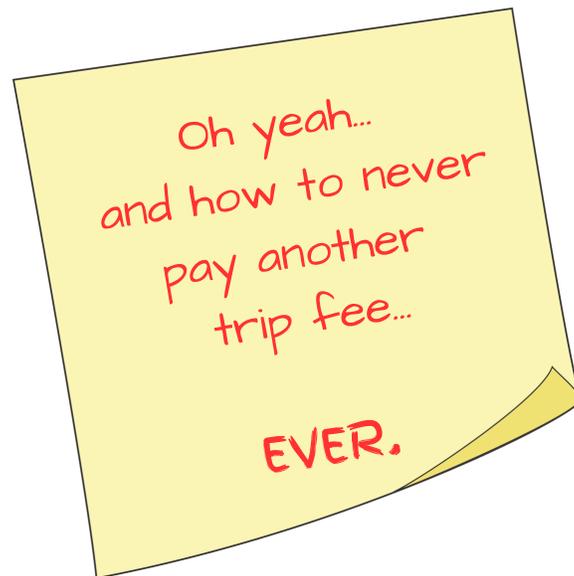

THE ULTIMATE BUILDER'S GUIDE TO POOL WIRING

HOW TO PLAN WELL, AVOID THE UNEXPECTED, AND LOOK
LIKE A TOTAL ROCKSTAR TO YOUR POOL CLIENTS



Safewater  Electric
Aquatic-Electric Solutions

INTRO

WHY TAKE THE TIME TO READ THIS BINDER

We understand...

your schedules are packed. You're often putting out fires instead of managing projects. And with ever-changing code updates and inspectors' shifting expectations, it's tough to know exactly what "ready" looks like. Nothing is more embarrassing than having to tell the customer that their project is running behind schedule because of an inspector hit you for code violations. *(It's even worse when the inspector tells the homeowner this...)*

The Solution: Help us help you

With well over 2,000 pools under our belt, we've learned a thing or two over the last 15 years. We've worked closely with inspectors and municipalities to make sure that we're not winging it. Everything we do is based on National Electric Code standards—the minimum for safety and quality. This binder contains all the hard-won lessons we've learned, distilled down to an easy to follow guide so you can have *everything* you need to ensure a job is truly "ready" when you call us in.

Think of this guide as your insurance against unnecessary costs. When the site is prepped as outlined here, we can get straight to work—efficiently, safely, and without interruption. No surprises. No extra charges. Just a smooth process that keeps your clients happy and your reputation with them rock-solid.

Follow it, and you'll **never pay another trip fee again!**

BONDING

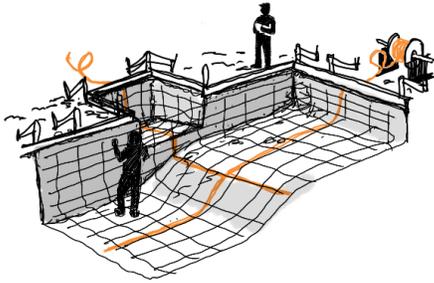


EQUIPOTENTIAL BONDING PREPARATION



BE READY!

BONDING IS **THE MOST IMPORTANT** ELECTRICAL SAFETY SYSTEM FOR YOUR POOL. IN ORDER FOR IT TO BE INSTALLED PROPERLY, THE SITE MUST BE READY. IMPROPER SITE PREPARATION MAY RESULT IN RETURN TRIPS, FAILED INSPECTIONS, AND ADDITIONAL FEES. *IT IS YOUR RESPONSIBILITY TO ENSURE THAT THE SITE IS READY FOR BONDING.*

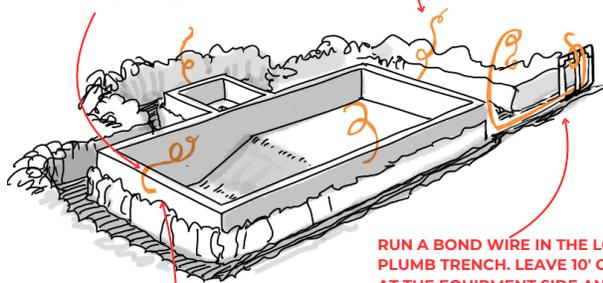


STEEL CAGE BOND: "INITIAL"

MAKE SURE THE REBAR CAGE IS COMPLETED PRIOR TO OUR ARRIVAL.

SENDING PICTURES OF THE COMPLETED STEEL THE DAY BEFORE OUR SCHEDULED ARRIVAL PREVENTS WASTED TIME AND FEES.

PROTECT THE BOND WIRE TAILS! IF THESE ARE DAMAGED OR CUT, YOU MAY BE REQUIRED TO CHIP OUT THE CONCRETE TO TIE NEW ONES IN.



RUN A BOND WIRE IN THE LONG PLUMB TRENCH. LEAVE 10' OUT AT THE EQUIPMENT SIDE AND 6' BESIDE THE SHELL.

LONG PLUMB: PUT THE WIRE IN!

WHEN THE LONG PLUMB TRENCH IS OPEN, LAY IN A BOND WIRE FROM THE SHELL TO THE EQUIPMENT LOCATION.

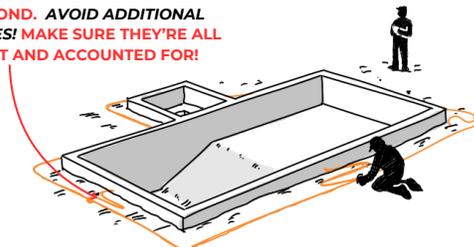
THIS IS THE IDEAL TIME TO PUT THIS WIRE IN, AS THE TRENCH IS ALREADY OPEN AND NO ADDITIONAL DIGGING IS REQUIRED.

IF THE WIRE IS NOT INSTALLED, YOU WILL BE REQUIRED TO EITHER:

- SEND A WORKER OUT TO DIG IT IN FOR US
- PAY OUR HOURLY CREW FEE FOR US TO DIG IT IN.

THIS WIRE **MUST** BE PROTECTED AND RUN ALL THE WAY BACK TO THE EQUIPMENT.

ALL TAILS MUST BE OBVIOUS AND ACCESSIBLE WHEN WE INSTALL THE DECK BOND. AVOID ADDITIONAL CHARGES! MAKE SURE THEY'RE ALL PRESENT AND ACCOUNTED FOR!



DECK BONDING: "360 BOND"

THE DECKING SURFACE MUST BE LEVEL AND COMPACTED PRIOR TO INSTALLING THE DECK BOND.

IT MUST BE 4-6" BELOW THE BOTTOM OF THE FINISHED DECKING OR TILE.

IF IT WILL BE A POURED CONCRETE DECK, BONDING MUST BE INSTALLED AFTER THE REBAR OR WIRE GRID IS INSTALLED.



IF THE BONDING TAILS ARE MISSING, DAMAGED, OR OTHERWISE COMPROMISED, ADDITIONAL COSTS MAY BE REQUIRED TO MAKE THE CORRECTIONS. **HELP US HELP YOU** BY PROTECTING THE WIRES AND ENSURING THAT THE JOBSITE IS READY PRIOR TO OUR ARRIVAL.



EQUIPOTENTIAL BONDING DETAILS

“INITIAL” BONDING



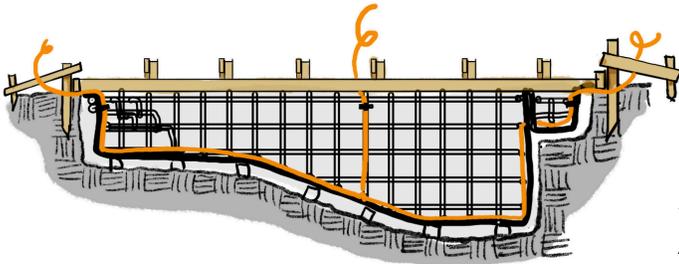
BE READY!

BONDING IS **THE MOST IMPORTANT** ELECTRICAL SAFETY SYSTEM FOR YOUR POOL. IN ORDER FOR IT TO BE INSTALLED PROPERLY, THE SITE MUST BE READY. IMPROPER SITE PREPARATION MAY RESULT IN RETURN TRIPS, FAILED INSPECTIONS, AND ADDITIONAL FEES. *IT IS YOUR RESPONSIBILITY TO ENSURE THAT THE SITE IS READY FOR BONDING.*

STEEL CAGE BOND: “INITIAL”

HOW TO BE READY FOR OUR ARRIVAL:

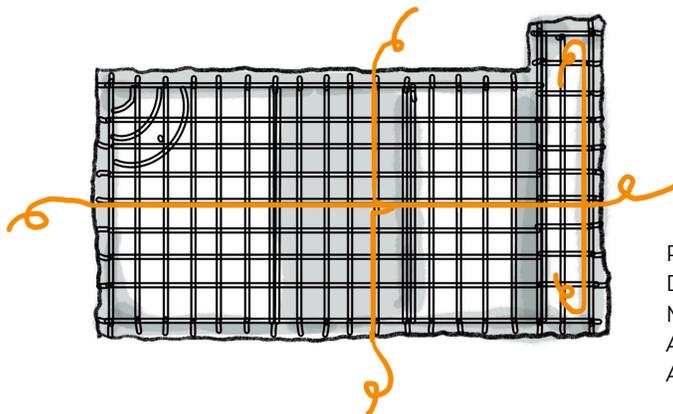
- MAKE SURE THE STEEL IS COMPLETED
- MAKE SURE THE SITE IS ACCESSIBLE
- **SEND PICTURES**



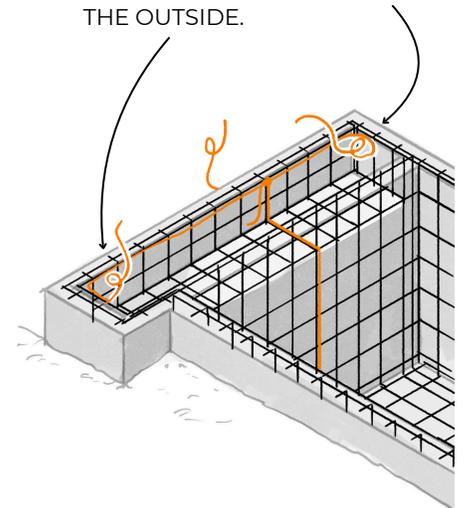
WE TAKE PHOTOS OF ALL BOND INSTALLS FOR OUR LIABILITY AND PROTECTION. THIS HAS SAVED US MULTIPLE TIMES WITH INSPECTORS.

AUTO COVER TAILS

THE TWO BOND TAILS AT EITHER END OF THE AUTO COVER TROUGH MUST REMAIN EXPOSED **INSIDE THE VAULT**. DO NOT DRAPE THEM OVER TO THE OUTSIDE.



PROTECT THESE TAILS DURING GUNITE. THEY MUST BE OBVIOUS AND ACCESSIBLE AFTER THE SHOOT.



TIMING:

- WHEN YOU BEGIN THE DIG, **CONTACT THE SAFEWATER SCHEDULER OR PM.** WE WILL PENCIL IN THE PROJECTED COMPLETION DATE.
- WHEN THE REBAR IS COMPLETE (OR NEARLY FINISHED) **SEND PHOTOS.** WE WILL LOCK IN THE BONDING TIME. IF YOU DON'T THINK IT'LL BE READY, BE SAFE AND PUSH THE DATE. WE CAN BE FLEXIBLE AS LONG AS WE KNOW AHEAD OF TIME.
- **IF YOU DON'T / CAN'T SEND PICTURES, WE WILL STILL KEEP THE DATE, BUT AT YOUR RISK.** IF WE ARRIVE AND THE STEEL IS NOT COMPLETED, **WE WILL CHARGE A TRIP FEE.**



WORK CANNOT BE DONE OUT OF SEQUENCE. PLAN AHEAD AND MAKE SURE THE SITE IS READY.

FOR SAFETY AND LIABILITY REASONS, NO ONE MAY INSTALL OR MODIFY THE BONDING WIRE OTHER THAN SAFEWATER TECHNICIANS, REGARDLESS OF “QUALIFICATIONS.”

THE STEEL CAGE BOND MUST BE INSPECTED BY THE MUNICIPALITY PRIOR TO GUNITE SHOOT. IF GUNITE IS APPLIED PRIOR TO INSPECTION, THE MUNICIPALITY MAY ENFORCE STRICT PENALTIES. IF YOU INSIST ON MOVING FORWARD AND THERE HASN'T BEEN AN INSPECTION, **SHOOT AT YOUR OWN RISK**



EQUIPOTENTIAL BONDING DETAILS

LONG PLUMB WIRE



SPECIAL EXCEPTION:

BOND WIRE IS USELESS IF IT'S NOT CONNECTED TO THE EQUIPMENT. THE SAFEST, EASIEST, MOST EFFICIENT WAY TO GET IT THERE IS TO RUN IT IN THE LONG PLUMB TRENCH. THIS PREVENTS DOUBLE WORK AND INSURES THE WIRE IS BURIED AT A SAFE DEPTH.

BECAUSE OF TIMING, CONVENIENCE, AND SAVINGS, RUNNING A WIRE IN THE LONG PLUMB TRENCH IS THE **ONLY** PORTION OF THE BONDING THAT CAN BE PERFORMED BY OTHERS. **NO CONNECTIONS ARE TO BE MADE.** THE ONLY THING WE NEED IS FOR A WIRE TO BE PLACED IN THE LONG PLUMB TRENCH WITH THE PIPES. THIS SAVES US FROM HAVING TO CHARGE YOU FOR DIGGING AND PROTECTS THE BOND WIRE MUCH BETTER THAN IT OTHERWISE WOULD BE.

LONG PLUMB RUN

HOW TO INSTALL THE BOND WIRE IN THE LONG PLUMB TRENCH:

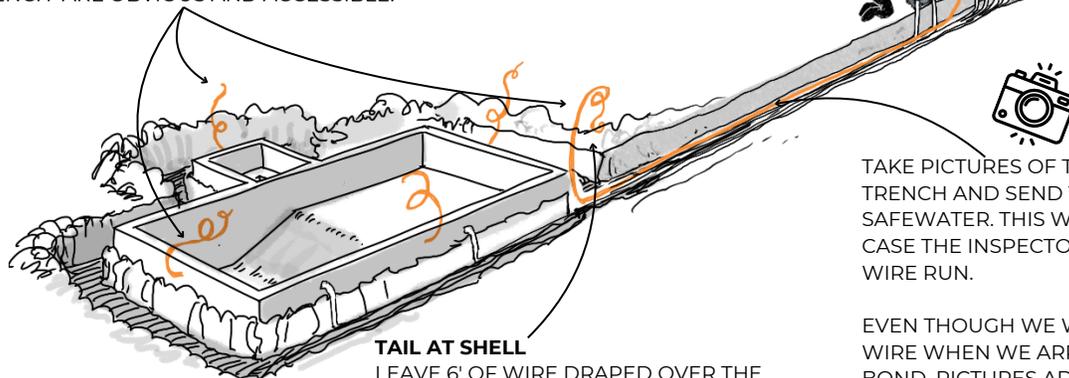
- AFTER PLUMBING HAS BEEN INSTALLED, RUN ONE CONTINUOUS PIECE OF #8 COPPER WIRE FROM THE POOL SHELL TO THE EQUIPMENT LOCATION. (**RUNNING THIS LAST PREVENTS IT FROM GETTING DAMAGED DURING PLUMBING**)
- LEAVE 6' OF WIRE AT THE POOL SHELL. DRAPE IT OVER THE SHELL SO THAT IT DOESN'T GET DAMAGED OR BURIED.
- COIL 10' OF WIRE AT THE EQUIPMENT LOCATION. WE WILL USE THIS TO BOND THE EQUIPMENT.
- **DO NOT MAKE ANY CONNECTIONS.** JUST RUN THE WIRE.
- **TAKE AND SEND PICTURES**

EQUIPMENT TAIL

LEAVE 10' OF WIRE COILED UP AT THE EQUIPMENT LOCATION.

PROTECT THESE WIRES!!

MAKE SURE **ALL** BOND TAILS COMING FROM THE SHELL AND LONG PLUMB TRENCH ARE OBVIOUS AND ACCESSIBLE!



TAIL AT SHELL

LEAVE 6' OF WIRE DRAPED OVER THE POOL SHELL FOR SAFEWATER TO TIE INTO WITH THE DECK BONDING.

TAKE PICTURES OF THE WIRE IN THE TRENCH AND SEND THEM TO SAFEWATER. THIS WILL PROTECT US IN CASE THE INSPECTOR WISHES TO SEE THE WIRE RUN.

EVEN THOUGH WE WILL BE TESTING THIS WIRE WHEN WE ARRIVE FOR THE DECK BOND, PICTURES ADD AN EXTRA LAYER OF LIABILITY PROTECTION.

WHO WILL PROVIDE BONDING WIRE?

BECAUSE WE INCLUDE THE FULL LENGTH OF THE WIRE FROM THE POOL TO THE EQUIPMENT IN OUR PRICE FOR BONDING, SAFEWATER WILL PROVIDE ROLLS OF #8 COPPER TO BE INSTALLED IN THE LONG PLUMB TRENCH.

ALTERNATIVELY:

WE WILL REDUCE THE PRICE OF OUR BONDING BY \$50 PER POOL IF YOU SUPPLY THIS WIRE. (MUST BE **SOLID #8 COPPER**)

HELP US HELP YOU!

IF A BOND WIRE IS NOT PUT INTO THE LONG-PLUMB TRENCH, OR THE CONTINUITY TEST SHOWS THAT IT IS DAMAGED OR BROKEN, A NEW BOND WIRE MUST BE RUN. HERE ARE THE TWO SOLUTIONS:

- YOU SEND A LABORER OUT TO DIG IT IN (18" DEPTH, OR TO PLUMBING PIPES, WHICHEVER IS SHALLOWER) **OR**
- WE WILL CHARGE YOU A DIG FEE AT OUR STANDARD CREW LABOR RATE OF \$250/HR TO DIG IT IN.



EQUIPOTENTIAL BONDING DETAILS

DECK BONDING



BE READY!

BONDING IS **THE MOST IMPORTANT** ELECTRICAL SAFETY SYSTEM FOR YOUR POOL. IN ORDER FOR IT TO BE INSTALLED PROPERLY, THE SITE MUST BE READY. IMPROPER SITE PREPARATION MAY RESULT IN RETURN TRIPS, FAILED INSPECTIONS, AND ADDITIONAL FEES. *IT IS YOUR RESPONSIBILITY TO ENSURE THAT THE SITE IS READY FOR BONDING.*

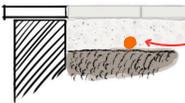
DECK BONDING: "360"

HOW TO BE READY FOR OUR ARRIVAL:

- MAKE SURE THE PERIMETER SURFACE IS PROPERLY PREPARED. (SEE DIAGRAM FOR DIFFERENT TYPES OF DECKING SURFACE)
- MAKE SURE ALL BOND TAILS ARE OBVIOUS AND ACCESSIBLE.
- MAKE SURE THE BOND WIRE HAS BEEN PROPERLY BURIED IN THE LONG PLUMB TRENCH.
- **SEND PICTURES**

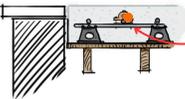


POSSIBLE DECKING SURFACES



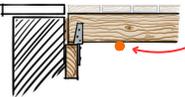
TILE, STONE, OR PAVERS

MAKE SURE THE GROUND AROUND THE POOL IS LEVEL AND COMPACTED AND MUST BE WITHIN 4-6" OF THE **BOTTOM** OF THE DECKING MATERIAL.



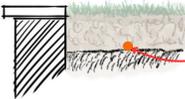
POURED CONCRETE DECKING

MAKE SURE THE WIRE MESH OR REBAR IS IN PLACE. WE WILL TIE THIS TO OUR BOND WIRE. THE BOND WIRE WILL LIVE **IN** THE POURED CONCRETE.



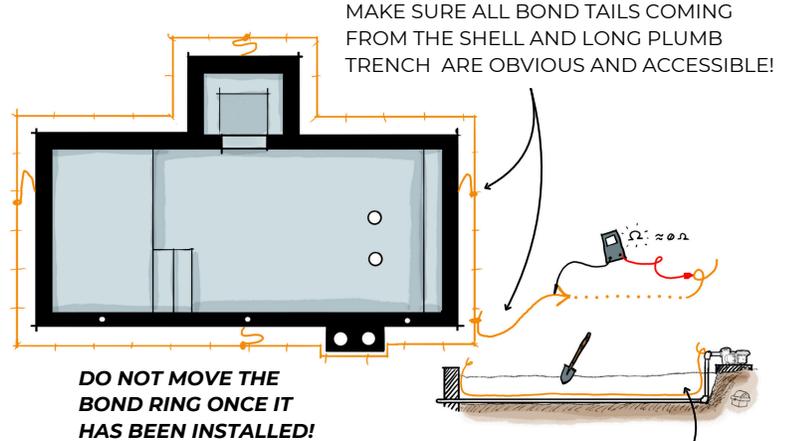
WOODEN DECKING

PER AN AMENDMENT TO THE CODE, THIS IS TECHNICALLY NOT CONSIDERED CONDUCTIVE AND DOES NOT REQUIRE BONDING. **HOWEVER**, MANY MUNICIPALITIES ARE REQUIRING THE WIRE BE STAPLED TO THE BOTTOM OF THE WOODEN DECK.



TURF OR GRASS

THE BOND WIRE MUST BE BURIED 4-6" UNDER FINISHED GRADE. MAKE SURE THE GROUND IS SMOOTH AND COMPACTED.



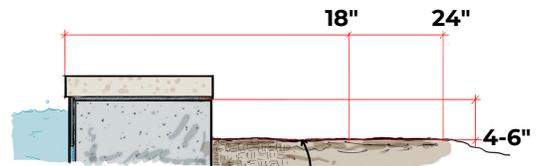
MAKE SURE ALL BOND TAILS COMING FROM THE SHELL AND LONG PLUMB TRENCH ARE OBVIOUS AND ACCESSIBLE!

DO NOT MOVE THE BOND RING ONCE IT HAS BEEN INSTALLED!

LONG PLUMB WIRE

WE WILL TEST THIS WIRE WHEN WE COME TO INSTALL THE 360 TO MAKE SURE IT IS CONTINUOUS. IF IT IS MISSING, DAMAGED, OR BROKEN, WE WILL DISCUSS OPTIONS AND COSTS OF CORRECTION.

THE MOST COMMON DECK PREP:



THE SUBGRADE **MUST** BE LEVEL, SMOOTH, AND COMPACTED 24" FROM WATER'S EDGE. WE **CANNOT/WILL NOT** INSTALL THE DECK BOND IF THE GRADE IS TOO ROUGH. **THIS IS A CODE REQUIREMENT AND NOT SAFEWATER BEING FINICKY.**



TIMING:

- ALERT THE SAFEWATER SCHEDULER OR PMs WHEN YOU HAVE A PROJECTED DATE. WE WILL PENCIL IN THE DATE AND HOLD IT FOR YOU.
- ONCE GRADING IS COMPLETE AND PREPPED, **SEND US PHOTOS**. WE WILL LOCK IN THE BONDING APPOINTMENT. IF YOU DON'T THINK IT'LL BE READY, BE SAFE AND PUSH THE DATE. WE CAN BE FLEXIBLE SO LONG AS WE KNOW AHEAD OF TIME.
- **IF YOU DON'T / CAN'T SEND PICTURES, WE WILL STILL KEEP THE DATE, BUT AT YOUR RISK.** IF WE ARRIVE AND THE DECK IS NOT READY, **WE WILL CHARGE A TRIP FEE.**



WORK CANNOT BE DONE OUT OF SEQUENCE. PLAN AHEAD AND MAKE SURE THE SITE IS READY.

FOR SAFETY AND LIABILITY REASONS, NO ONE MAY INSTALL OR MODIFY THE BONDING WIRE OTHER THAN SAFEWATER TECHNICIANS, REGARDLESS OF "QUALIFICATIONS."



EQUIPOTENTIAL BONDING DETAILS

DECK BONDING: POTENTIAL CODE UPDATE



UPDATE

POSSIBLE CHANGE COMING DOWN THE LINE

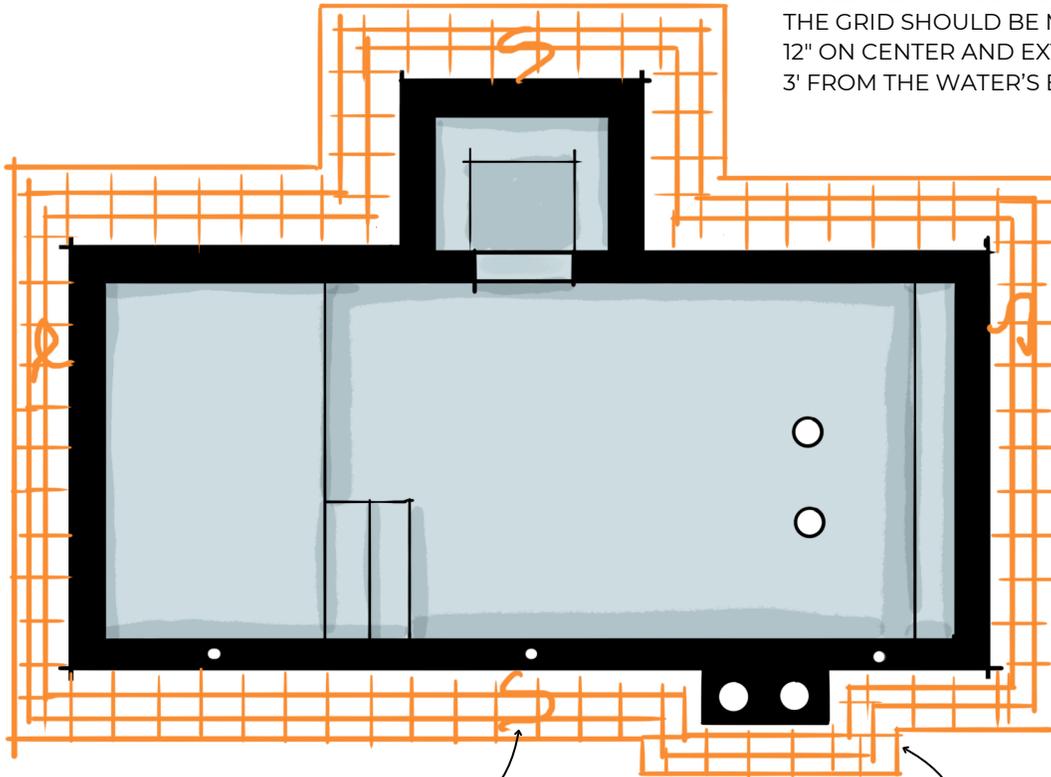
BECAUSE BONDING IS SO CRITICAL, EQUIPOTENTIAL BONDING CODES HAVE BEEN UNDER A HIGHER LEVEL OF SCRUTINY LATELY. RECENT TEST HAVE SHOWN THAT THE BONDING "RING" METHOD ALLOWED BY NEC 680.26 MAY NOT BE AN EFFECTIVE DECK BONDING MEANS AND MAY NOT BE PERMITTED IN THE FUTURE. IN ITS PLACE, WE HAVE SEEN THE PROPOSAL OF THE BONDING GRID.

DECK BONDING GRID

A MORE EFFECTIVE DECK BONDING METHOD

PER CODE, THE DECK BONDING SHOULD PROTECT A SURFACE AREA OF 3' FROM THE WATER'S EDGE. THE BONDING GRID ACCOMPLISHES THIS MORE EFFECTIVELY THAN THE BONDING RING.

THE BONDING GRID CAN BE EITHER COPPER OR GALVANIZED STEEL MESH. THE SPACING OF THE GRID SHOULD BE MINIMUM 12" ON CENTER AND EXTEND OUT 3' FROM THE WATER'S EGDE.



THE WIRES ATTACHED TO THE POOL SHELL STEEL MUST BE ATTACHED TO THE GRID AT 4 PLACES EQUALLY SPACED AROUND THE PERIMETER, JUST AS WITH THE RING.

GRID SECTIONS, IF NOT CONTINUOUS, MUST BE SPLICED TOGETHER WITH UL LISTED WIRE SPLICES.



IT IS UNCLEAR WEATHER OR NOT THIS NEW METHOD WILL SEE WIDE-SPREAD ADOPTION IN THE NEAR FUTURE. I WANT YOU TO BE AWARE THAT IT MAY SUDDENLY BECOME A REQUIREMENT. ACCORDING TO ALL I'VE READ AND STUDIED, IT **IS** A MORE EFFECTIVE BONDING MEANS. FROM A SAFETY STANDPOINT, I WOULD NOT BE OPPOSED TO IT.

IF MUNICIPALITIES OPT FOR THIS METHOD AND DISALLOW THE BONDING RING, PRICES FOR BONDING WILL NEED TO BE RENEGOTIATED, REGARDLESS OF THE SALE DATE OF THE POOL.



CHANGES TO NEC 680.26 : PERIMETER BONDING



HELPFUL CHANGES WE'RE PUSHING FOR MUNICIPALITIES TO ADOPT

A RECENT EMERGENCY AMENDMENT TO THE 2023 CODE FINALLY CLARIFIES SOME KEY DEFINITIONS REGARDING PERIMETER SURFACES AND HOW THESE SHOULD BE BONDED. THIS SHOULD MAKE OUR TASK OF BONDING ELEVATED POOLS MUCH MORE CLEAR AND EFFECTIVE. SAFEWATER IS PUSHING FOR THIS UPDATE TO BE ADOPTED BY ALL MUNICIPALITIES.

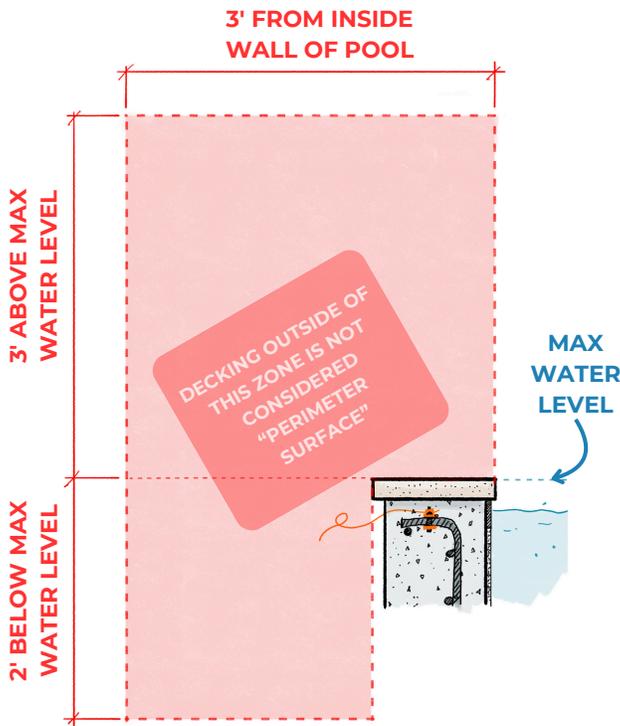
NFPA 70 - 2023 - TIA 23-9(SC 23-3-8 / TIA Log # 1687)



PERIMETER SURFACE DEFINITION

MODIFICATION OF 680.26 B(2)

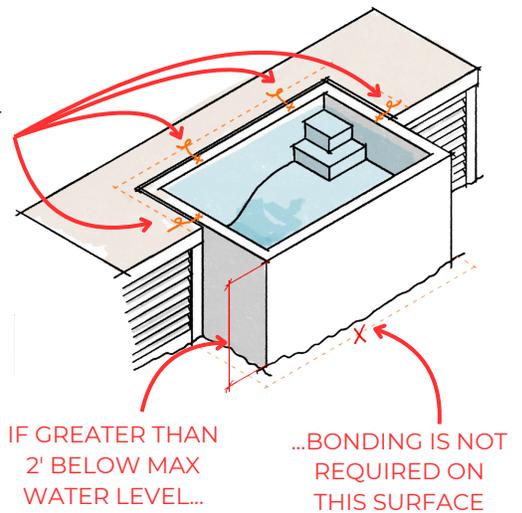
THE PERIMETER SURFACE TO BE BONDED SHALL BE CONSIDERED TO EXTEND FOR 3 FT HORIZONTALLY BEYOND THE INSIDE WALLS OF THE POOL WHILE ALSO AT A HEIGHT BETWEEN 3 FT ABOVE AND 2 FT BELOW THE MAXIMUM WATER LEVEL.



IF THE BONDED PERIMETER SURFACE DOES NOT SURROUND THE ENTIRE POOL:

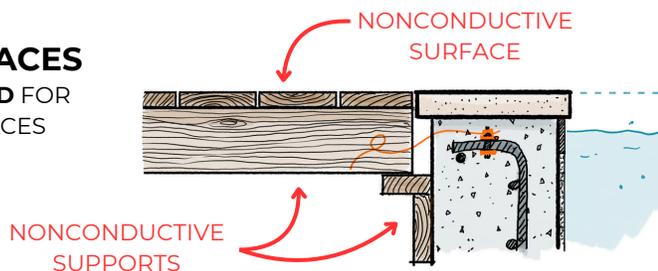
MODIFICATION OF 680.26 B(2)

IT SHALL BE ATTACHED TO THE POOL REINFORCING STEEL OR COPPER CONDUCTOR GRID AT A MINIMUM OF FOUR UNIFORMLY SPACED POINTS **ALONG THE BONDED PERIMETER SURFACE.**



NONCONDUCTIVE PERIMETER SURFACES

EQUIPOTENTIAL BONDING **SHALL NOT BE REQUIRED** FOR **NONCONDUCTIVE** PORTIONS OF PERIMETER SURFACES THAT ARE SEPARATED FROM EARTH OR RAISED ON NONCONDUCTING SUPPORTS...



INFORMATIONAL NOTE:

NONCONDUCTIVE MATERIALS INCLUDE, BUT ARE NOT LIMITED TO, **WOOD**, PLASTIC, WOOD-PLASTIC COMPOSITES, FIBERGLASS, AND FIBERGLASS COMPOSITES

PER THIS AMENDMENT, **WOOD DECKING IS NOT CONSIDERED CONDUCTIVE.**

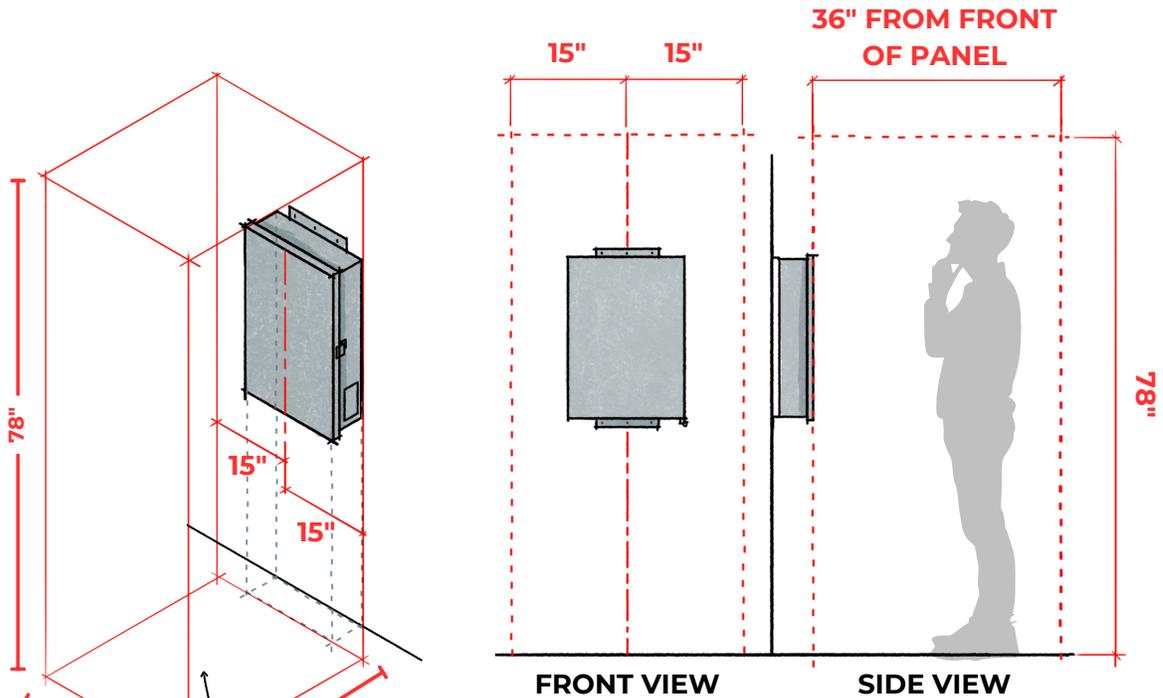
POWER REQUIREMENTS



ELECTRICAL BOX CLEARANCE REQUIREMENTS

NEC 110.26 WORKING SPACE

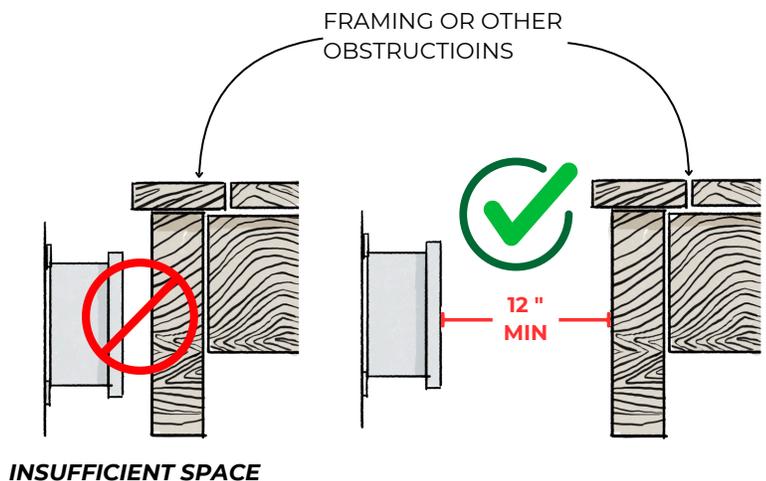
- *DEPTH OF WORKING SPACE:* A MINIMUM OF 36' IN FRONT OF THE EQUIPMENT
- *WIDTH OF WORKING SPACE:* THE WORKING SPACE MUST BE 30" WIDE OR THE WIDTH OF THE EQUIPMENT, WHICHEVER IS GREATER.
- *HEIGHT OF WORKING SPACE:* THE HEIGHT OF THE WORKING SPACE MUST BE AT LEAST 6.5' OR THE HEIGHT OF THE EQUIPMENT, WHICHEVER IS GREATER.



NO NON-ELECTRICAL ITEMS ALLOWED IN CLEARANCE ZONE. THIS INCLUDES PLUMBING, PUMPS, HEATERS, GAS LINES, ETC.

NEC 314.29 JUNCTION BOXES

ALL JUNCTION BOXES AND CONDUIT BODIES SHALL BE INSTALLED SO THAT THE WIRING CONTAINED IN THEM CAN BE RENDERED ACCESSIBLE WITHOUT REMOVING ANY PART OF THE BUILDING OR, IN UNDERGROUND SYSTEMS, WITHOUT EXCAVATING SIDEWALKS, PAVING, EARTH, OR OTHER SUBSTANCE THAT IS TO BE USED TO ESTABLISH THE FINISHED GRADE.



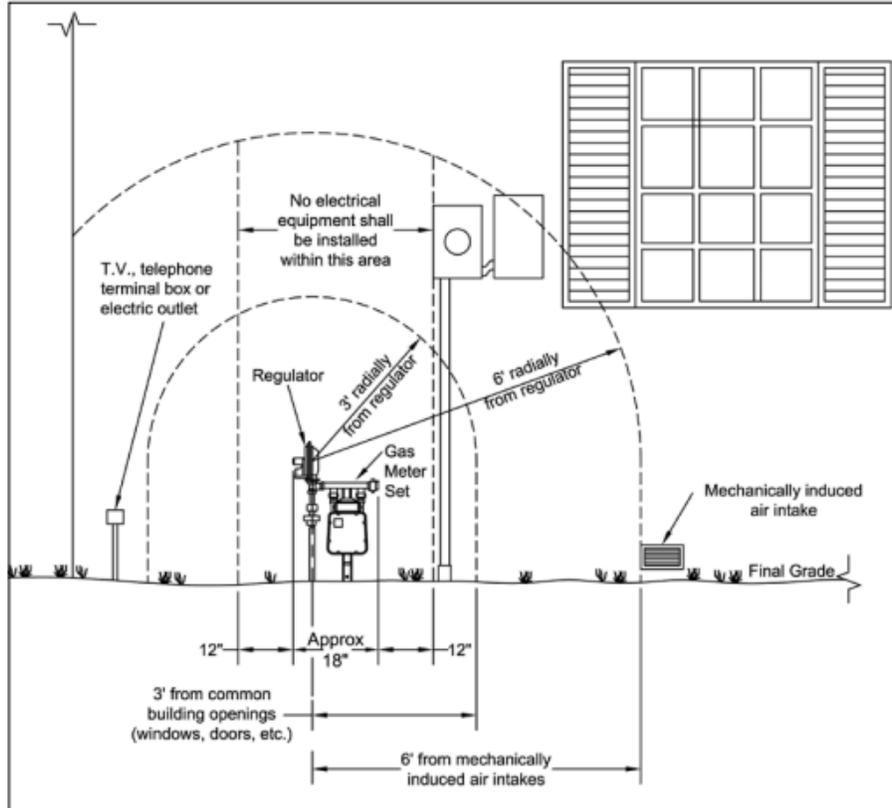
INSTALLATION OF ANY EQUIPMENT, STRUCTURES, OR MATERIALS WITHIN THE DESIGNATED CLEARANCE ZONE MAY RESULT IN FAILED INSPECTIONS, SAFETY HAZARDS, AND ADDITIONAL CORRECTIVE COSTS. ENSURE ALL COMPONENTS REMAIN OUTSIDE THIS AREA TO MAINTAIN COMPLIANCE AND AVOID ADDITIONAL FEES, DELAYS, OR REWORK.



ELECTRICAL BOX CLEARANCE REQUIREMENTS

TYPICAL GAS METER CLEARANCES AS REQUIRED BY UTILITY COMPANIES FOR SAFE OPERATION

Clearance requirements from gas meter



TYPICAL CLEARANCES

ITEM	DISTANCE	NOTES
GAS METER	3' MIN	RADIAL DISTANCE FROM VALVE
PROPANE TANK	10' MIN	RADIAL DIASTANCE FROM VALVE
NATURAL GAS TANK	10' MIN	RADIAL DISTANCE FROM VALVE

*This chart is for general refence only. Distances of electrical items from gas tanks, valves, and other combustibile must comply with local codes and utilities. **Always consult a qualified professional before finalizing any design or installation.***



ELECTRICAL POWER FEED REQUIREMENTS

“POWER PROVIDED BY OTHERS”



POOL POWER REQUIRES A SEPARATE PERMIT AND MUST BE INSTALLED BY A QUALIFIED, LICENSED ELECTRICAL CONTRACTOR.

IF PROVIDED POWER DOES NOT MEET MINIMUM NATIONAL ELECTRIC CODE (NFPA 70 NEC) STANDARDS, SAFEWATER WILL NOT MAKE FINAL CONNECTION TO PROVIDED POWER UNTIL CORRECTIONS ARE MADE.

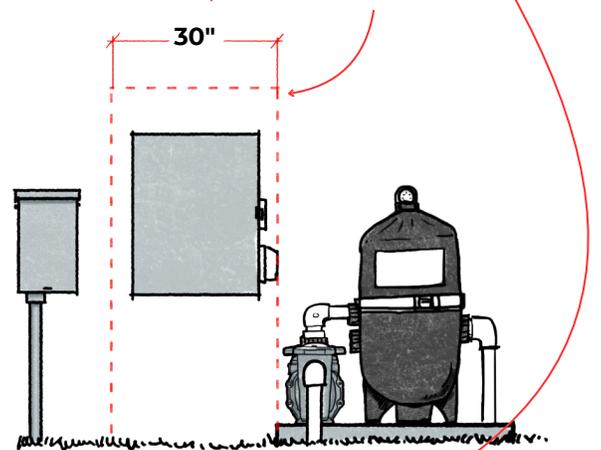
OPTION 1: PROVIDE A DISCONNECT

PROVIDE A UL LISTED, OUTDOOR RATED DISCONNECTING MEANS OR SUB PANEL.

DISCONNECT MUST MEET THE FOLLOWING REQUIREMENTS:

- BE FED BY A 4-WIRE SERVICE (240 V WITH SEPARATE NEUTRAL AND GROUNDING CONDUCTORS)
- NEUTRALS AND GROUNDS **MUST** BE SEPARATED (NEUTRAL CANNOT BE BONDED TO THE GROUNDING) SEE NATIONAL ELECTRIC CODE (NFPA 70 NEC) 250.32(B)(1)
- CONDUCTORS MUST BE SIZED IN ACCORDANCE WITH NEC 310.16
- LEAVE SUFFICIENT SPACE FOR POOL AUTOMATION PANEL SO THAT BOTH THE PROVIDED DISCONNECT AND THE AUTOMATION PANEL HAVE CLEARANCE PER NEC 110.26

WE ESTABLISH THIS AREA DURING THE PRECONSTRUCTION MEETING. DO NOT BLOCK WITH EQUIPMENT, PLUMBING, OR LANDSCAPING!

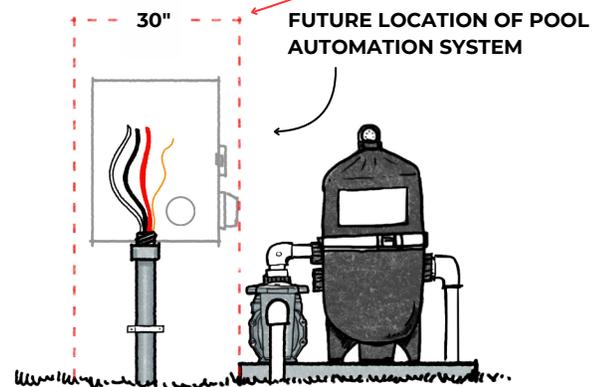


OPTION 2: PROVIDE WIRE “WHIP”

PROVIDE A LENGTH OF WIRE AT THE POOL AUTOMATION LOCATION.

WIRE MUST MEET THE FOLLOWING REQUIREMENTS:

- BE A 4-WIRE, **COPPER** FEED (240 V WITH SEPARATE NEUTRAL AND GROUNDING CONDUCTORS) **ALUMINUM WIRE IS NOT COMPATIBLE WITH POOL CONTROL PANELS.**
- CONDUCTORS MUST BE SIZED IN ACCORDANCE WITH NEC 310.16
- CONDUCTORS MUST BE RATED FOR DAMP LOCATIONS
- LEAVE SUFFICIENT SPACE FOR POOL AUTOMATION PANEL TO HAVE CLEARANCE PER NEC 110.26



NOTE:

POOL AUTOMATION PANELS HAVE HOLES IN BOTH THE BOTTOM AND THE BACK. WIRE WHIP MUST BE PROVIDED SO TO ENTER ONE OF THOSE LOCATIONS.



IF POWER IS NOT PROVIDED AS DESCRIBED, SAFEWATER WILL NOT MAKE FINAL CONNECTION.

IF MODIFICATION OR ALTERATION IS REQUIRED TO CONNECT TO PROVIDED POWER, A CHANGE ORDER MUST BE APPROVED BEFORE COMPLETION.

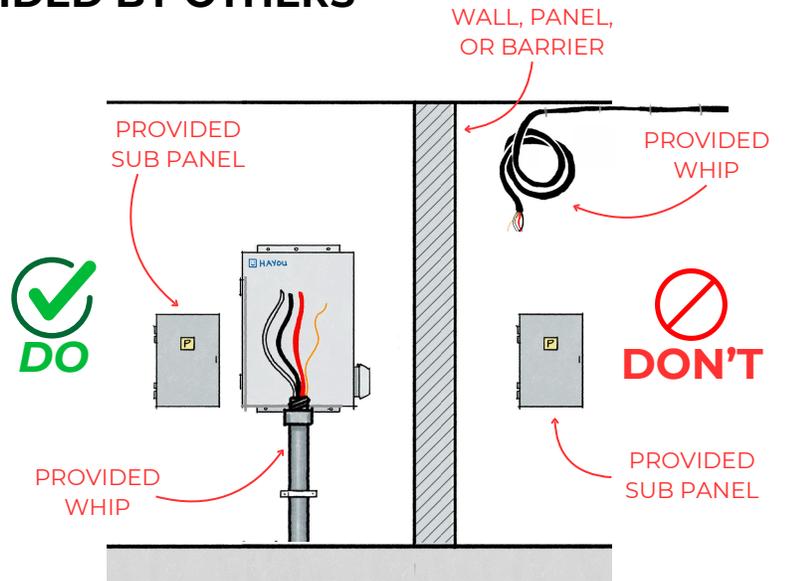


ELECTRICAL POWER FEED LOCATION

“POWER PROVIDED BY OTHERS”

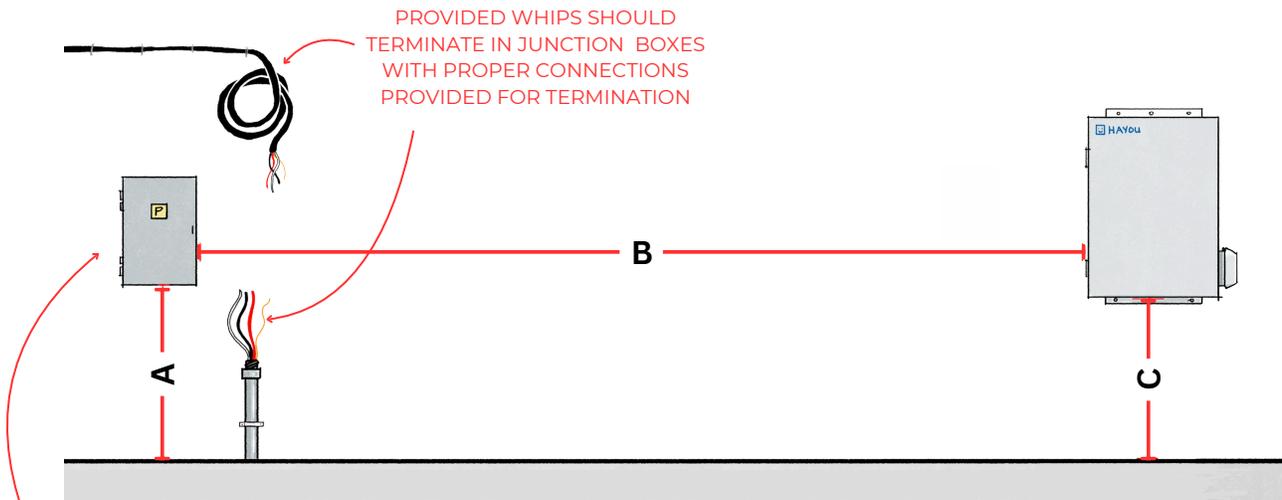
POWER PROVIDED SHOULD BE WITHIN THE SAME PHYSICAL SPACE

THE PROVIDED POWER MUST NOT BE SEPARATED FROM THE PANEL LOCATION BY PERMANENT BARRIERS THAT REQUIRE MODIFICATION. THE GOAL IS EFFICIENCY. IF WE HAVE TO DRILL HOLES, ADD CONDUIT, OR PULL WIRES, THIS DOES NOT QUALIFY AS “POWER PROVIDED” AND ADDITIONAL COSTS MUST BE APPROVED PRIOR TO SAFEWATER MAKING THE FINAL TERMINATIONS.



POWER PROVIDED SHOULD BE WITHIN 10'

10' IS NOT SIMPLY THE HORIZONTAL DISTANCE BETWEEN PROVIDED POWER AND AUTOMATION LOCATION. THE 10' INCLUDES VERTICAL AND HORIZONTAL DISTANCES REQUIRED TO RUN THE POWER NEATLY FROM THE PROVIDED PANEL OR WHIP TO THE POOL AUTOMATION PANEL.



PROVIDED DISCONNECTS SHOULD CONTAIN BREAKERS OR SPLICES REQUIRED FOR TERMINATION AND HAVE GROUNDS AND NEUTRALS PROPERLY ISOLATED PER CODE.

IF : $A + B + C \leq 10'$ POWER = PROVIDED

IF : $A + B + C \geq 10'$ POWER \neq PROVIDED



IF THE PROVIDED POWER REQUIRES THE ADDITION OF JUNCTION BOXES, SPECIALTY SPLICES (SUCH AS INSULATED LUGS) AND/OR EXTENDING MORE THAN 10', SAFEWATER WILL QUOTE THE ADDITIONAL COST FOR APPROVAL OR CORRECTION PRIOR TO FINALIZING THE POWER CONNECTIONS. SAFEWATER WILL NOT MAKE FINAL CONNECTIONS WITHOUT APPROVAL.



KEY NOTES ABOUT FEEDER WIRES

“POWER PROVIDED BY OTHERS”

WIRE SIZE RULES OF THUMB

AMPACITY	WIRE SIZE	NOTES
30 AMPS	#10 AWG	ALL # 10 REQUIRED
60 AMPS	#6 AWG W/#10 GROUND	Breaker sized to accommodate inrush current on motors. However, #6 generally allowed on 60 amp pool feeds due to reduced combined continuous loads
100 AMPS	#4 AWG W/#8 GROUND	Breaker sized to accommodate inrush current on motors. However, #4 AWG is generally allowed on 100 amp pool circuits due to reduced combined continuous loads

The wire ampacity values shown in this chart are general rules of thumb provided for reference only. They do not account for all conditions, such as ambient temperature, conduit fill, or installation method. All conductor sizes and ampacities must be calculated and verified in accordance with the latest edition of the National Electrical Code (NEC). **Always consult the NEC and a qualified professional before finalizing any electrical design or installation.**

DO NOT REDUCE THE NEUTRAL

IN SOME INSTANCES, IT IS PERMISSIBLE TO RUN A REDUCED NEUTRAL TO A SUB PANEL. HOWEVER, FOR POOL EQUIPMENT IT IS CRITICAL THAT THE NEUTRAL BE FULL SIZED AND THE GROUNDING CONDUCTOR BE PROPERLY SIZED PER THE **NEC**.

THIS IS DUE TO HARMONIC IMBALANCES FROM MOTOR VFDs AND LED LIGHTING CONTROLS.

DO NOT INSTALL A GROUNDING ROD AT THE POOL EQUIPMENT

NEC 680.26(B) STATES: AN 8 AWG OR LARGER SOLID COPPER BONDING CONDUCTOR PROVIDED TO REDUCE VOLTAGE GRADIENTS IN THE POOL AREA **SHALL NOT** BE REQUIRED TO BE EXTENDED OR ATTACHED TO REMOTE PANEL BOARDS, SERVICE EQUIPMENT, OR ELECTRODES.

A NOTE ON GROUNDING 4-WIRE SYSTEMS

IN ORDER TO PREVENT DANGEROUS PARALLEL CIRCUITS AND OBJECTIONAL BE CURRENT IN THE POOL, THE GROUNDING AND NEUTRAL CONDUCTORS MUST REMAIN SEPARATED AT ALL SUB PANELS.

INSTALLING A GROUND ROD AND RUNNING A WIRE TO IT **WILL NOT PROVIDE ADEQUATE GROUNDING TO THE SYSTEM**. MAKE SURE THAT THE SUPPLY FEED IS AN INTEGRAL 4-WIRE FEED AND THAT THE NEUTRALS AND GROUNDS REMAIN SEPARATE BEYOND THE MAIN SERVICE DISCONNECT FOR THE PROPERTY.

EQUIPMENT

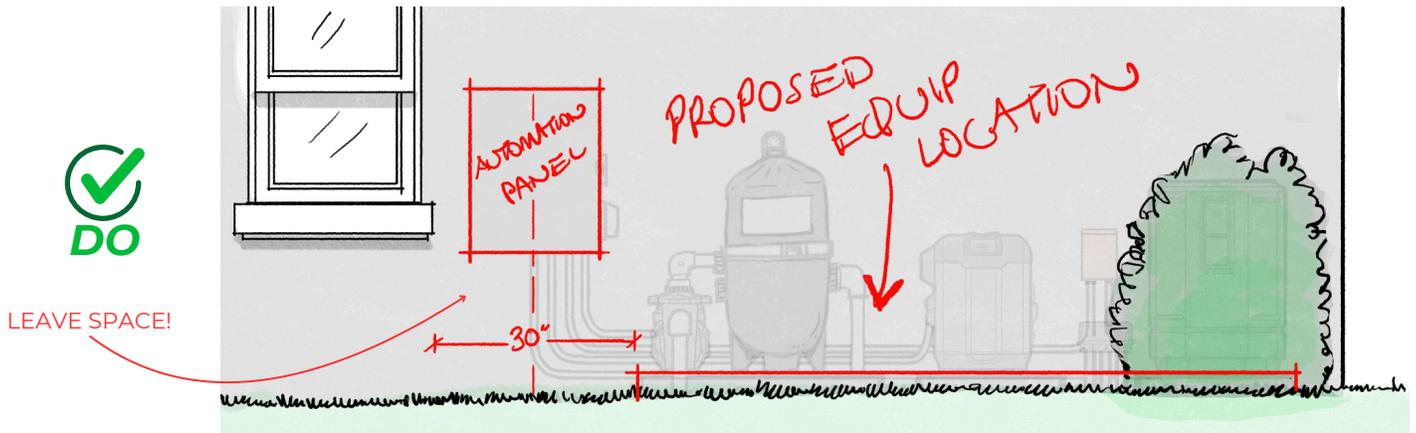


POOL EQUIPMENT LOCATION PLANNING

CODE REQUIRED CLEARANCES: PRACTICAL APPLICATION

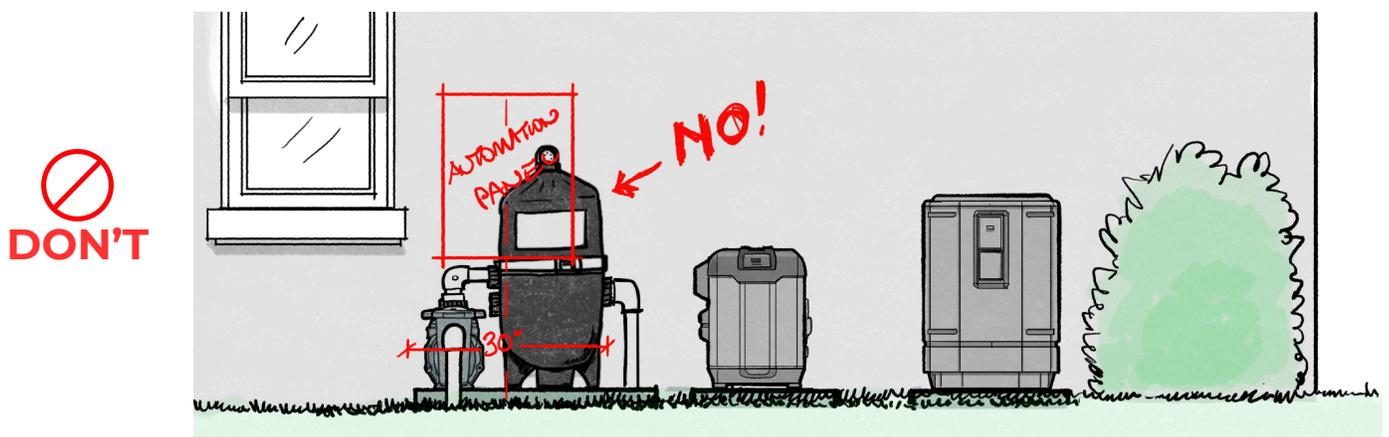
THE SAME ACCESS REQUIREMENTS APPLY TO POOL CONTROLS

WHEN PLANNING OUT EQUIPMENT LOCATIONS, ALWAYS **BUDGET 30" ADDITIONAL LENGTH** FOR THE CONTROL PANEL TO HAVE PROPER ACCESS. **SEE NEC 110.26**



DON'T BLOCK PLANNED PANEL LOCATION

IF THE EQUIPMENT IS PLACED IN FRONT OF THE PLANNED PANEL LOCATION **OR** THE PROVIDED DISCONNECT MEANS, CORRECTING THE ISSUE MAY REQUIRE A CHANGE ORDER. ALL CHANGE ORDERS MUST BE APPROVED PRIOR TO CONTINUING WORK. **SAVE YOURSELF THE EXPENSE...DON'T BLOCK THE PANEL LOCATION!**



DON'T LET YOUR EQUIPMENT CREW COST YOU!! PROTECT THE CLEARANCE!!



PROVIDED POWER

MAKE SURE TO ALWAYS LEAVE SPACE (30" X 36") IN FRONT OF ALL ELECTRICAL PANELS, SUB PANELS, AND DISCONNECTS TO ALLOW SAFE, COMPLIANT ELECTRICAL. HELP US STAY EFFICIENT AND SAFE!! **PLAN AHEAD!**



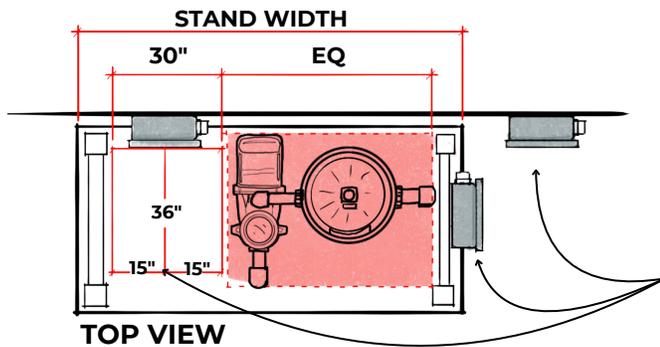
EQUIPMENT STAND CLEARANCE REQUIREMENTS

NOTE TO PLUMBERS!!

DO NOT BLOCK ELECTRICAL PANELS, DISCONNECTS, OR JUNCTIONS WITH EQUIPMENT

STAND WIDTH

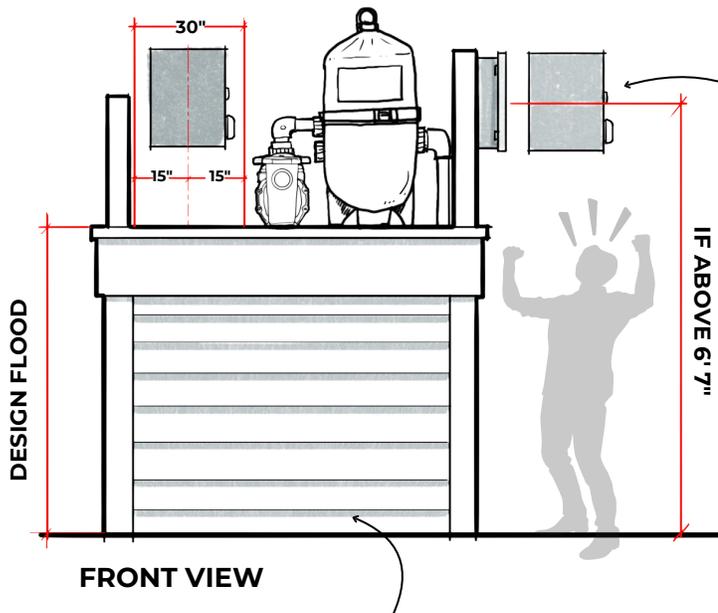
THE **INTERIOR** DIMENSIONS OF THE EQUIPMENT STAND MUST BE = (EQ WIDTH) + 30"



NEC 110.26 WORKING SPACE

WORKING SPACE RULES STILL APPLY TO EQUIPMENT STANDS

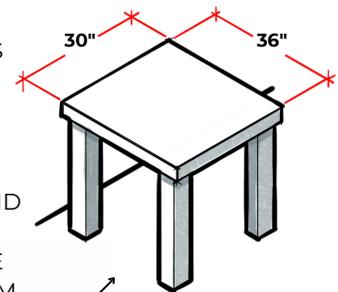
- AUTOMATION PANEL MAY BE MOUNTED TO THE OUTSIDE OF EQUIPMENT STANDS, BUT ACCESS MUST BE PROVIDED (SEE NEC 240.24 BELOW)
- REGARDLESS OF AUTOMATION PANEL LOCATION, CODE-REQUIRED WORKING CLEARANCES STILL APPLY.



NEC 240.24(A) , (F)

A WORKING PLATFORM **MUST** BE PROVIDED FOR ACCESS IF AUTOMATION PANEL'S TOP BREAKER IS 6' 7" OR HIGHER ABOVE GRADE.

PLATFORM DIMENSIONS MUST BE 30" W x 36" L AND HIGH ENOUGH FOR THE HIGHEST BREAKER TO BE NO MORE THAN 6'7" FROM THE PLATFORM.



SOME MUNICIPALITIES REQUIRE THE STAND TO BE ENGINEERED AND STAMPED PLANS MUST BE PRESENTED TO PASS INSPECTION.



INSTALLATION OF ANY EQUIPMENT, STRUCTURES, OR MATERIALS WITHIN THE DESIGNATED CLEARANCE ZONE MAY RESULT IN FAILED INSPECTIONS, SAFETY HAZARDS, AND ADDITIONAL CORRECTIVE COSTS. ENSURE ALL COMPONENTS REMAIN OUTSIDE THIS AREA TO MAINTAIN COMPLIANCE AND AVOID ADDITIONAL FEES, DELAYS, OR REWORK.



POOL EQUIPMENT REQUIRED CLEARANCES



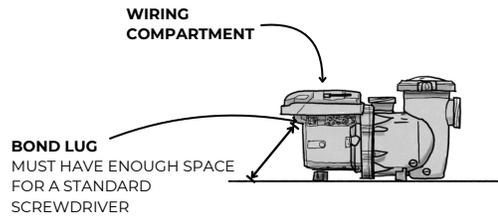
BASIC RULE: LEAVE US SPACE TO WORK!!

REGARDLESS OF LOCATION, ALL POOL EQUIPMENT MUST HAVE CLEAR AND ACCESSIBLE SPACE FOR SAFE WIRING AND SERVICE. INSUFFICIENT ACCESS WILL LEAD TO INEFFICIENT WORK, DANGEROUS CONDITIONS, AND POSSIBLE CODE VIOLATIONS, WHICH MAY RESULT IN RETURN TRIPS AND ADDITIONAL FEES.

PUMPS: TOP AND BACK ACCESS

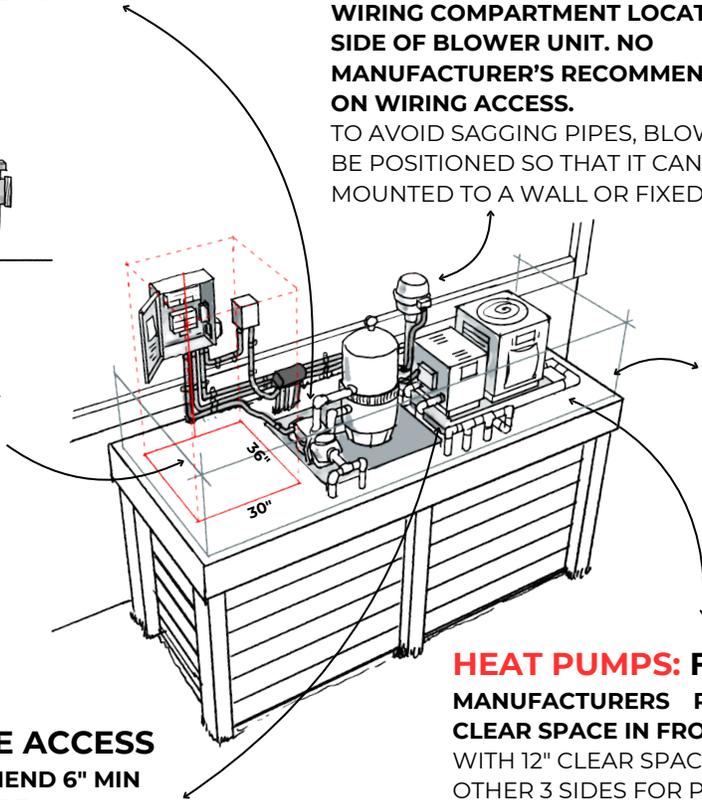
WIRING COMPARTMENT ON TOP OF BACK SIDE OF PUMP. DO NOT BLOCK WITH PLUMBING.

BONDING LUG IS ON THE BACK OF THE PUMP UNIT AND REQUIRES AT LEAST 10" OF WORKING CLEARANCE.



NEC 110.26 WORKING SPACE WORKING SPACE RULES STILL APPLY TO EQUIPMENT STANDS

REGARDLESS OF AUTOMATION PANEL LOCATION, CODE-REQUIRED WORKING CLEARANCES STILL APPLY. (SEE ELECTRICAL BOX CLEARANCE PAGE FOR MORE DETAILS.)



AIR BLOWERS: SIDE ACCESS; WALL MOUNT

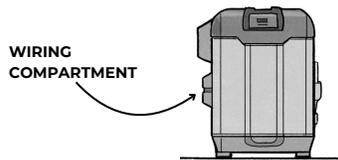
WIRING COMPARTMENT LOCATED ON SIDE OF BLOWER UNIT. NO MANUFACTURER'S RECOMMENDATION ON WIRING ACCESS.

TO AVOID SAGGING PIPES, BLOWER MUST BE POSITIONED SO THAT IT CAN BE MOUNTED TO A WALL OR FIXED SURFACE.

PROVIDE DOORS OR REMOVABLE PANELS TO PROVIDE ACCESS IN FRONT OF HEATER.

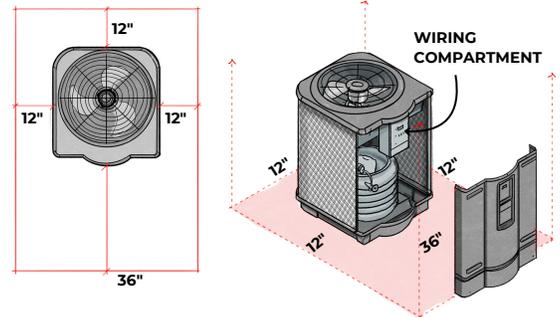
GAS HEATERS: SIDE ACCESS MANUFACTURES RECOMMEND 6" MIN CLEAR SPACE ON VENT SIDE

WIRING COMPARTMENT IS LOCATED BELOW THE EXHAUST VENT. WE RECOMMEND 12" CLEARANCE FOR PROPER VIEW TO INSTALL WIRING.



HEAT PUMPS: FRONT ACCESS

MANUFACTURERS RECOMMEND 24-36" CLEAR SPACE IN FRONT OF HEAT PUMPS WITH 12" CLEAR SPACE AROUND THE OTHER 3 SIDES FOR PROPER FUNCTION.



IF WE CAN'T GET TO IT,
WE CAN'T WIRE IT! SAVE
US BOTH THE HEADACHE
AND LEAVE SPACE!



IF WE CANNOT ACCESS THE WIRING COMPARTMENTS DUE TO PLUMBING OR FRAMING BLOCKING OUR ACCESS, ADDITIONAL COSTS MAY BE INCURRED TO CORRECT THE PROBLEM.
NOTE: SOME MANUFACTURE'S WARRANTIES MAY BE VOIDED IF PROPER CLEARANCE IS NOT AVAILABLE AROUND EQUIPMENT.



POOL EQUIPMENT REQUIRED CLEARANCES

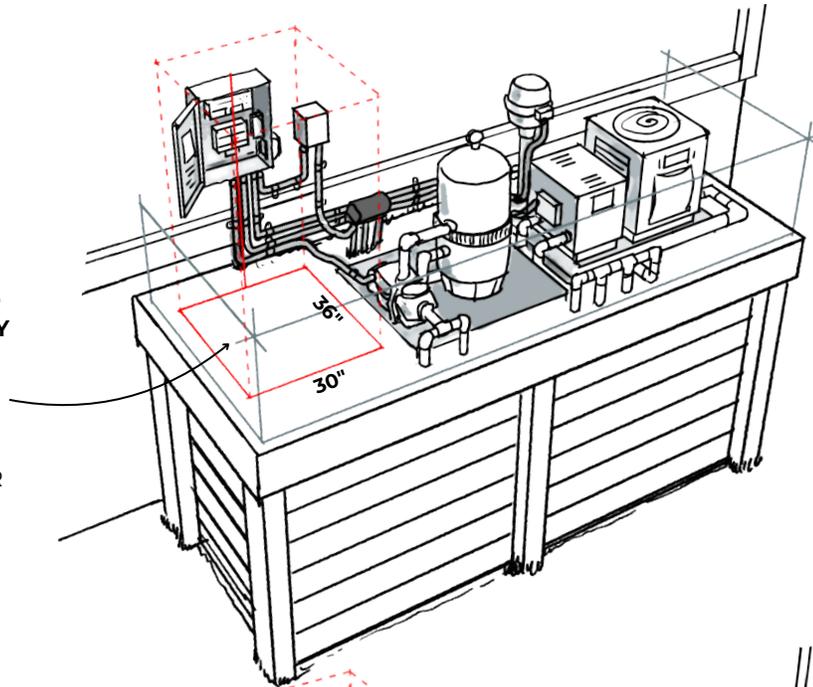


BASIC RULE: EFFICIENCY IS KEY

ANYTHING THAT PREVENTS OUR TEAM FROM WORKING EFFICIENTLY DRIVES THE COSTS UP. IF WE'RE PLANNING ON THE CONTROL PANEL TO BE IN A CERTAIN LOCATION, THEN FIND THAT LOCATION BLOCKED UPON ARRIVAL, DETERMINING A NEW LOCATION COULD TAKE HOURS--PHONE CALLS FOR APPROVAL, FINDING A COMPLIANT LOCATION, POSSIBLY BUILDING A MOUNTING BACKER...THESE ARE THE CONSEQUENCES WE HAVE TO DEAL WITH. **PROTECT YOURSELF FROM ADDED EXPENSES BY LEAVING US SPACE!!**

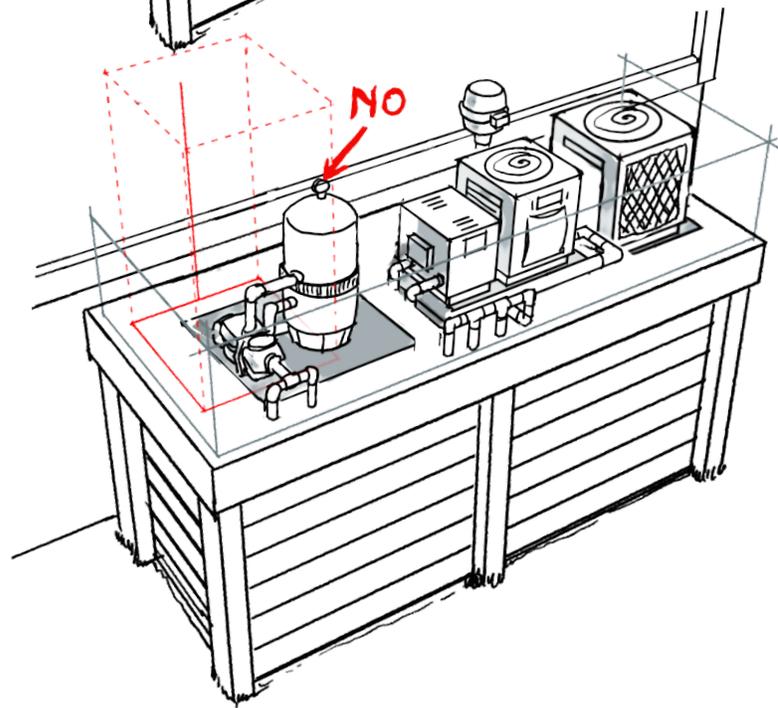
NEC 110.26 WORKING SPACE WORKING SPACE RULES STILL APPLY TO EQUIPMENT STANDS

REGARDLESS OF AUTOMATION PANEL LOCATION, CODE-REQUIRED WORKING CLEARANCES STILL APPLY. (SEE ELECTRICAL BOX CLEARANCE PAGE FOR MORE DETAILS.)



BLOCKING THE WORKING SPACE KILLS EFFICIENCY DON'T LET YOUR EQUIPMENT CREW SCREW YOU!

COMMUNICATE CLEARLY WITH YOUR TEAM SO THEY CAN PROTECT THE SPACE WE NEED. IF WE DON'T HAVE ACCESS TO OUR PLANNED AREA AND ARE REQUIRED TO ALTER OUR PLANS, ADDITIONAL COSTS MAY BE INCURRED DUE TO COMPROMISED EFFICIENCY



IF WE CANNOT ACCESS THE WIRING COMPARTMENTS DUE TO PLUMBING OR FRAMING BLOCKING OUR ACCESS, ADDITIONAL COSTS MAY BE INCURRED TO CORRECT THE PROBLEM.
NOTE: SOME MANUFACTURE'S WARRANTIES MAY BE VOIDED IF PROPER CLEARANCE IS NOT AVAILABLE AROUND EQUIPMENT.



COMMON POOL WIRING VIOLATIONS



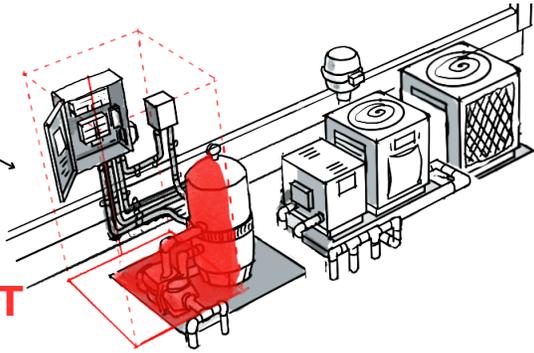
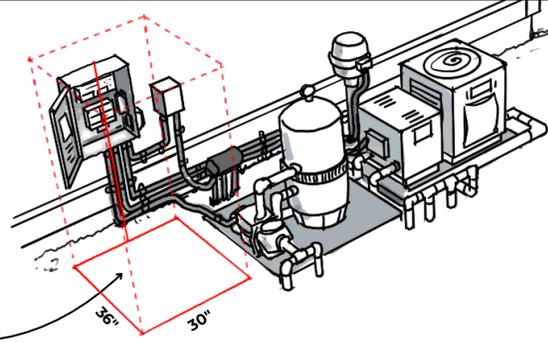
NOTICE

UNIQUE POOL RULES

POOL WIRING CODE RULES ARE OUTLINED IN **SECTION 680** OF THE NATIONAL ELECTRIC CODE. THIS SECTION SPELLS OUT ADDITIONAL AND SOMETIMES CONFLICTING INSTRUCTIONS THAT MUST BE UNDERSTOOD AND APPLIED PROPERLY TO EACH SITUATION. THESE RULES SUPERCEDE OTHER SECTIONS OF THE CODE. ELECTRICIANS AND INSPECTORS DO NOT ALWAYS UNDERSTAND OR CATCH VIOLATIONS, SO JUST BECAUSE THE ELECTRICIAN IS "LICENSED" OR THE JOB "PASSED INSPECTION" DOES NOT MEAN THAT IT IS CORRECT.

NEC 110.26 WORKING SPACE WORKING SPACE RULES STILL APPLY TO EQUIPMENT STANDS

REGARDLESS OF AUTOMATION PANEL LOCATION, CODE-REQUIRED WORKING CLEARANCES STILL APPLY. (SEE ELECTRICAL BOX CLEARANCE PAGE FOR MORE DETAILS.) OFTEN INSPECTORS WILL MISS THIS BECAUSE THE AUTOMATION DOES NOT LOOK LIKE NORMAL SUB PANELS.



GFCIs: NOT ALL EQUAL

WITH FEW EXCEPTIONS, ALL PUMPS AND MOST OTHER POOL EQUIPMENT MUST BE GFCI PROTECTED.

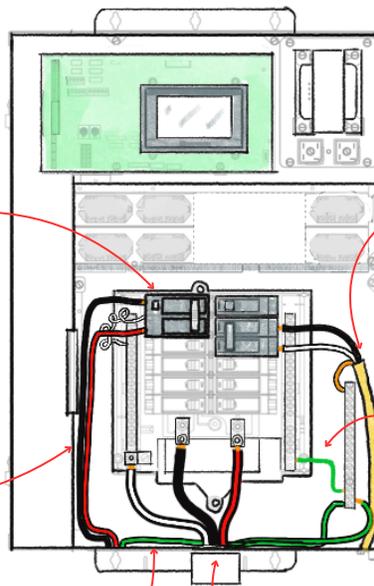
CERTAIN PUMPS NEED SPECIAL GFCIs. NOT ALL GFCI BREAKERS WILL WORK ON VARIABLE SPEED PUMPS.

WIRING: THHN/THWN

ONLY WIRING RATED FOR DAMP LOCATIONS MAY BE USED.

GROUNDING: MUST BE INSULATED

PER NEC 680, ALL GROUNDING CONDUCTORS FOR POOL EQUIPMENT MUST BE INSULATED AND A MINIMUM OF #12 AWG.



NO ROMEX: ROMEX NOT RATED A COMMON VIOLATION IS THE USE OF ROMEX OR UF WIRING FOR POOL EQUIPMENT

ROMEX IS NOT RATED FOR OUTDOORS AND UF CABLE DOES NOT HAVE AN INSULATED GROUNDING CONDUCTOR.

KEEP SEPARATE: GROUNDS AND NEUTRALS

CODE REQUIRES GROUNDS AND NEUTRAL CONDUCTORS TO BE SEPARATED IF NOT SEPARATED, CURRENT CAN BACKFEED INTO THE SYSTEM CREATING DEADLY CONDITIONS.

NO ALUMINUM: COPPER ONLY

MOST POOL AUTOMATION PANELS SPECIFY COPPER CONDUCTORS ONLY

ALUMINUM IS NOT RATED FOR POOL WIRING. THIS INCLUDES FEEDER WIRES FOR THE MAIN POWER



COMMON POOL WIRING VIOLATIONS



NOTICE

GENERAL RULES

IF NOT OUTLINED IN **SECTION 680** OF THE NATIONAL ELECTRIC CODE, ALL OTHER POOL WIRING MUST ABIDE BY OTHER CODE SECTIONS THAT APPLY TO THE INSTALLATION. ALL MATERIALS AND METHODS MUST BE UL LISTED AND APPROVED FOR DAMP/WET LOCATIONS.

THE STORAGE OF POOL CHEMICALS IS PROHIBITED IN THE IMMEDIATE LOCATION OF THE POOL EQUIPMENT.

NEC 110.26 WORKING SPACE

WORKING SPACE RULES STILL APPLY TO EQUIPMENT STANDS

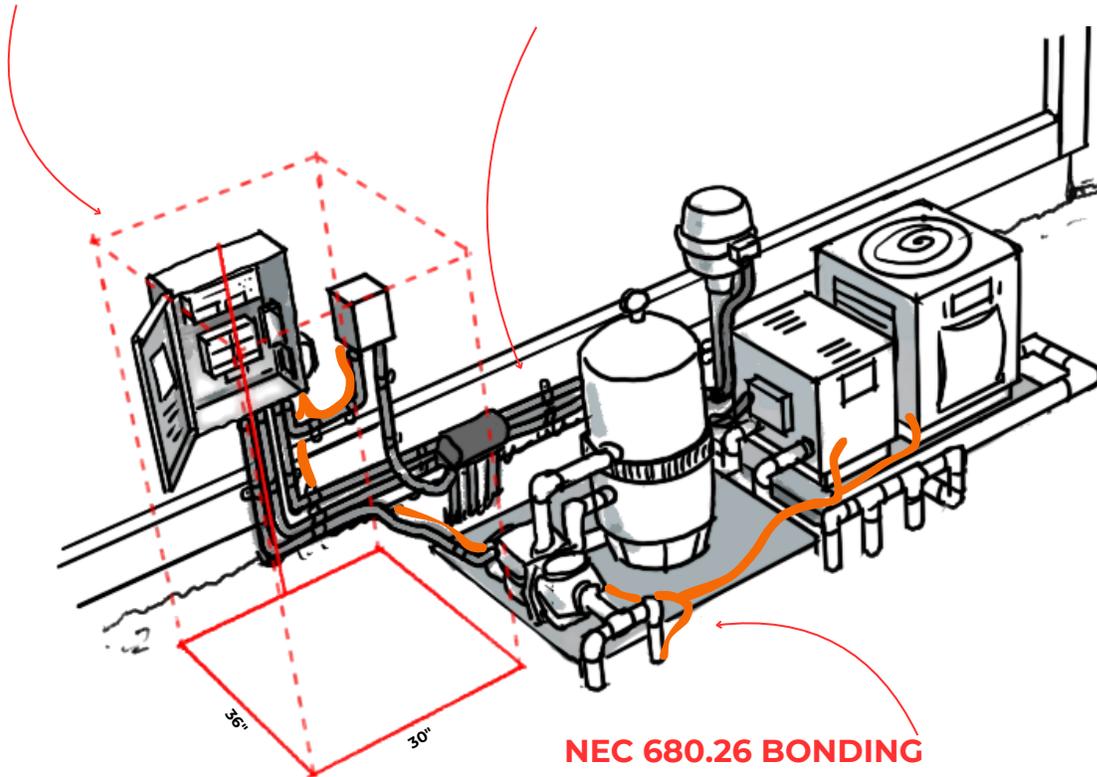
REGARDLESS OF AUTOMATION PANEL LOCATION, CODE-REQUIRED WORKING CLEARANCES STILL APPLY. (SEE ELECTRICAL BOX CLEARANCE PAGE FOR MORE DETAILS.)

NEC 110.12 WORKMANSHIP

MECHANICAL EXECUTION OF WORK

ELECTRICAL EQUIPMENT SHALL BE INSTALLED IN A NEAT AND WORKMANLIKE MANNER

THIS SECTION GIVES PARTICULAR EMPHASIS ON SECURING AND SUPPORTING THE EQUIPMENT PROPERLY. IT ALSO HIGHLIGHTS THAT THE INSTALLATION SHOULD NOT RESULT IN A HAZARD OR BE DAMAGED BY NORMAL BUILDING USE.



NEC 680.26 BONDING

ALL EQUIPMENT TO BE BONDED

ELECTRICAL EQUIPMENT SHALL BE BONDED. THIS INCLUDES LIGHT TRANSFORMERS, PUMPS, HEATERS, CONTROLS, ETC.

THE WATER MUST ALSO BE BONDED. IN NONCONDUCTIVE SHELLS, A SEPARATE WATER BOND MUST BE ADDED.



COMMON POOL WIRING VIOLATIONS

POWER SUPPLY

4-WIRE SERVICE REQUIRED FOR SAFETY

NEC 250.24(A)(5)

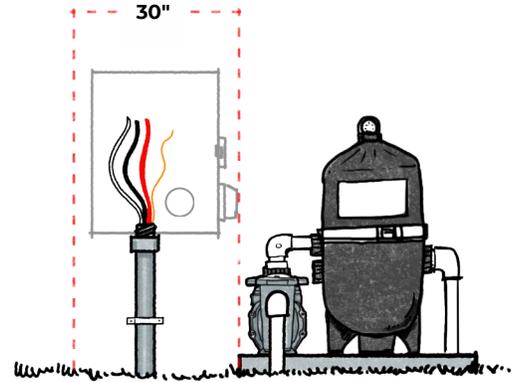
GROUNDING AND GROUNDED (NEUTRAL) CONDUCTORS SHALL BE KEPT SEPARATE AFTER THE SERVICE DISCONNECT.

NEC 250.32(B)(1)

4-WIRE FEED REQUIRED FOR SUBPANELS AFTER THE FIRST MEANS OF DISCONNECT (REGARDLESS OF WHETHER IT'S THE SAME BUILDING OR NOT)

NEC 250.32(A)

GROUND ELECTRODE (ROD) REQUIRED FOR SUBPANELS ATTACHED TO SEPARATE STRUCTURES. **THE GROUND ROD IS NOT AN ADEQUATE SUBSTITUTE FOR A DEDICATED GROUNDING CONDUCTOR**



OTHER COMMON ERRORS:

NEC 110.12(A) – Mechanical Execution of Work (2020 & 2023 NEC)

ELECTRICAL EQUIPMENT SHALL BE INSTALLED IN A NEAT AND WORKMANLIKE MANNER

NEC 110.12(B) – Integrity of Electrical Equipment and Connections

INTERNAL PARTS OF ELECTRICAL EQUIPMENT, INCLUDING BUSBARS, WIRING TERMINALS, INSULATORS, AND OTHER SURFACES, SHALL NOT BE DAMAGED OR CONTAMINATED BY FOREIGN MATERIALS

This implies that damaged or deteriorated enclosures must be repaired or replaced to maintain integrity.

NEC 110.12(C) – Unused Openings

REQUIRES THAT UNUSED OPENINGS IN ENCLOSURES BE CLOSED TO MAINTAIN THE PROPER ENVIRONMENTAL RATING.

NEC 300.7 – Protection Against Moisture

REQUIRES SEALING OR PROTECTING RACEWAYS AND ENCLOSURES TO PREVENT MOISTURE INTRUSION WHERE APPLICABLE.



TLDR: IF THE PANEL DOESN'T HAVE 4 WIRES, IS FAILING MECHANICALLY/STRUCTURALLY, IF IS DAMAGED BY WATER OR OTHER ELEMENTS, THESE THINGS SHOULD BE CORRECTED.

NOTE: OLDER SYSTEMS OFTEN ONLY HAVE 3 WIRES. IF THIS WAS THE CODE WHEN INSTALLED, IT IS TYPICALLY GRANDFATHERED IN UNLESS IT POSES A SERIOUS SAFETY CONCERN.



FLOOD ZONES REGULATIONS



WHERE TO FIND FLOOD INFORMATION

YOU CAN CONSULT THE FEMA MAP FOR GENERAL REFERENCES. BUT FOR SPECIFIC PROPERTY INFORMATION, YOU SHOULD REQUEST A FLOOD CERTIFICATE FOR THE PROPERTY FROM THE MUNICIPALITY.

FEMA FLOOD MAP WEBSITE:



Example: AE-14

AE 14 INDICATES A **BASE FLOOD ELEVATION (BFE)** OF 14 FEET ABOVE THE DESIGNATED DATUM.

DETERMINE THE REQUIRED ELEVATION

- MOST LOCAL FLOODPLAIN MANAGEMENT REGULATIONS REQUIRE THAT THE LOWEST FLOOR OF A STRUCTURE BE BUILT AT OR ABOVE THE BFE, OFTEN WITH FREEBOARD (AN ADDED SAFETY MARGIN).

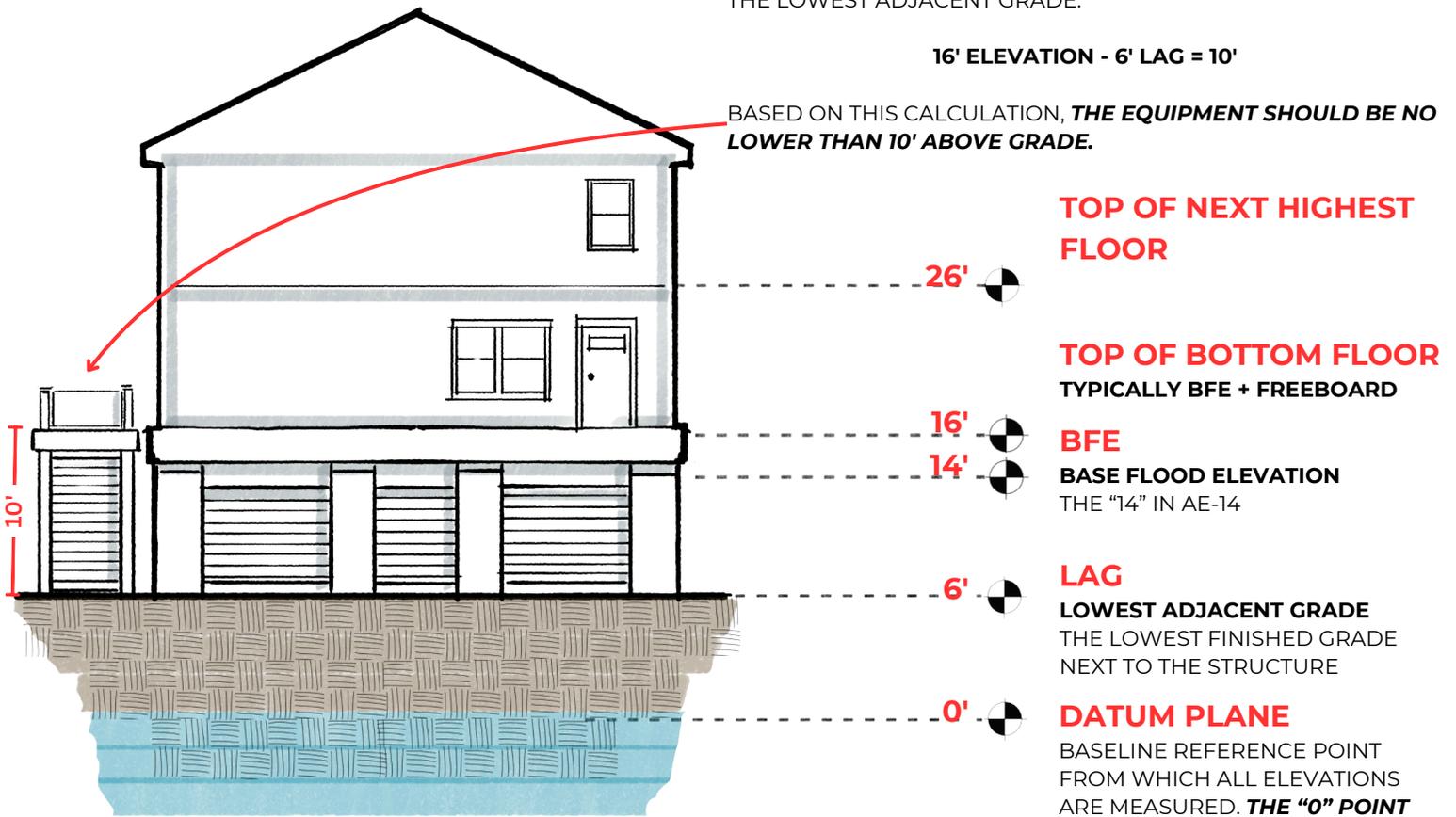
FOR A HOUSE IN AN AE-14 FLOOD ZONE, WITH A 2' FREEBOARD, WE FIRST FIND THE REQUIRED ELEVATION:

$$14' \text{ BFE} + 2' \text{ FREEBOARD} = 16' \text{ ELEVATION}$$

WE CAN NOW DETERMINE THE EQUIPMENT HEIGHT BASED ON THE LOWEST ADJACENT GRADE:

$$16' \text{ ELEVATION} - 6' \text{ LAG} = 10'$$

BASED ON THIS CALCULATION, **THE EQUIPMENT SHOULD BE NO LOWER THAN 10' ABOVE GRADE.**



IT IS THE BUILDER'S RESPONSABILITY TO VERIFY FLOOD ELEVATIONS

WE HATE REWORK AS MUCH AS YOU DO. IF WE THINK THE FLOOD ELEVATION IS AN ISSUE, WE'LL LET YOU KNOW. HOWEVER, OBTAINING AN UPDATED FLOOD ELEVATION CERTIFICATE AND CONFIRMING EQUIPMENT ELEVATION IS THE RESPONSABILITY OF THE POOL BUILDER OR GENERAL CONTRACTOR. **EQUIPMENT RELOCATION AND REWIRING DUE TO FLOOD ELEVATION VIOLATIONS WILL INCUR ADDITIONAL FEES.**



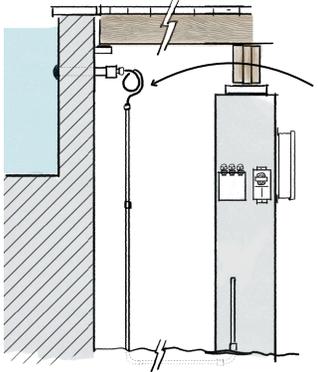


PULLING LIGHTS

ELEVATED POOLS

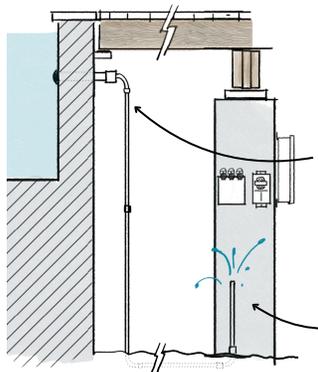
IN ORDER TO PROPERLY RUN LIGHTS IN AN ELEVATED POOL, SPECIAL PRECAUTIONS MUST BE TAKEN TO PREVENT LEAKS. WE USE ALL NON-METALLIC, PRESSURE CLAMP CORD GRIPS (SOMETIMES CALLED CABLE GLANDS).

THE WIRE MUST THEN BE STAPLED OR STRAPPED AND NEATLY RUN BACK TO THE LIGHT TRANSFORMER LOCATION. SOMETIMES THIS MEANS USING A MASONRY DRILL AND SPECIAL SCREWS & ANCHORS TO STRAP THE WIRE TO THE BOTTOM OF THE DECKING. **THIS IS MUCH MORE LABOR INTENSIVE THAN SIMPLY PULLING WIRES THROUGH A CONDUIT, HENCE THE ADDITIONAL COST TO PULL THESE LIGHTS.**



LEAVE SPACE

IF YOU ARE PROVIDING A CHASE FROM THE SHELL TO THE EQUIPMENT LOCATION, MAKE SURE TO LEAVE THE TWO CONDUITS SEPARATE SO WE CAN ADD THE DRIP/SERVICE LOOP.



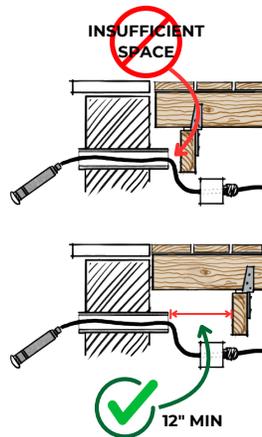
GRAVITY WILL WIN

IF YOU RUN A CONTINUOUS CONDUIT AND GLUE IT INTO THE SHELL, THE WATER PRESSURE **WILL** CAUSE A LEAK.

HOW TO BE PREPARED

MAKE SURE ALL AREAS AROUND THE LIGHT CONDUIT PENETRATIONS ARE CLEAR OF OBSTRUCTIONS.

IF THE EQUIPMENT IS IN A SEPARATE PHYSICAL SPACE FROM THE POOL SHELL, PROVIDE A CHASE BETWEEN THE SHELL AREA AND THE EQUIPMENT SO WE CAN RUN OUR WIRES.



FRAMING CONCERNS

WHEN LOCATING THE LIGHTS THROUGH THE SHELL, MAKE SURE THAT THE DECK FRAMING, PLUMBING, OR STRUCTURAL OBSTACLES DON'T BLOCK THE CONDUIT.

SAFEWATER IS NOT QUALIFIED TO MAKE STRUCTURAL MODIFICATIONS IN ORDER TO PULL THE LIGHTS. **IT IS THE BUILDER'S RESPONSIBILITY TO ENSURE THE LIGHT CONDUITS ARE ACCESSIBLE.**

SERVICE LOOP

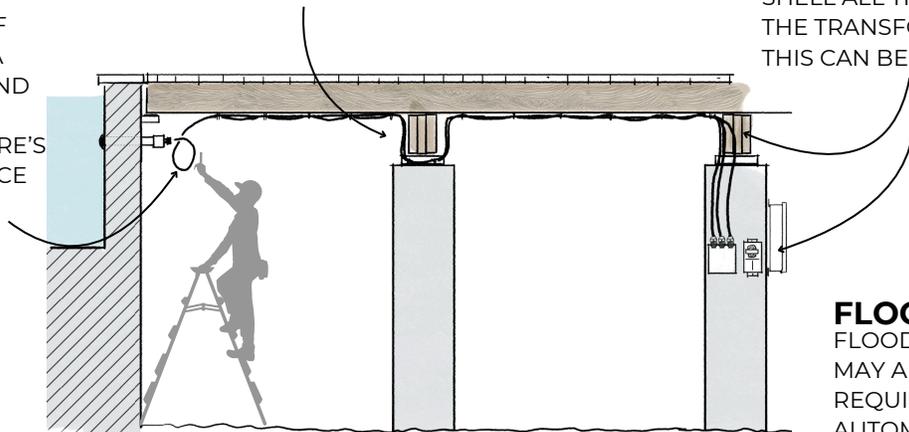
WHERE THE WIRE COMES OUT OF THE SHELL, WE SECURE IT WITH A GLUED COUPLING, CORD GRIP, AND SILICONE SEALANT TO PREVENT DRIPS. WE ALSO MAKE SURE THERE'S A LOOP LONG ENOUGH TO SERVICE THE LIGHT FIXTURE IF NEEDED IN THE FUTURE.

CLEAN WIRE RUNS

WIRE MUST RUN AROUND STRUCTURAL OBSTACLES IN A NEAT AND WORKMANLIKE MANNER.

LABOR INTENSIVE

WIRE MUST BE STAPLED OR STRAPPED NEATLY FROM THE SHELL ALL THE WAY BACK TO THE TRANSFORMER LOCATION. THIS CAN BE 70' OR MORE.



FLOOD ZONES
FLOOD REGULATIONS MAY AFFECT REQUIRED HEIGHT OF AUTOMATION AND LIGHT TRANSFORMERS



PULLING LIGHTS

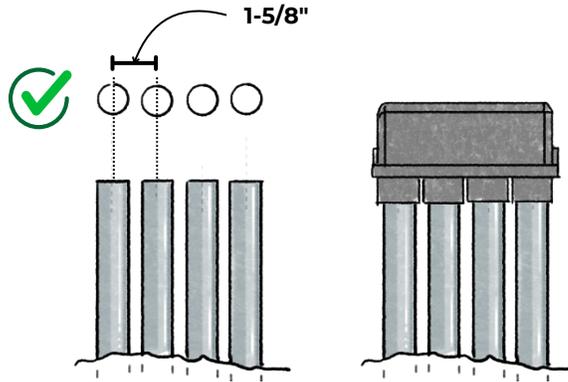
IN-GROUND POOL SHELLS

CONDUIT PLACEMENT

SAVE YOURSELF TIME AND MONEY! STUB UP THE LIGHT CONDUITS NEATLY. BECAUSE WE NEED TO RUN THEM ALL INTO A JUNCTION BOX, THEY CANNOT BE CROWDED TOO TIGHTLY TOGETHER OR SPACED TOO FAR APART. IF WE ARE REQUIRED TO DIG OR MAKE SIGNIFICANT MODIFICATIONS TO THE CONDUITS, YOU WILL INCUR ADDITIONAL CHARGES.

CORRECT PLACEMENT

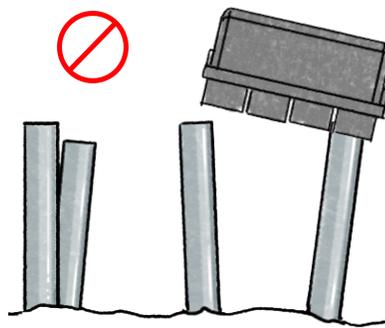
IN ORDER TO FIT INTO THE JUNCTION BOX, THE CONDUITS SHOULD BE SPACED APPROXIMATELY 1-5/8" APART ON CENTER.



INCORRECT PLACEMENT: IMPROPER SPACING / CROOKED PIPES



PIPES THAT ARE TOO CLOSELY SPACED TOGETHER AND THAT ARE NOT PLUMB REQUIRE A LOT MORE WORK AND EFFORT TO CORRECT. SAVE YOURSELF EXTRA CHARGES BY RUNNING THE CONDUITS PROPERLY.



PIPES THAT ARE SPACED TOO FAR APART LIKEWISE REQUIRE EXTRA WORK AND EFFORT TO CORRECT. SAVE YOURSELF EXTRA CHARGES BY MAKING SURE THAT THE PIPES ARE PROPERLY SPACED.



CODE REGULATIONS

THE NATIONAL ELECTRIC CODE (NEC) REQUIRES THAT ALL POOL LUMINARIES BE TERMINATED IN A JUNCTION BOX THAT HAS BEEN UL LISTED FOR SWIMMING POOL USE. THESE BOXES ARE DIFFERENT FROM STANDARD-USE JUNCTION BOXES AND HAVE VERY SPECIFIC SIZE PARAMETERS AND HOLE SPACING. HENCE THE NEED FOR THE LIGHT CONDUITS TO STUB UP STRAIGHT AND AT THE PROPER DISTANCE APART.

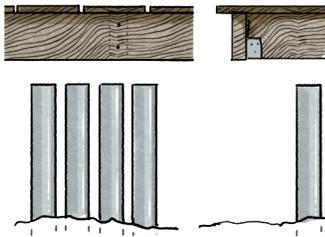


PULLING LIGHTS

IN-GROUND POOLS

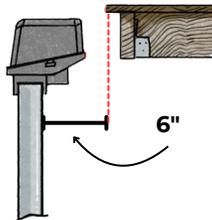
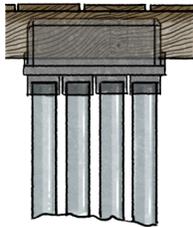
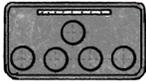
ACCESSIBILITY CONCERNS

IF THE EQUIPMENT IS GOING ON A STAND OR ELEVATED PLATFORM, MAKE SURE THAT THE LIGHT CONDUITS ARE STILL ACCESSIBLE. WE NEED ENOUGH SPACE FOR THE CODE-REQUIRED LIGHT JUNCTION BOX TO FIT OVER TOP OF THE CONDUITS, AND HAVE SPACE TO WORK TO MAKE THE PROPER JUNCTION. ANY STRUCTURAL MODIFICATIONS OR DIGGING REQUIRED TO MOVE THE LIGHT CONDUITS TO AN ACCESSIBLE LOCATION WILL BE BILLED AS AN ADDITIONAL COST.



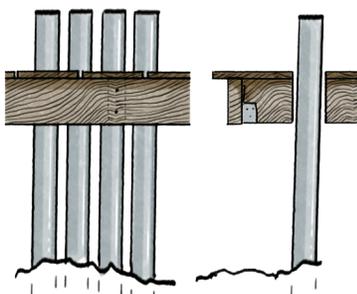
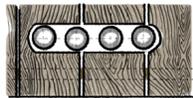
INCORRECT PLACEMENT: BLOCKED CONDUITS

CONDUITS THAT ARE BLOCKED BY STRUCTURES SUCH AS EQUIPMENT STANDS, PLATFORMS, ETC. PROVIDE NEITHER ADEQUATE WORKING ROOM TO PULL THE LIGHTS NOR ROOM FOR THE JUNCTION BOX. SAVE YOURSELF EXTRA COSTS BY AVOIDING THIS IN THE FIRST PLACE. MAKE SURE CONDUITS ARE ACCESSIBLE.



CORRECT PLACEMENT: CONDUITS HAVE ENOUGH SPACE

ONE OPTION IS TO RUN THE CONDUITS IN FRONT OR BESIDE THE STAND, PLATFORM, OR STRUCTURE INSTEAD OF UNDER IT. POSITION THE CONDUITS AT LEAST 6" FROM ANY STRUCTURAL MEMBER TO ALLOW WORKING SPACE.



CORRECT PLACEMENT: CONDUITS BROUGHT UP THROUGH STRUCTURE

ANOTHER OPTION IS TO DRILL HOLES IN THE DECKING OF THE PLATFORM, STAND, OR STRUCTURE AND BRING THE LIGHT CONDUITS UP THROUGH THE FRAMING. THIS ALLOWS ALL THE PLUMBING TO BE HIDDEN IF DESIRED WHILE PRESERVING ACCESSIBILITY FOR THE TECHNICIANS TO PULL AND WIRE THE LIGHTS.

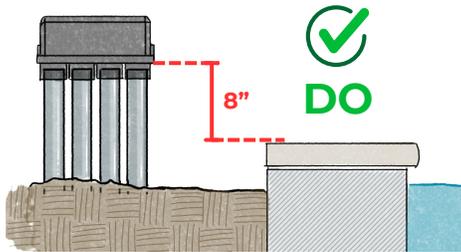


PULLING LIGHTS

BOX HEIGHT REQUIREMENTS

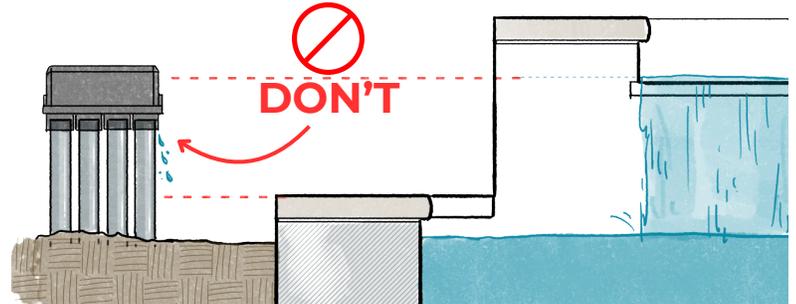
CODE REQUIRED ELEVATIONS

PER CODE, THE LIGHT JUNCTION BOX MUST BE LOCATED 8" ABOVE THE HIGHEST WATER LEVEL. THIS PREVENTS WATER FROM ENTERING THE JUNCTION AND FLOODING CONNECTED ELECTRICAL COMPONENTS.



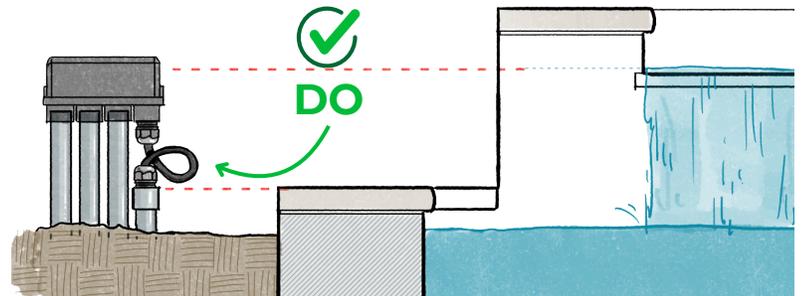
CORRECT PLACEMENT

POSITION THE JUNCTION BOX SO THAT THE BOTTOM OF THE BOX IS NO LOWER THAN 8" ABOVE THE HIGHEST WATER LEVEL.



INCORRECT PLACEMENT

THE LIGHT CONDUIT FOR THE SPA IS BELOW THE HIGHEST WATER LEVEL. THIS WILL FLOOD THE PIPES AND CREATE A LEAK.



THE FIX

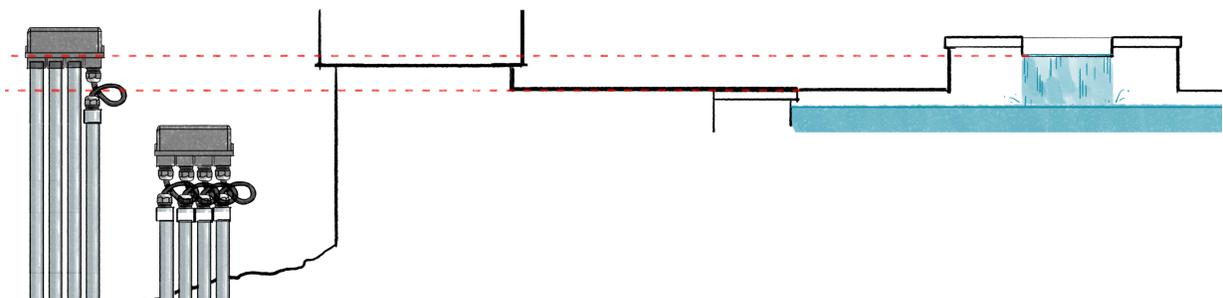
THE SOLUTION TO THIS PROBLEM IS TO EITHER RAISE ALL THE CONDUITS ABOVE THE HIGHEST WATER LEVEL, OR TO USE CABLE GLANDS/CORD GRIPS TO CREATE A SEAL TO PREVENT BACK FLOODING AND LEAKS.

PLAN AHEAD

IF WE KNOW THAT THE POOL WILL BE ELEVATED ABOVE THE WATER LEVEL, WE NEED TO PLAN AHEAD FOR HOW WE CAN ENSURE BOTH AN AESTHETICALLY PLEASING AND CODE COMPLIANT SOLUTION.

OUT OF SIGHT

IF THE POOL EQUIPMENT IS NOT WITHIN SIGHT OF THE POOL ITSELF, THE PROPER ELEVATION CAN BE DIFFICULT TO VERIFY. REGARDLESS OF THE DISTANCE, THE JUNCTION MUST BE EITHER ELEVATED ABOVE THE HIGHEST WATER LEVEL (WHICH MAY BE UNSIGHTLY) OR CORD GRIPS USED TO SECURE ALL THE LIGHTS AGAINST LEAKS.





LIGHT CONDUIT RUNS

HOW TO RUN CONDUITS FOR EFFICIENCY

CODE REQUIREMENTS

THE **NEC** LIMITS THE NUMBER OF BENDS TO **360 DEGREES** BEFORE REQUIRING A PULLING POINT. THERE ARE THREE KEY REASONS FOR THIS LIMITATION:

- EASE OF PULLING:** TOO MANY TURNS MAKES THE WIRE DIFFICULT TO PULL
- REDUCE MECHANICAL STRESS:** EACH BEND ADDS RESISTANCE AND FRICTION, WHICH REQUIRES MORE FORCE TO PULL THE WIRE. THIS STRESS CAN DAMAGE THE WIRES, CONNECTORS, AND CONDUIT, REDUCING THE SYSTEM'S RELIABILITY AND SAFETY.
- AVOIDING STUCK WIRES:** TOO MANY BENDS CAN CAUSE WIRES OR PULLING DEVICES TO GET STUCK PARTWAY THROUGH THE CONDUIT, MAKING THE INSTALLATION TAKE LONGER THAN IT SHOULD OR FORCING COSTLY REWORK.

FOLLOWING THESE RULES NOT ONLY KEEPS YOU COMPLIANT BUT HELPS THE JOB FLOW MORE EFFICIENTLY.

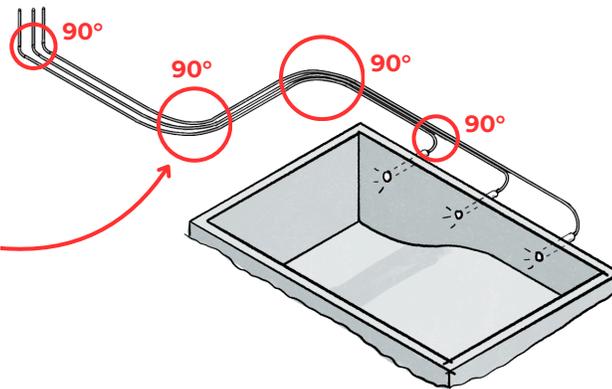
KEEP LESS THAN 360°

TOTAL BENDS

PER CODE, YOU MUST AVOID HAVING MORE THAN 360° OF TOTAL BENDS IN THE RUN OF THE PIPE.

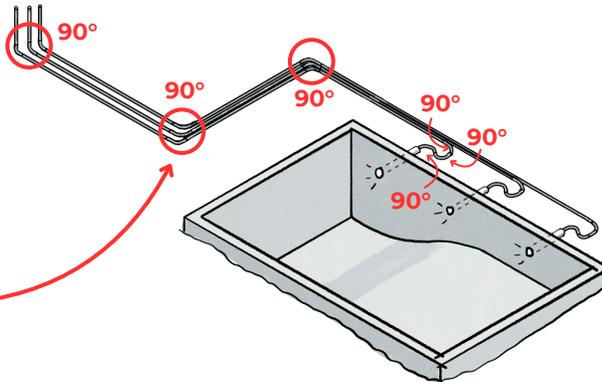
BIG SWEEPS

WHOLE STICKS OF PVC CAN BEND IN LARGE SWEEPS, AVOIDING THE NEED FOR SHARP 90° TURNS. THIS MAKES PULLING LIGHT WIRES MUCH EASIER.



DON'T EXCEED 360°

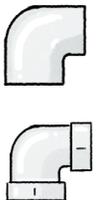
EXCESSIVE TURNS INCREASES THE LIKELIHOOD OF PROBLEMS DURING CONSTRUCTION AND WHEN SERVICING THE LIGHTS LATER.



DON'T

NEVER USE PLUMBING 90'S FOR ELECTRICAL

PLUMBING 90S TURN TOO TIGHTLY FOR ELECTRICAL WIRES TO BE SAFELY PULLED AND ARE **NOT RATED FOR ELECTRICAL USE.**



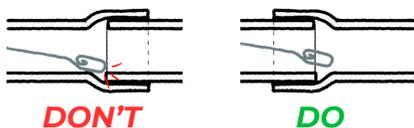
90° TOO CLOSE

PUTTING THE SWEEPS BACK TO BACK MAKES FISHING WIRES THROUGH EXTREMELY DIFFICULT. **TRY TO AVOID THIS IF AT ALL POSSIBLE.**



PRO TIP

← **EQUIPMENT LOCATION**



BELL DIRECTION MATTERS

WHEN LAYING THE CONDUIT, POSITION ALL THE BELLS IN THE SAME DIRECTION **FACING TOWARDS** THE EQUIPMENT SET. THIS WILL ALLOW THE FISH TAPE OR STRING TO AVOID GETTING SNAGGED IN THE CONNECTION POINTS.



RUNNING CONDUITS: GENERAL RULES

INSTALLING CONDUITS AS CHASE PIPES

BEST PRACTICES AND CODE REQUIREMENTS

WHEN RUNNING ANY ELECTRICAL CONDUIT, FOLLOW THESE BEST PRACTICES AND CODE REQUIREMENTS TO ENSURE A SAFE, EFFICIENT, AND COMPLIANT INSTALLATION:

BEST PRACTICES

- MAKE SURE ALL BELLS FACE THE SAME DIRECTION
- AVOID TIGHT TURNS WHEN POSSIBLE
- AVOID PLACING SWEEPS IN CLOSE PROXIMITY

CODE REQUIREMENTS:

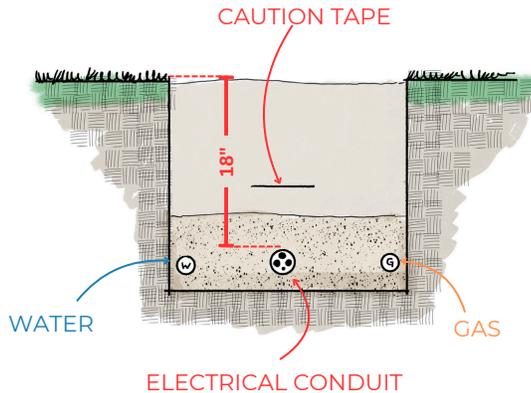
- DO NOT EXCEED 360 DEGREES OF BENDS
- AVOID CHANGING CONDUIT SIZES IN INACCESSIBLE LOCATIONS
- NEVER USE PLUMBING PIPE OR FITTINGS FOR ELECTRICAL INSTALLATIONS
- KEEP 12" MIN DISTANCE FROM WATER AND GAS LINES IN THE SAME TRENCH
- CONDUITS MUST BE BURIED 18" TO THE TOP OF THE PIPE (12" IF GFCI PROTECTED)



BURIAL & SEPARATION

ELECTRICAL LINES MUST BE SEPARATED FROM GAS AND WATER LINES BY 12" IF IN THE SAME TRENCH.

UNLESS GFCI PROTECTED, ELECTRICAL LINES MUST BE BURIED 18" TO TOP OF CONDUIT.



DIRECTION OF THE BELL MATTERS

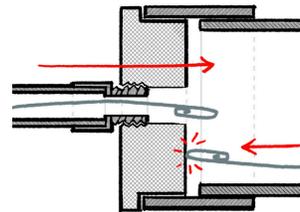
WHEN LAYING THE CONDUIT, POSITION ALL THE BELLS IN THE SAME DIRECTION **FACING TOWARDS** THE EQUIPMENT SET. THIS WILL ALLOW THE FISH TAPE OR STRING TO AVOID GETTING SNAGGED IN THE CONNECTION POINTS.



NEVER USE PLUMBING FITTINGS OR PIPE FOR ELECTRICAL



PLUMBING 90S TURN TOO TIGHTLY FOR ELECTRICAL WIRES TO BE SAFELY PULLED. PLUMBING PVC **IS NOT RATED FOR ELECTRICAL USE.**



AVOID CONDUIT SIZE CHANGES

UNLESS THE CHANGE OCCURS AT A PULL POINT (SUCH AS A JUNCTION BOX OR LB) AVOID CHANGING THE SIZE OF THE CONDUIT IN THE RUN. THIS MAKES FISHING WIRES EXCEPTIONALLY DIFFICULT, IF NOT IMPOSSIBLE. IF CORRECTIONS ARE REQUIRED, ADDITIONAL FEES MAY BE INCURRED.



PLANNING FOR AUTO COVERES

HOW TO RUN CONDUITS FOR EFFICIENCY

CODE REQUIREMENTS

THE **NEC** LIMITS THE NUMBER OF BENDS TO **360 DEGREES** BEFORE REQUIRING A PULLING POINT. THERE ARE THREE KEY REASONS FOR THIS LIMITATION:

1. **EASE OF PULLING:** TOO MANY TURNS MAKES THE WIRE DIFFICULT TO PULL
2. **REDUCE MECHANICAL STRESS:** EACH BEND ADDS RESISTANCE AND FRICTION, WHICH REQUIRES MORE FORCE TO PULL THE WIRE. THIS STRESS CAN DAMAGE THE WIRES, CONNECTORS, AND CONDUIT, REDUCING THE SYSTEM'S RELIABILITY AND SAFETY.
3. **AVOIDING STUCK WIRES:** TOO MANY BENDS CAN CAUSE WIRES OR PULLING DEVICES TO GET STUCK PARTWAY THROUGH THE CONDUIT, MAKING THE INSTALLATION TAKE LONGER THAN IT SHOULD OR FORCING COSTLY REWORK.

FOLLOWING THESE RULES NOT ONLY KEEPS YOU COMPLIANT BUT HELPS THE JOB FLOW MORE EFFICIENTLY.

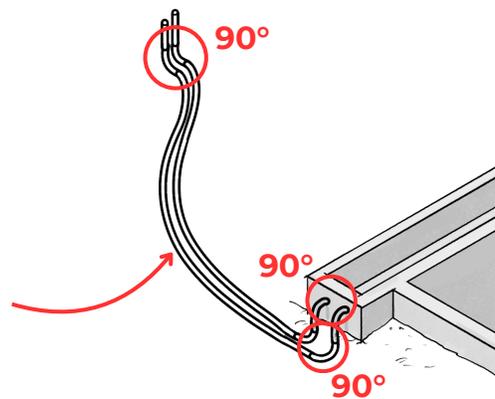
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TOTAL BENDS

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BIG SWEEPS

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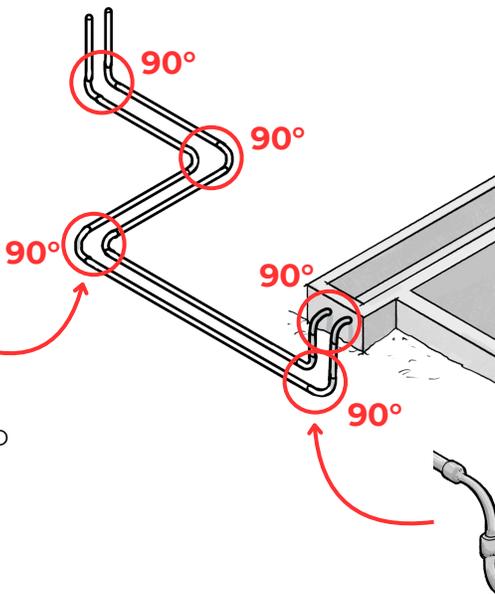


DON'T EXCEED 360°

EXCESSIVE TURNS INCREASES THE LIKELIHOOD OF PROBLEMS DURING CONSTRUCTION AND WHEN SERVICING THE LIGHTS LATER.

NEVER USE PLUMBING 90°S FOR ELECTRICAL

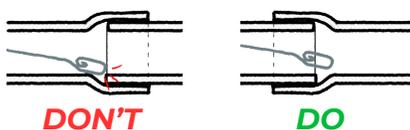
PLUMBING 90°S TURN TOO TIGHTLY FOR ELECTRICAL WIRES TO BE SAFELY PULLED AND ARE **NOT RATED FOR ELECTRICAL USE.**



90° TOO CLOSE
PUTTING THE SWEEPS BACK TO BACK MAKES FISHING WIRES THROUGH EXTREMELY DIFFICULT. **TRY TO AVOID THIS IF AT ALL POSSIBLE.**

PRO TIP

← **EQUIPMENT LOCATION**



DIRECTION OF THE BELL MATTERS

WHEN LAYING THE CONDUIT, POSITION ALL THE BELLS IN THE SAME DIRECTION **FACING TOWARDS** THE EQUIPMENT SET. THIS WILL ALLOW THE FISH TAPE OR STRING TO AVOID GETTING SNAGGED IN THE CONNECTION POINTS.



PLANNING FOR AUTO COVERES

KEY SWITCH PLACEMENT

CODE REQUIREMENTS: UL 325

CODE REQUIRES THAT THE KEY SWITCH MEET THE FOLLOWING TWO CRITERIA:

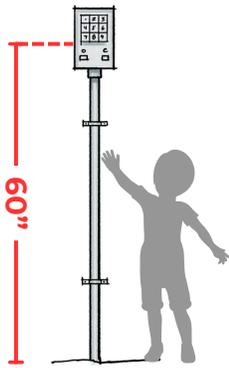
1. **THE KEY OR KEYPAD MUST BE AT LEAST 5' ABOVE THE SURROUNDING DECK.** THIS HELPS PREVENT UNQUALIFIED CHILDREN FROM ACCIDENTALLY CLOSING THE COVER WHILE SWIMMERS ARE STILL IN THE POOL
2. **THE OPERATOR MUST BE ABLE TO SEE THE ENTIRE POOL DURING OPERATION.** THIS HELPS PREVENT CLOSING THE COVER ON SWIMMERS WHO CANNOT BE SEEN

FOLLOWING THESE RULES IS CRITICAL FOR SWIMMER SAFETY. **SAFEWATER WILL NOT INSTALL AUTO COVER WIRING IF THESE CONDITIONS ARE NOT MET.**



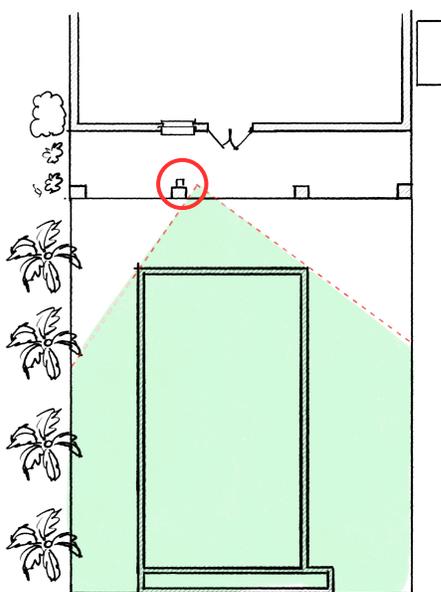
KEY PAD LOCATION

PLACE THE KEYPAD IN A LOCATION WHERE THE OPERATOR CAN SEE THE ENTIRE BODY OF WATER WHILE OPERATING THE COVER.

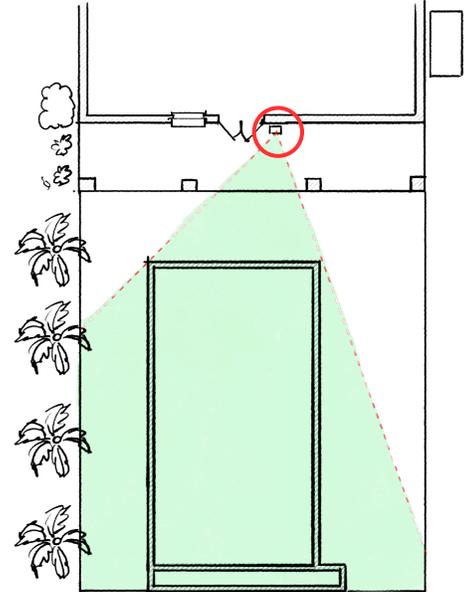


5' KEY PAD HEIGHT

THE AUTO COVER KEY PAD **MUST** BE POSITIONED AT 5'



FULL VISIBILITY



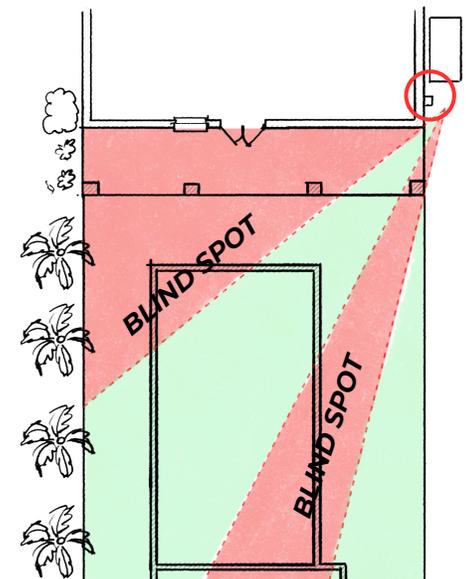
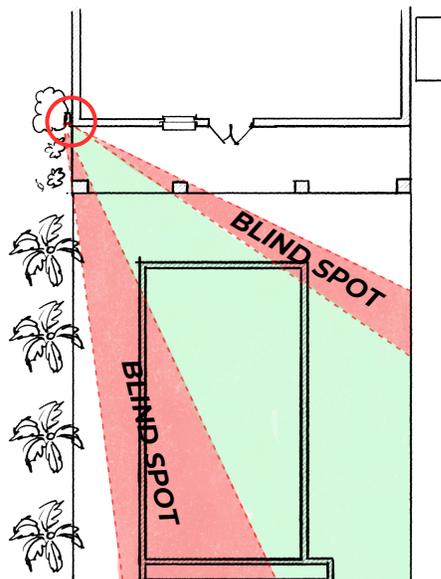
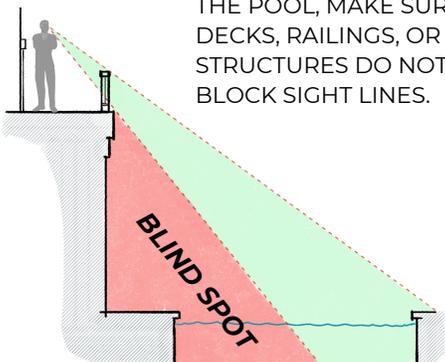
FULL VISIBILITY



AVOIDE LOCATIONS WITH BLOCKED LINES OF SIGHT

ELEVATION

IF THE KEYPAD IS ABOVE THE POOL, MAKE SURE THAT DECKS, RAILINGS, OR OTHER STRUCTURES DO NOT BLOCK SIGHT LINES.





GENERATOR CLEARANCE REQUIREMENTS

NFPA 37 & 110 GUIDELINES

HORIZONTAL CLEARANCE

MUST ALLOW READY ACCESS FOR:

- MAINTENANCE
- REPAIRS
- FIRST RESPONDERS

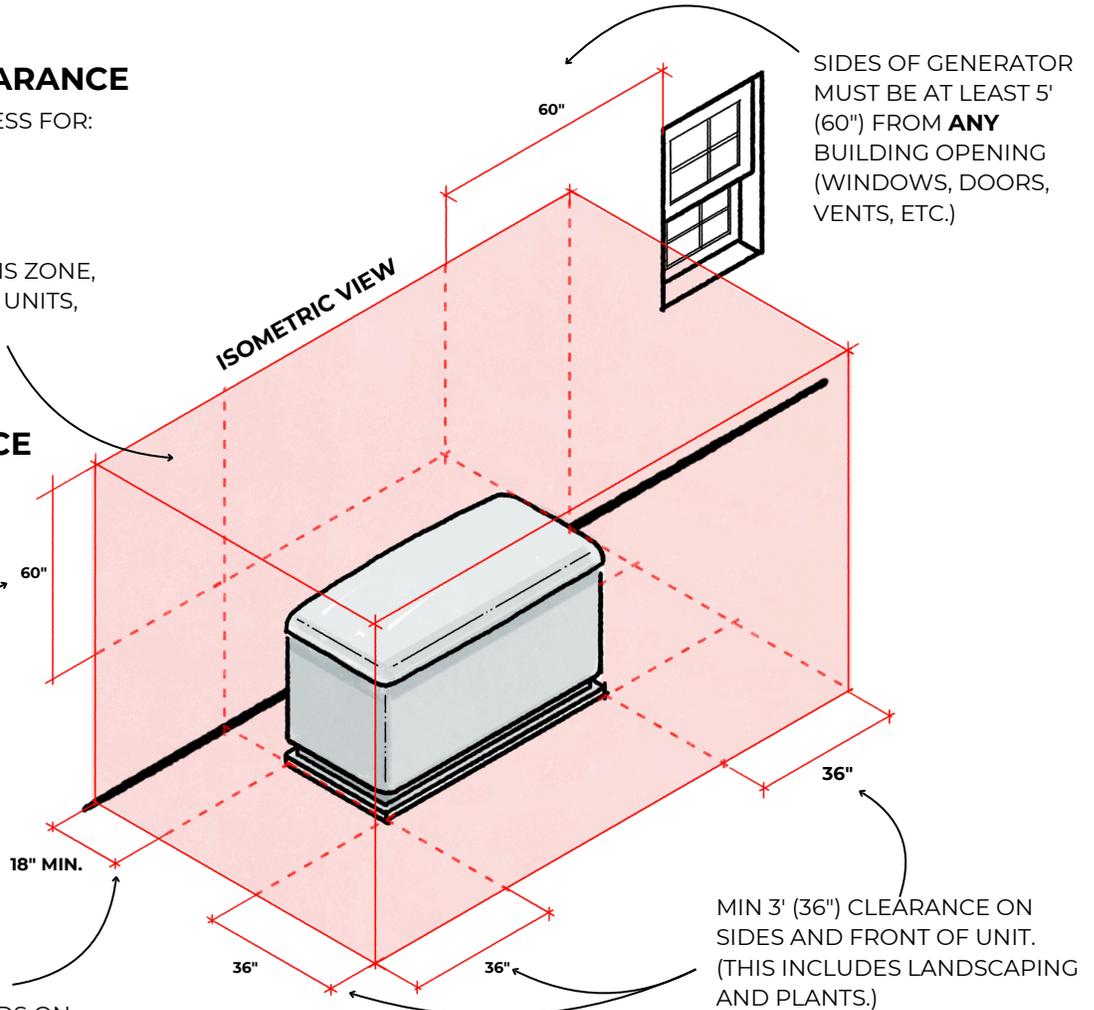
NOTHING ALLOWED IN THIS ZONE, INCLUDING PLANTS, HVAC UNITS, POOL EQUIPMENT, ETC.

VERTICAL CLEARANCE

THERE MUST BE 5' (60") OF CLEAR SPACE ABOVE THE GENERATOR.

DO **NOT** INSTALL GENERATOR UNDER A WOODEN DECK OR PLATFORM

18" MINIMUM. (BUT UP TO 60") BUILDING CLEARANCE DEPENDS ON MAKE AND MODEL OF GENERATOR.



CHECK WITH THE JURISDICITON HAVING AUTHORITY FOR ANY ADDITIONAL REQUIREMENTS.



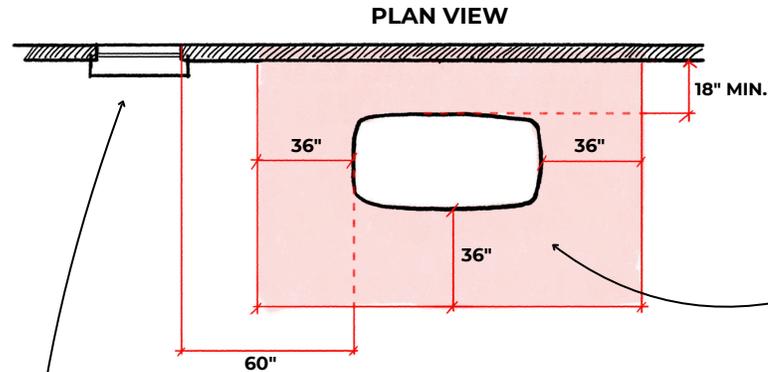
INSTALLATION OF ANY EQUIPMENT, STRUCTURES, OR MATERIALS WITHIN THE DESIGNATED CLEARANCE ZONE MAY RESULT IN FAILED INSPECTIONS, SAFETY HAZARDS, AND ADDITIONAL CORRECTIVE COSTS. ENSURE ALL COMPONENTS REMAIN OUTSIDE THIS AREA TO MAINTAIN COMPLIANCE AND AVOID ADDITIONAL FEES, DELAYS, OR REWORK.





GENERATOR CLEARANCE REQUIREMENTS

NFPA 37 & 110 GUIDELINES

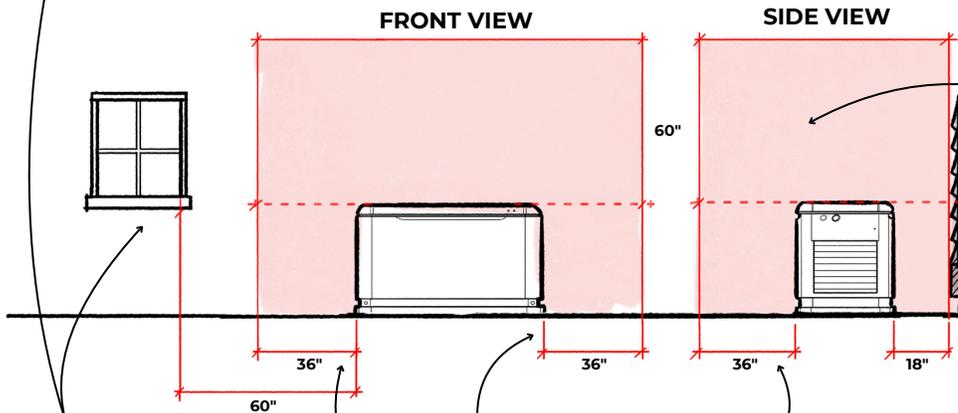


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- MAINTENANCE
- REPAIRS
- FIRST RESPONDERS

NOTHING ALLOWED IN THIS ZONE, INCLUDING PLANTS, HVAC UNITS, POOL EQUIPMENT, ETC.



VERTICAL CLEARANCE

THERE MUST BE 5' (60") OF CLEAR SPACE ABOVE THE GENERATOR.

DO **NOT** INSTALL GENERATOR UNDER A WOODEN DECK OR PLATFORM

SIDES OF GENERATOR MUST BE AT LEAST 5' (60") FROM **ANY** BUILDING OPENING (WINDOWS, DOORS, VENTS, ETC.)

MIN 3' (36") CLEARANCE ON SIDES AND FRONT OF UNIT. (THIS INCLUDES LANDSCAPING AND PLANTS.)

18" MINIMUM. (BUT UP TO 60") BUILDING CLEARANCE DEPENDS ON MAKE AND MODEL OF GENERATOR.

CHECK WITH THE JURISDICTION HAVING AUTHORITY FOR ANY ADDITIONAL REQUIREMENTS.



INSTALLATION OF ANY EQUIPMENT, STRUCTURES, OR MATERIALS WITHIN THE DESIGNATED CLEARANCE ZONE MAY RESULT IN FAILED INSPECTIONS, SAFETY HAZARDS, AND ADDITIONAL CORRECTIVE COSTS. ENSURE ALL COMPONENTS REMAIN OUTSIDE THIS AREA TO MAINTAIN COMPLIANCE AND AVOID ADDITIONAL FEES, DELAYS, OR REWORK.

