Installation Instructions and Considerations

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Electair Exports Ltd.

Swimming pool electrical installations are covered by Part P and Amendment 3 of BS7671. Not suitable for DIY - but the pool engineer's input to your electrician is important as often electricians have not encountered this type of installation before.

Selection	Considerations	
Mains Supply & Type	It is important to be able to totally isolate the pool area. The total load of the pool area is often quite high and sustained the supply cable to the plant room is often a large SWA so the Switchgear must be suitable. We recommend fitting a timed delay RCD at the supply end and suitable MCB usually Type C to cover starting currents. But the fault clearance times must comply with BS7671. The supply characteristic must be known (ie: TNS/ TNCS /PME). If TT (earthed via earth stake) the earth loop impedance for TT should be below 100 ohms. **New** If it is PME there must still be an earth stake of 20 ohms or less (now required by 18th edition of BS7671). Voltage and fault current potential and ZE figures are important.	**Before you start it is important to find the maximum total load if single or 3 phase and any future possible Loads in the house and pool area.** Note a 100 or 300 mA RCD that is not time delayed will not give discrimination as the initial fault current can very high.
Single or 3 Phase	The equipment selected by the pool builder will dictate what voltage the electrical load is required but most domestic pool equipment is single phase. Where 3 phase is available often single phase equipment is spread over designated phases to give the property as close as possible total balanced load. But sometimes the house may be on one phase and Pool area on the other two.	
Sub Mains to Plant Room & Size	**Do not make the expensive mistake of under sizing this cable.**	An undersized cable costs the end customer for ever, eg: a 12 KW resistance heater on seven hours

	Be very careful not to damage the outer sheath as a small nick when undergound allows water penetration that can rust through the SWA sheath in a very short time and lose the continuity if you are using this sheath as the earthing conductor Always repair any minor damage to SWA sheaths. a day with electricity at 14p per unit with a cable that gives a 12 volt drop would lose 600 watt per hour into the ground. That equates to 4 KW per day or 60p per day for nothing.
Energy Saving Switching	In the future many types of equipment will require an internet connection. When installing the mains service, include two LAN cables and possibly a CCTV cable to monitor children and security, one for direct connection. Expensive to install later
WiFi/LAN	The LAN Cat 6 cables are for future connection of web-controlled equipment and the router for local WiFi. (WiFi down the garden does not work reliably). The second Cat 6 is provision for low voltage remote switching of equipment (ie: lights or heating). By being able to switch off the pool heating without having to go down the garden and switch it back on again will be the biggest energy saver you ever invest in.
Wi Fi Face Time	Using Wi Fi communications with a camera can drastically reduce the service costs as a junior engineer can be helped by a senior engineer without extra visits but it must work inside the plant room. Often the plant room is a sort of Fariday cage and radio signals can be very difficult so in room WiFi is important.
Single or 3 Phase	This needs to be a joint decision between the pool contractor and the electrician but is often dictated by what is available.
Total Loadings	The total loading of the pool equipment is important in most houses as they have a limited supply and often an indoor pool/spa exceeds the existing supply cable to the property. It is important not to overlook the existing house load
Pool Load	Totalise the pool load.
Totalise the House	Load and apply a diversity factor.

Diversity Factor	**Often the fact of having a pool changes how the occupants live their life style, for example they fill the dish washer, washing machine and dryer the. decide to use the leisure room.** **When you take the cover off the pool, on comes the de-humidification. Turn on the sauna or spa, the pool water temperature will start to drop so, after, say 20 minutes, the heating will come on, all lighting will be on and any features will be in use (ie: swim jets or bubblers).** **In real life there is no diversity factor in the swimming pool area the as recovery time on pool heating and de-humidification will exceed an hour, but the features are very variable and some have high starting currents. Each installation needs to be looked at on an individual basis.** **A swimming pool/spa area load calculator is at the top of Electair home page www. Coming soon.**
Load Shedding	**This sometimes has to be done when total supply is limited if the heating is a resistance heater, heat pump or there is a spa or a swim jet endless pool, fastlane, steam or sauna. These systems time delay the re-start of the heating until the load reduces or after a time delay, this is often a much lower cost than a larger supply or house service cable. These load shed systems have to be designed for each installation.**
Other Services **IMPORTANT parallel earths.**	**There may be a gas, oil boiler, mains water, domestic house hot water boiler to AHU equipment and home automation. telecoms cable sheaths all can create parallel earths.** **Be very careful as a data cable sheath can become a main earthing conductor and fail structural steel and AHU ducts and telcoms. Be careful. If the area is going to be TT, any of these services can give a parallel earth and convert your installation back to PME.**
Metal or Plastic Enclosure	**Amendment 3 made consumer units and control panels metal inside a dwelling compulsory.** **Swimming pool control panels have the same electrical components plus a lot more and are often higher loaded than consumer units. Therefore, swimming pool control panels inside a dwelling must be of metal construction or fire withstanding material.** **Electair metal enclosures have log burner continuous rated 6mm thick glass view panels so the end user can see controls inside a fireproof material enclosure.** **Plastic enclosures can be used in outbuildings, but it is the installer's responsibility to judge if there is any risk of fire spread to any other property.** **If there is a bed/sleeping position in the outbuilding, the electrical equipment must be in metal enclosure.**

Electrical Control Panel Position	**It is very important that the swimming pool control panel has <u>unobstructed access</u> and can have settings changed without the use of steps.**
Accessibility & Mounting	**Electrical control panels have moving parts inside that are designed to be secured to a vertical wall.** **If laid on its back, the ratings are reduced by 80%.** **Do not put pipes across the door access.** **Dependant on selected enclosure, some hinge on left and some right. There needs to be a gap between the side of the panel and adjacent wall or equipment to allow the door to open (see drawings).**

Possible Loads

1 or More Filtration Pumps	**The filtration pump may be continuously on or time switched or auto restart from remote control or frost thermostat.** **Isolate and lock off the supply before maintenance.**
Heating	**This has to be interlocked with the circulation pumps. It may be a domestic gas boiler with heat exchanger, a dedicated pool boiler (gas or oil), an air source or ground source heat pump, solar PV boosted or biomass electric resistance heater.** **All of these systems require different supplies and interlock methods and are heavy load.**
Chemical Systems	**These again have to be interlocked inside the control panel, but some makes of chemical control require continuous and interlocked electrical connections.**
PH/Chlorine UV	**This covers PH/chlorine/UV/ozone/flock dosing/ ioniser/shock dosing systems.**
De Chlorination	**This is becoming an increasing demand by local authorities where backwash water is held in a tank until de chlorinated.**
Auto Pool Cleaner	**These have been around for many years and some are water pump driven. Depending on the make, they require different interlocking.** **Others are electrically powered connected to a local RCD protected socket.**
Pool Lights	**These are well established and built to a standard remote switching and is often requested.** **Think about where you want this switch.** **You may want it in the house, so a switching cable will be required. LED and 12VAC 300 watt units are available.**

Surround Lights	**Here there can be a serious problem. Often lights selected are designed for dry locations and power supplies are not suitable for pool areas - be careful.**
Emergency Light	**We recommend on all indoor pools and also recommend on outdoor pools that are used at night have an emergency light with battery backup.**
Underwater Audio	**Ensure that isolation transformers conform to required standard. Do not just connect to back of audio amp.**
Auto Drive Covers	**There are many different units, some with high starting currents. On indoor pools often the cover closing will automatically reduce the air heat setting.**
Rain Pumps	**On outside pools, ensure that they are connected via an RCD and tested.**
Plant Room Light	**This must be an enclosed fitting with a guarded cover to reduce the risk of pool cleaning tools (ie pole that can touch light fittings and cause damage).**
Service Socket	**This must be RCD protected.**
Frost Protection	**This can be a domestic boiler thermostat in an enclosure. We recommend digital as they use less energy by being far more accurate. Always install the sensor out of direct sunlight and keep all sensor cables away from power cables.**
Swim Jet	**These have very high starting currents and must have a lockable isolator in the plant room that cuts all poles and an IP65 rated isolator in the pump pit. IE regulations recommends a low voltage sensor and auto switch off if the cover is opened.**
Endless Pool	**These again have a heavy load and can be used to load shed other equipment.**
Feature Pumps	**These could be anything. Give this consideration and where you are going to want it switched.**

The reason is the installation will be protected by an RCD. If it trips, the area will go into darkness and if there are non swimmers in the pool, they could panic not knowing the way out.

Air Compressor	**Usually in plant rooms. Sometimes used to aid backwashing and control of valves.**
De Humidification	**If wall mounted over pool, must have lockable isolator switching all poles including control of boiler.**
Total AHU Systems	**These can be single phase or 3 phase, depending on type.** **Isolation problems for servicing as there is the power supply and other circuits (ie: heat demand pump re start and cover link for set back, there are three or four circuits inside the control box that must be isolatable. Live and switch wire as a back feed can come from other controls.**

Package Spas

Built in Spa	**Check pump size or load for each of these:**
Jet Pump 1	**Amps per phase.**
Jet Pump 2	**Amps per phase.**
Jet Pump 3	**Amps per phase.**
Floor Air Blower	**Amps per phase.**
Jet Boost Air Blower	**Amps per phase.**
Method of Switching & Flush	**All spas must auto flush to reduce the risk of Legionella.**
1 or 2 Balance Tanks	**If a level deck pool or spa there will be a balance tank. This may have up to four level sensors fitted.**
Backwash Hold Tank	**May require level switches and drainage pump.**
Auto Backwash	**May be electric mains voltage or low voltage or compressed air actuated.**
Jandy Valves	**These are usually 24VAC and change circulation for spa heating/water features and solar.**

Besco Valves	**Either water powered or compressed air.**
Changing Room Lights	**Must be suitable for high humidity situations and cord switched or low volt switched.**
Store Lights	**Always use an enclosed light fitting and exterior type switch.**
Garden Lights	**Recommend low voltage with suitable power supplies transformers in plant room lights with inbuilt transformers are mains voltage and must not be close to pool.**
Sauna	**Another high load item that will probably be on at the same time as other pool loads.**
Steam	**Another high load item that will probably be on at the same time as other pool loads.**
Other Loads	**Swimming pools are usually down the garden so the supply may also feed a store/stable or garage with car charger in the future. Now, with electric cars, consider the total load. It can be very high for a short time buy long enough to have no acceptable diversity factor.**

New Considerations Part of 18 Edition of BS7671 and Signatures Required or Panel Builder Should Include as Standard (some are expensive)

The site designer or installing contractor must sign that there is no fire spread risk to any dwellings if a plastic enclosure is going to be used for garden pool with shed type plant room otherwise the control panel must be metal.

No petrol driven machines or petrol should be stored in a garden plant room as there are natural sparks when pump contactors operate properly, also remember when doing a fire risk assessment that some pool chemicals are oxidising agents that will make any fire more intense.

The site designer or installing contractor must sign that surge protection is not required. The new regulations recommend that if there is high value equipment in the building then it should be installed.

Control panels for pool equipment should have Type 3 surge protection. However, for this to work there has to be a Type 1 or 2 within 10 meters in the supply (Type 1 if an overhead supply).

The site designer or installing contractor must sign that arc fault protection is not required. With garden plant rooms, we doubt if it is needed, but in a main house the E & M architect may say it has to be included.

The site designer or installing contractor must sign for what type of RCD protection is required. If the person ordering does not give full details of load, the panel supplier will have to include type B RCDs. These are very expensive!

New energy saving equipment has harmonics and EMC protection equipment in it that has AC leakage to earth together with a DC ripple back up the mains. This can block or slow down the tripping of standard RCDs that could affect safety.

There are five main types of RCD:	**Type AC**	**As used in most consumer units.**
	Type A	**This will work with AC ripple and DC ripple leakage up to 6mA.**
	Type F	**These will work up to 10mA interference.**
	Type B	**These are good for up to 30% of trip rating but will work with Pure DC back feed.**
	Type S	**Are time delayed for supply end.**

All 3 phase combined systems will require Type B protection.
Do not get confused between Type B & C of MCB's and Type B RCD's as they are totally different. There are MCBO's with Type A characteristics for the RCD section and Type B & C for the overload part .

The problem is that swimming pool systems now have speed controlled filter pumps; inverter heat pumps - salt generators - LED lights - chemical controllers speed controlled AHU equipment & in indoor pools PLC controls all of these pieces of equipment are causing the problem. (Even your office and home pc has 1.5 ma leakage, a printer 1.5mA, screen 1.5mA so a small office could be way over the 6mA.)

It is important that the pool supply house end must not go through the house consumer unit. It must have a separate RCD and MCB.

If you change a pump or fit an inverter heat pump, you need to consider the supply RCDs as to whether it will affect the safety.

Control Component Functions

Supply Switch Fuse/RCD	**To protect the supply cable to pool/spa control panel.**

Control Panel RCD	**To reduce the risk of electrocution if you touch anything live and get a shock, providing you are not also touching the neutral or second phase. It will probably save your life as it is designed to switch off quickly.** (It does not stop you getting a shock.)
Control Panel MCBs	**These are short circuit and overload protection. There are designated maximum tripping times.**
Control Panel Time Switches	**These are for energy management and sometimes to switch pool loads off at house peak load times.**
Control Panel Thermostats	**These are for temperature control, pool water, air temperature, frost protection and safety high temperature shut down.**
Motor Contactors	**To provide load break of all poles.**
Motor Overloads	**To reduce the risk of fire, by switching off on a closely settable figure also protects against overload caused by debris in pump or a seized bearing or winding failure.**
Other Relays	**To provide interface switching.**
Crouzet Controllers	**To provide sequence control and timing, pump protection and level control.**
Extra LV Power Supplies	**To provide a safe control voltage in wet areas.**
Rail Fuses	**To protect low voltage system (fast acting}.**
Load Meters	**For engineer and client information.**
Earthing Bonding & Earth Stake	**This is a dual function; to provide earth connection for TT systems if PME in order to reduce the difference in real ground and the network earth potential that may be raised by volts drop/resistance in the neutral/earth conductors.**
Installation Testing	**It is extremely important that polarity and earthing connection tests are carried out <u>before the supply is made live.</u> The true earth electrode resistance must be tested and recorded <u>without watering the soil</u>. Ze and Zs- insulation -polarity -R1 R2 must be tested and, using a clamp meter, check the running load of all equipment. We always carry out an earth loop test from every piece of equipment.**
Regular Service Testing	**The RCD must have the test button pressed every three months (this does not test the earthing network, it makes sure it stays free and works).**

Maintenance	**Regular visual inspection is very important. The most common problem is rodent damage.**
Further Information	**How to set time switches, both analogue and digital – this will be available on our Customer Help web page by end of 2018.** **How to adjust thermostats – customer level.** **How to set thermostats – engineer level.** **How to adjust motor overloads –** **High limit thermostats are designed to be noticed that they are about to fault by stopping spa functions and on start up or power failure, will take several minutes to re-set.**

Further Information

Technical Connections	**Always printed and stuck inside the panel.**
RCD Tests	**Manufacturing data tests are always recorded inside the enclosure.**
After Sales Service	**Please photograph the front of the panel and email it to us at roger@electair.co.uk to help us identify your unit (some can be over 30 years old).**