ADVISED TO COMPLETELY SURVEY THE WORK AREA TO IDENTIFY ANY UPCOMING PROBLEMS.

   C. COORDINATE MOUNTING HEIGHT OF ALL EXTERIOR LIGHTING FIXTURES WITH ARCHITECTURAL ELEVATION DRAWINGS.

   D. ELECTRICAL CONTRACTOR SHALL ARRANGE FOR ALL INSPECTIONS WHEN THEY BECOME DUE, AND SHALL NOT COVER ANY WORK UNTIL APPROVED BY THE INSPECTION AUTHORITY.

   E. ANY AND ALL FEES ASSOCIATED WITH THE ELECTRICAL WORK INCLUDING CONSTRUCTION AND INSPECTIONS SHALL BE PAID FOR BY THE ELECTRICAL CONTRACTOR IN ORDER TO DELIVER AND COMPLETE THE FINISHED BUILDING, READY FOR OCCUPANCY AND 100% USAGE.

   F. ANY COSTS DUE TO THE LACK OF COOPERATION AMONG TRADES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

   G. REFER TO THE LATEST ARCHITECTURAL DRAWINGS FOR EXACT WALL LOCATIONS, DIMENSIONS, AND CONFIGURATIONS: DOOR SWINGS FOR SWITCH LOCATION, REFLECTED CEILING PLANS FOR LIGHT FIXTURE LOCATIONS.

   H. ELECTRICAL CONTRACTOR SHALL FIELD VERIFY ALL ELECTRICAL EQUIPMENT LOADS PRIOR TO ROUGH-IN AND SHALL NOTIFY THE ENGINEER IF ANY DISCREPANCIES EXIST.

   I. ELECTRICAL CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY ALTERATIONS REQUIRED BY THE OWNER, ARCHITECT, OR FIELD CONDITIONS.

   J. ALL EQUIPMENT SHALL BE NEW AND SHALL HAVE APPROPRIATE UNDERWRITERS LABORATORIES (UL) LABEL AND SHALL CONFORM TO THE LATEST INDUSTRY STANDARDS.

   K. ELECTRICAL CONTRACTOR SHALL MAINTAIN ALL WORKING CLEARANCES FOR ALL ELECTRICAL EQUIPMENT PER N.E.C. REQUIREMENTS.

   L. AT THE COMPLETION OF WORK, THE ELECTRICAL CONTRACTOR SHALL PROVIDE COMPLETE, ACCURATE, TYPED PANELBOARD DIRECTORIES.

   M. ANY DEVIATION FROM PLANS WITHOUT PRIOR APPROVAL OF THE ARCHITECT/ENGINEER SHALL BE CAUSE FOR REJECTION OF MATERIALS AND/OR METHODS AND ANY COSTS INCURRED TO CORRECT SUCH DEVIATION TO THE SATISFACTION OF THE ARCHITECT/ENGINEER SHALL BE THE CONTRACTOR'S RESPONSIBILITY.

   N. COST TO INSTALL TEMPORARY POWER AND LIGHTING PER OSHA STANDARDS AND TEMPORARY POWER TO CONSTRUCTION TRAILER SHALL BE INCLUDED IN ELECTRICAL CONTRACTOR'S BID.

   O. ALL DIMENSIONS ARE FROM FINISHED FLOOR OR FACE OF STUD TO CENTER OF DEVICE UNLESS OTHERWISE NOTED.

   P. REFER TO MECHANICAL DRAWINGS FOR LOCATION OF THERMOSTATS AND OTHER SPECIAL EQUIPMENT OR CONTROLS. ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR INSTALLATION OF ALL CONDUITS, JUNCTION BOXES, WIRING, AND DISCONNECT SWITCHES AND THERMOSTAT JUNCTION BOXES.

GENERAL:
"CONDUCTORS NORMALLY USED TO CARRY CURRENT SHALL BE OF COPPER. FOR ALUMINUM AND COPPER-CLAD ALUMINUM #6AWG AND LARGER, SEE SECTION 310-15. EXCEPTION: ALUMINUM CONDUCTORS SMALLER THAN #6AWG MAY BE USED PROVIDED THE METHOD OF CONNECTION IS APPROVED IN ADVANCE BY THE BUILDING OFFICIAL AND THE INSTALLATION IS MADE UNDER CONTINUOUS SPECIAL INSPECTION.

INSTALLATION NOTES

1. EQUIPMENT SUPPLIED BY POOL CONTRACTOR AND INSTALLED BY ELECTRICAL CONTRACTOR SHALL INCLUDE THE FOLLOWING:
   A. POOL CONTROL PANEL (MODEL #LX 820 COMPOOL)
   B. SPRING WOUND TIMER (SWT)
   C. EMERGENCY STOP PUSHBUTTON (ESS)
   D. POOL LIGHTS
   E. POOL WATER LEVEL SENSOR
   F. SPA WATER LEVEL SENSOR

2. ALL METAL PARTS IN SWIMMING POOL AND SPA AREAS AND EQUIPMENT ROOM SHALL BE GROUND BONDED WITH #8 SOLID BARE COPPER INCLUDING BUT NOT LIMITED TO ALL PUMPS, HEATERS, POOL AND SPA LIGHTS, LADDERS, HAND RAILS, AND REBAR PER REQUIREMENTS OF N.E.C. 680.6 AND 680.26.

3. ELECTRICAL CONTRACTOR SHALL FIELD VERIFY LOCATION OF SWIMMING POOL AND SPA POOL LIGHT TOGGLE SWITCHES PER REQUIREMENTS OF N.E.C. 680.22 AND EMERGENCY OFF TOGGLE SWITCH PER 680.41.

4. ELECTRICAL CONTRACTORS WITH 120V COILS AND STARTERS WITH 120V COILS SHALL BE SUPPLIED AND INSTALLED BY ELECTRICAL CONTRACTOR.

5. ELECTRICAL CONTRACTOR SHALL FIELD VERIFY LOCATION OF POOL AND SPA WATER LEVEL SENSORS WITH POOL CONTRACTOR. LOW VOLTAGE CONTROL WIRING SHALL BE PROVIDED BY THE POOL CONTRACTOR..

6. POOL AND SPA LIGHT FIXTURES SHALL BE INSTALLED PER REQUIREMENTS OF NEC 680.23 FOR UNDERWATER LIGHTING FIXTURES.

7. BONDING OF ALL POOL AND SPA EQUIPMENT AND CONSTRUCTION SHALL BE INSTALLED PER REQUIREMENTS OF N.E.C. 680.6 AND 680.26.

8. WHERE CONNECTING CONDUCTORS TO MOTOR TERMINALS, USE LIQUIDTITE CONDUIT (3' MAXIMUM) FROM THE RIGID CONDUIT TO THE MOTOR J-BOX.

9. ELECTRICAL CONTRACTOR SHALL FIELD VERIFY LOCATION OF TIMER AND EMERGENCY STOP PUSHBUTTON PER REQUIREMENTS OF N.E.C. 680.41.

10. ELECTRICAL CONTRACTOR SHALL PERFORM ALL FINAL POWER AND CONTROL WIRING TERMINATIONS AT POOL CONTROL PANEL, CONTROL J-BOX, PCP STARTER, EMERGENCY STOP PUSHBUTTON, TIMER AND WATER LEVEL SENSORS AS REQUIRED FOR PROPER NORMAL AND EMERGENCY SHUTDOWN OPERATION OF ALL PUMPS.

ALL MOTOR BRANCH CONDUITS SHALL HAVE AN INSULATED GROUNDING CONDUCTOR SIZED IN ACCORDANCE TO TABLE 250.122 NO SMALLER THAN 12AWG 2013 N.E.C. 680.20(A)(1).

NOTES PER BLDG DEPT
1) UNDERGROUND WIRING LOCATION SHALL COMPLY WITH 2014 N.E.C. 680.10.
2) UNDERGROUND WIRING SHALL NOT BE PERMITTED UNDER THE POOL OR WITHIN THE AREA EXTENDING 5FT HORIZONTALLY FROM THE INSIDE WALL OF THE POOL UNLESS THIS WIRING IS NECESSARY TO SUPPLY POOL EQUIPMENT PERMITTED BY THIS ARTICLE. WHERE SPACE LIMITATIONS PREVENT WIRING FROM BEING ROUTED A DISTANCE OF 5FT OR MORE FROM THE POOL, SUCH WIRING SHALL BE PERMITTED WHERE INSTALLED IN RIGID METAL CONDUIT, INTERMEDIATE METAL CONDUIT, OR A NONMETALLIC RACEWAY SYSTEM. ALL METAL CONDUIT SHALL BE CORROSION RESISTANT AND SUITABLE FOR THE LOCATION. THE MINIMUM DEPTH SHALL BE GIVEN IN TABLE 680.10.

LOCATION:

PANEL: EX "P1"
VOLTAGE: 240 / 120 1Ø 3W
BUS: 60AMPS
MAINS: L.O.
MOUNTING: SURFACE
FULLY RATED AIC: 10,000 NEMA: 1 ENCLOSURE
DATE: 9/7/18 7:10 AM
JOB:
CIRCUIT CODE: L - LIGHTING K - KITCHEN
R - RECEPTACLES H - ELECTRIC HEATING
AM - AIR CONDIT MOTOR O - MISCELLANEOUS
M - MOTOR

CKT NO	CODE	TRIP	POLE	LOAD DESIGNATION DESCRIPTION	(NOTE)	CONNECTED VA ØA	ØB	ØC	(NOTE)	LOAD DESIGNATION DESCRIPTION	TRIP	POLE	CKT NO
1	M	20	1	IRRIGATION POWER		200	-	-		spare	30	-	2
3	H	20	1	SPA HEATER		400	-	-		-	-	2	4
5	H	20	1	POOL HEATER		400	-	200		LIGHTING	20	1	6
7	M	20	-	SPA CIRC PUMP 2hp 13.3A	1	1600	-	400		RECPTS BATHROOMS	20	1	8
9	M	-	2	-	1	1600	-	500		EXTERIOR LIGHTING	15	1	10
11	M	20	-	POOL CIRC PUMP 2hp 13.3A	1	1600	-	100		EXH FAN	15	1	12
13	M	-	2	-	1	1600	-	-		SPARE	15	1	14
15	M	15	1	CONTROLLER		200	-	-		SPARE	20	1	16
17	M	20	-	JET PUMP 2hp 13.3A	1	1600	-	-		-	-	2	18
19	M	-	2	-	1	1600	-	-		SPACE			20
21	M	20	-	SPARE		-	-	-		SPACE			22
23	M	-	2	-		-	-	-		SPACE			24
25				NOT APPLICABLE		-	-	-		NOT APPLICABLE			26
27				NOT APPLICABLE		-	-	-		NOT APPLICABLE			28
29				NOT APPLICABLE		-	-	-		NOT APPLICABLE			30
31				NOT APPLICABLE		-	-	-		NOT APPLICABLE			32
33				NOT APPLICABLE		-	-	-		NOT APPLICABLE			34
35				NOT APPLICABLE		-	-	-		NOT APPLICABLE			36
37				NOT APPLICABLE		-	-	-		NOT APPLICABLE			38
39				NOT APPLICABLE		-	-	-		NOT APPLICABLE			40
41				NOT APPLICABLE		-	-	-		NOT APPLICABLE			42

PANEL NOTES:
1) FURNISH WITH LOCK ON AND "GFCI" RATED CIRCUIT BREAKER

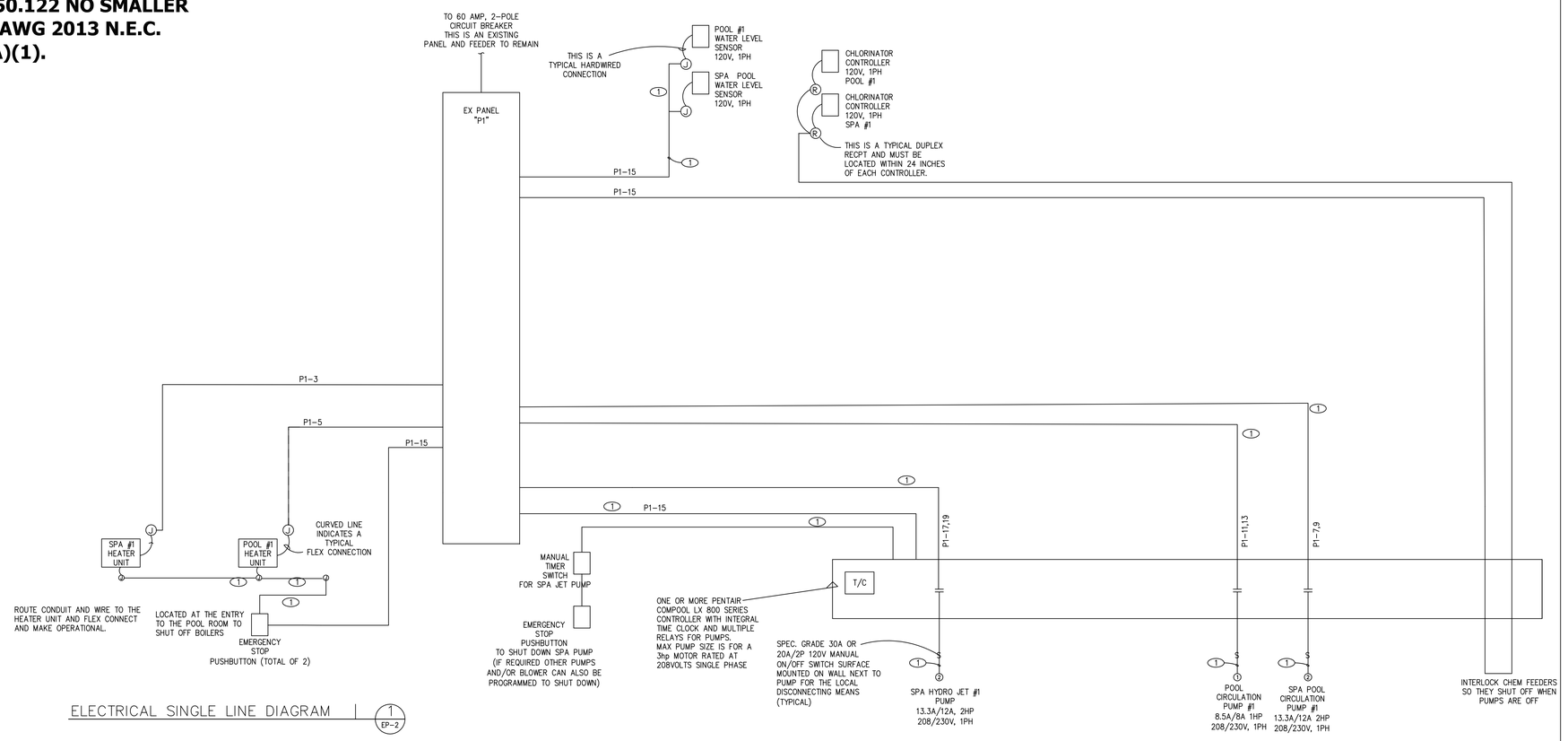
PHASE TOTALS: PH A: 6100 PH B: 5900
TOTAL CONNECTED VA: 12000
PANEL CONNECTED KVA: 12.0
PANEL DEMAND KVA: 12.2
PANEL DEMAND AMPS: 50.7
Type:

PANEL EX "P1" LOAD CALCULATION

LIGHTING	700	VOLTAMPS x	1.25	= 875	VOLTAMPS
RECEPTACLES - 1ST 10KVA	400	VOLTAMPS x	1.00	= 400	VOLTAMPS
RECEPTACLES - BALANCE	0	VOLTAMPS x	0.50	= 0	VOLTAMPS
LARGEST MOTOR LOAD	0	VOLTAMPS x	1.25	= 0	VOLTAMPS
BALANCE OF MOTOR LOADS	10,100	VOLTAMPS x	1.00	= 10,100	VOLTAMPS
KITCHEN EQUIPMENT	0	VOLTAMPS x	0.65	= 0	VOLTAMPS
ELECTRIC HEATING EQUIPMENT	800	VOLTAMPS x	1.00	= 800	VOLTAMPS
MISC LOADS	0	VOLTAMPS x	1.00	= 0	VOLTAMPS

TOTAL CALCULATED DEMAND LOAD = 12,175 VOLTAMPS
50.7 FULL LOAD AMPS

NOTES PER BLDG DEPT
i) WIRING CONFORMS TO THE UNIFORM CODE AND ISSUED BY THE NEW YORK BOARD OF FIRE UNDERWRITERS OR EQUIVALENT CERTIFYING AGENCY.
ii) NO OVERHEAD ELECTRICAL WITHIN 20 FEET HORIZONTALLY OF THE POOL
iii) GROUND FAULT CIRCUIT INTERRUPTERS PROVIDED
iv) THERE SHALL BE AN ELECTRICAL INTERLOCK BETWEEN THE RE-CIRCULATION PUMP AND CHEMICAL FEEDERS
v) FUEL BURNING HEATING EQUIPMENT INSTALLED AND VENTED TO OUTDOORS IN ACCORDANCE WITH THE UNIFORM CODE



ELECTRICAL SINGLE LINE DIAGRAM | 1 EP-2

SHEET INDEX

CONDUIT & WIRE SCHEDULE

CONDUIT RUN	CONDUIT QTY	CONDUIT SIZE	CONDUCTORS IN E.A. CONDUIT QTY	CONDUCTORS IN E.A. CONDUIT SIZE	CONDUCTORS IN E.A. CONDUIT GROUND	COMMENTS
(1)	1	1/2"	2	#12 AWG	#12 AWG	-
(2)	1	1/2"	2	#10 AWG	#10 AWG	-

CPS
2801 Youngfield St.
Ste. 260 Golden, CO
Office: 303-420-7321 Fax: 303-420-7207

APSP
The Association of Pool & Spa Professionals

TORIAN PLUM
POOL AND SPAS
1855 SKI TIME SQUARE DR
STEAMBOAT SPRINGS, CO 80487

Seal
COLORADO REGISTERED PROFESSIONAL ENGINEER
9-7-2018

Drawn By	Reviewed By	Review Date
AR		

No.	Revision/Issue	Date

Project No.

Drawing Title
ELECTRICAL SPECIFICATIONS AND POWER ONE LINE DIAGRAM FOR PANEL "P1"

Date

Sheet No.
EP-1 OF 3