

FIELD MANUAL · VOLUME 19

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# Bonded. Sealed. Signed.

The pool is bonded once. Wire it before the gunite cures.

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PREPARED FOR

Operators · Project Managers · Designers · Integrators · Owner's Reps

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MANIFESTO

# The pool is bonded once. Wire it before the gunite cures.

Vol 19 governs the automation, hydraulics, heating, sanitization, lighting, and equipotential bonding of Restrepo Innovations luxury residential pools and spas across the NJ/NY metro corridor. Every bond conductor, every pump circuit, and every conduit stub serving the pool shell must be set, photographed, and inspected before the gunite crew mobilizes. Rebar corrects at framing. Bond wire corrects before the pour. Salt cells and UV systems are sequenced before the deck pours. The pool is not a water feature added to a finished yard — it is infrastructure from the first excavation stake.

SCOPE

Residential-only. Applies to new luxury in-ground pool and spa construction and major renovations within Restrepo Innovations projects in the NJ/NY metro corridor (IECC Climate Zone 4A). Covers gunite/shotcrete and fiberglass construction. Governing codes: NEC 2020/2023 Article 680 (NJ UCC, NJAC 5:23-3.16), Virginia Graeme Baker Pool and Spa Safety Act (VGBA), DOE 10 CFR 431 Subpart Z (effective 2021-07-19), NSF/ANSI 50/60, ANSI/APSP-7/8/16, IRC 2021 Chapter 42, NJ UCC NJAC 5:23, ASHRAE 90.2. Cross-references Vol 02 (Electrical Rough-In), Vol 16 (Geothermal), and the Pre-Pool Bonding Standard sidecar. The manifesto: the pool is bonded once. Wire it before the gunite cures.

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PART 1

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# Automation & Hydraulics

Sections 01–04 — Why Pool Automation Now, Automation Platforms, Pumps & Hydraulics, Water F

§ 01

# Why Pool Automation Now

PART I — AUTOMATION & HYDRAULICS

The luxury residential pool has crossed from a recreational amenity into a precision energy and water management system. Variable-speed federal mandates, remote chemistry dosing, smart-home scene integration, and single-shot bonding discipline have made pool automation infrastructure as consequential as the home's electrical service. Every decision made before the gunite cures — bond grid, conduit stubs, niche frames, and drain positions — is locked for the life of the pool.

THE FOUR PARTS OF THIS VOLUME

| Part                        | Sections | Primary Disciplines                                                          |
|-----------------------------|----------|------------------------------------------------------------------------------|
| I — Automation & Hydraulics | 01–04    | Platform selection, VS pumps, DOE compliance, water features, vanishing edge |
| II — Heat & Water           | 05–07    | Gas heaters, heat pumps, salt/UV/AOP sanitization, LED lighting              |
| III — Code & Bonding        | 08–10    | NEC 680 bonding, conduit discipline, Crestron/Lutron/C4 integration          |
| IV — Discipline & Closeout  | 11–13    | Without written direction, pre-gunite checklist, QC/audit/closeout           |

FIELD RULE

**Bond before gunite. Conduit before deck.**

The two irreversible gates on every pool project: (1) the equipotential bond grid #8 AWG solid copper must be set, photographed, and approved before the gunite crew arrives — no corrective access after the shell is poured; (2) all conduit stubs for wet niches, J-boxes, and equipment circuits must be positioned, pull-stringed, and capped before the deck pour. Both gates are one-shot opportunities. The pool is bonded once. Wire it before the gunite cures.

SPECIFICATION

**Residential-only discipline.**

Every provision in Vol 19 is residential. We do not reference commercial or multifamily standards as primary authority. DOE 10 CFR 431 Subpart Z applies to all single-family pool pump motors above 0.711 THP effective 2021-07-19. NEC 2020 Article 680 is the electrical floor; NEC 2023 Article 680 expansions are noted where NJ AHJ adoption is anticipated. Confirm with the AHJ before permit submittal on each project.



**NOTE****NJ code stack — UCC, not IPC.**

New Jersey adopts the NEC 2020 electrical subcode (NJAC 5:23-3.16) and the IRC 2021 Chapter 42 / International Swimming Pool and Spa Code pool barrier requirements as amended by NJ UCC (NJAC 5:23). The NJ pool subcode requires AHJ sign-off on the bonding and grounding certificate at construction. All permit documents must cite the applicable NJ UCC section, not the base model code section alone.

§ 02

# Automation Platforms

PART I — AUTOMATION & HYDRAULICS

The luxury residential pool automation market is consolidated around three OEM ecosystems: Pentair IntelliCenter, Jandy AquaLink RS, and Hayward OmniLogic. Each uses an RS-485 serial bus to connect the head-end controller to variable-speed pumps, valve actuators, chemical controllers, heaters, and LED light engines. Platform selection governs the quality of third-party smart-home integration, the driver maturity available for Crestron Home, Control4, and Lutron RA3, and the long-term serviceability of the installed system.<sup>1</sup>

PENTAIR INTELLICENTER PLATFORM COMPARISON

| Model                  | Relays          | Spa Body | Wireless           | Best Application                                |
|------------------------|-----------------|----------|--------------------|-------------------------------------------------|
| IntelliCenter i5P      | 5 (exp. to 40)  | No       | ICL Plus40 900 MHz | Standard residential pool; no spa body required |
| IntelliCenter i5PS     | 5 (exp. to 40)  | Yes      | Yes                | Pool + spa; 5 relay base with expansion         |
| IntelliCenter i8PS     | 8 (exp. to 40)  | Yes      | Yes                | Feature-rich pool + spa; waterfall relays       |
| IntelliCenter i10P     | 10 (exp. to 40) | No       | No                 | Large systems; separate wired panel             |
| IntelliCenter Lite i5P | 5               | No       | Sold separately    | Retrofit / smaller equipment pad                |

Expansion to 40 relays is achieved through up to three i10X expansion enclosures. The system supports up to 16 IntelliFlo VSF pump heads on a single RS-485 bus and up to 10 assignable IntelliValve actuators. IntelliCenter communicates to the Pentair Pool app via TCP/IP over the local area network; cloud connectivity is secondary. For luxury projects, a wired Cat6A drop from the MDF to the equipment pad is required — Wi-Fi backhaul at 60–100 ft over concrete decks and landscape is not reliable for control panel integration.<sup>2</sup> The ControlWorks Crestron Home driver provides real-time bidirectional control of all IntelliCenter circuits directly within the Crestron Home processor; each IntelliCenter instance requires a separate driver license.<sup>3</sup>

JANDY AQUALINK RS AND HAYWARD OMNILOGIC COMPARISON

| Platform                   | Panels / Relays                    | Bus    | Cloud Bridge                              | 3rd-Party Driver                         |
|----------------------------|------------------------------------|--------|-------------------------------------------|------------------------------------------|
| Jandy AquaLink RS Z4/Z6/Z8 | 4–16 relays; Z-series designations | RS-485 | iAquaLink IQ900 Wi-Fi bridge <sup>4</sup> | Crestron Home native; Control4 certified |



|                            |                                         |            |                                       |                                             |
|----------------------------|-----------------------------------------|------------|---------------------------------------|---------------------------------------------|
| Hayward OmniLogic (HLBASE) | 4 base (exp. to 16); 12 valve actuators | RS-485     | Ethernet + OmniLogic app <sup>5</sup> | Crestron Home certified; Control4 certified |
| Hayward OmniHub            | 3 VS pumps; 2 valve controls            | Wi-Fi mesh | Integrated <sup>6</sup>               | Limited 3rd-party; AquaRite via comm board  |

## NETWORK INFRASTRUCTURE REQUIREMENTS

| Requirement                            | Specification                                                                                                                                  |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Cat6A drop — MDF to equipment pad      | Shielded Cat6A; dedicated 1-inch PVC conduit; 100-ft max for 10G; static IP assignment at router                                               |
| RS-485 bus polarity and termination    | A+/B– polarity maintained through all splices; 120-ohm termination resistor at bus end; Belden 9842 or equivalent 22 AWG shielded twisted pair |
| Pool automation VLAN                   | Dedicated VLAN isolating pool controller, booster pump, and IP cameras from general IoT devices                                                |
| SPD on network switch at equipment pad | Transient voltage protection on Cat6A port; pool bonding zone requires surge-protected switch port                                             |
| Wi-Fi use policy                       | Primary control: wired LAN only. Wi-Fi: secondary / owner app fallback; never primary for Crestron/Control4 integration                        |

### FIELD RULE

#### ScreenLogic2 is a legacy bridge — IntelliCenter is the replacement.

ScreenLogic2 (Pentair) bridges legacy IntelliTouch and EasyTouch systems to the home network via Ethernet. Firmware has not been updated beyond build 5.2.738 (2019).<sup>7</sup> On any new construction or system replacement, IntelliCenter is the correct platform. Do not specify ScreenLogic2 for new installations. Any retrofit encountering a Compool or Autelis bridge requires complete controller replacement with IntelliCenter or iAquaLink 3.0.

### SPECIFICATION

#### Owner credential discipline at closeout.

After commissioning, the installing dealer creates the Pentair Pool app, iAquaLink, or OmniLogic app account on behalf of the owner. Credential ownership is transferred to the owner at final walkthrough. The dealer account is removed from cloud access unless the owner explicitly retains service access in writing. Static IP assignments for all pool devices are documented in the owner closeout package with VLAN number, switch port assignments, and subnet information.

**BEST PRACTICE****Local LAN execution — Crestron, Control4, and Lutron RA3.**

Crestron Home and Control4 execute all pool automation sequences locally on the LAN without cloud dependency. A cloud outage at Pentair, Jandy, or Hayward servers does not interrupt Crestron Home or Control4 local execution.<sup>8</sup> Lutron RA3 integrates with Control4 or Crestron as the integration host; there is no direct Lutron-to-pool-controller native driver. Pico keypads at pool-area locations provide local lighting scene control independent of the automation host.

**SOURCES**

<sup>1</sup> [Pentair IntelliCenter Info Sheet](#) <sup>2</sup> [Pentair IntelliCenter Product Page](#) <sup>3</sup> [ControlWorks IntelliCenter Crestron Home Driver](#) <sup>4</sup> [Jandy AquaLink RS Product Page](#) <sup>5</sup> [Hayward OmniLogic HLBASE Installation Manual](#) <sup>6</sup> [Hayward OmniHub Installation Manual](#) <sup>7</sup> [Pentair ScreenLogic2 Software Downloads](#) <sup>8</sup> [Crestron Home Pool Controllers Documentation](#)

## § 03

# Pumps & Hydraulics

## PART I — AUTOMATION & HYDRAULICS

Federal law prohibits single-speed pool pumps above 0.711 THP on filtered residential pools. DOE 10 CFR 431 Subpart Z, effective July 19, 2021, mandates variable-speed drive on all self-priming inground pool pumps above 1.0 THP and sets minimum Water Energy Factor requirements for pumps above 0.711 THP.<sup>9</sup> This is not a code option — it is a federal energy conservation regulation with enforcement authority. All specified pumps in this section are DOE-compliant variable-speed products. Motor circuits are 230V single-phase; RS-485 control runs are separate from the motor circuit conduit.

### VARIABLE-SPEED PUMP SURVEY — SPECIFIED PRODUCTS

| Manufacturer / Model                  | THP     | WEF           | Max GPM   | RS-485         | Notes                                                                          |
|---------------------------------------|---------|---------------|-----------|----------------|--------------------------------------------------------------------------------|
| Pentair IntelliFlo3 VSF (3 HP)        | 3.0     | 7.1           | 140       | IntelliCenter  | Sensorless flow control; GPM-mode setpoints; 230V/20A <sup>10</sup>            |
| Pentair IntelliFlo3 VSF (1.5 HP)      | 1.5     | 9.4           | 90        | IntelliCenter  | Compact residential; 230V; loss-of-prime detection                             |
| Pentair IntelliFlo XF VSF             | 3.0–5.0 | Per curve     | Per curve | IntelliCenter  | Large pools; high-flow water features; negative-edge returns <sup>11</sup>     |
| Hayward TriStar VS 900 (SP3202VSP)    | 1.85    | Per ESTAR     | Per curve | OmniLogic      | ENERGY STAR certified; 600–3450 RPM; 230/115V <sup>12</sup>                    |
| Hayward TriStar VS 950 (SP32950VSP)   | 2.70    | Per ESTAR     | Per curve | OmniLogic      | 4-year warranty; 230V; replaces 3 HP single-speed <sup>13</sup>                |
| Jandy VS FloPro 1.85 HP (VSFHP185DVS) | 1.85    | Per ESTAR     | Per curve | AquaLink RS    | 115V/230V dual voltage; SpeedSet controller or iQPUMP01 <sup>14</sup>          |
| Jandy VS FloPro 2.7 HP (VSFHP270AUT)  | 2.7     | Per ESTAR     | Per curve | AquaLink RS    | ENERGY STAR certified; adjustable base for retrofit <sup>14</sup>              |
| Jandy ePump (VSPHP270)                | 2.7     | Per MFR       | Per curve | AquaLink RS    | AO Smith PM motor; ~10% motor efficiency improvement over FloPro <sup>15</sup> |
| Waterway Power Defender 270 (PD-270)  | 2.7     | DOE compliant | Per curve | RS-485 compat. | NSF/ANSI 50; 50 PSI rated; Viton shaft seal; 230V <sup>16</sup>                |

### HYDRAULIC DESIGN — PIPE SIZING AND VGBA COMPLIANCE

| Design Element                    | Specification                                                                                                      | Authority                 |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------|---------------------------|
| Main suction pipe                 | 2-inch nominal minimum; velocity $\leq 3$ ft/s on suction side                                                     | NSF/ANSI 50; APSP-8       |
| Return manifold                   | 1.5-inch minimum; 2-inch preferred for VS pump performance                                                         | Hydraulic best practice   |
| Suction velocity limit            | $\leq 3$ ft/s suction; $\leq 6$ ft/s discharge; sweep elbows on suction side                                       | APSP-7; designer standard |
| Dual main drains                  | Minimum two sumps; centers $\geq 3$ ft apart; ASME/ANSI A112.19.8 or ANSI/APSP-16 anti-vortex covers <sup>17</sup> | VGBA; ANSI/APSP-7         |
| Anti-vortex cover rating          | Cover flow rating $\geq$ max pump GPM at any programmed speed                                                      | VGBA; APSP-16             |
| SVRS requirement                  | SVRS or auto pump shutoff on any single blockable main drain                                                       | VGBA; ANSI/APSP-7         |
| Booster pump — Polaris PB4-60     | 3/4 HP; 115/230V; dedicated GFCI circuit; bonding lug to #8 AWG grid <sup>18</sup>                                 | DOE 10 CFR 431; NEC 680   |
| In-floor cleaning — Paramount PV3 | Pressure pop-up heads; dedicated 2-inch suction from main drain; NSF/ANSI 50 <sup>19</sup>                         | APSP-8; NSF 50            |

#### SPECIFICATION

### DOE 10 CFR 431 — variable speed is not optional above 0.711 THP.

DOE 10 CFR Part 431, Subpart Z (effective July 19, 2021) prohibits the sale and installation of single-speed pool pumps above 0.711 THP for filtered residential pools.<sup>9</sup> A further Final Rule issued in 2023 extended and expanded minimum WEF standards phased by THP class. Specifying or installing a single-speed pump above this threshold is a federal violation. All pump branches must carry GFCI protection per NEC 680.21(C). Motor circuits are 230V single-phase; the RS-485 control cable terminates separately at the load center data port.

#### FIELD RULE

### **Pump wiring — motor circuit and RS-485 control circuit are separate.**

For each VS pump: (1) Motor circuit — 230V/60Hz single-phase, dedicated breaker in pool subpanel, sized per pump nameplate (IntelliFlo3 3 HP: 20A minimum), copper only, 10 AWG for runs ≤50 ft, 8 AWG for 50–100 ft; GFCI breaker at subpanel; PVC Schedule 40/80 conduit from subpanel to pump pad; LFMC for final 3 ft flexible connection to motor. (2) RS-485 control circuit — 22 AWG 2-conductor shielded twisted pair in separate low-voltage conduit; shield drain wire terminated at load center only, pump end floating.

#### INSPECTION STANDARD

### **Vanishing-edge surge tank sizing — confirm before shell pour.**

A vanishing-edge pool requires a dedicated surge (balance) tank sized for bather displacement + evaporation allowance + 10–15% wave action reserve, with a 25% safety margin. For NJ/NY Climate Zone 4A, size for 4 gallons per linear foot of overflow edge per day evaporation allowance. The surge tank must be below frost depth (36-inch minimum in NJ) or insulated and heated. A dedicated variable-speed return pump (IntelliFlo3 VSF or IntelliFlo XF) sized for the overflow flow rate and the static head return differential.

#### SOURCES

<sup>9</sup> DOE 10 CFR 431 Subpart Z — eCFR <sup>10</sup> IntelliFlo3 VSF Installation Guide <sup>11</sup> IntelliFlo XF VSF Product Page <sup>12</sup> TriStar VS 900 Spec Sheet <sup>13</sup> TriStar VS 950 Spec Sheet <sup>14</sup> Jandy VS FloPro Product Page <sup>15</sup> Jandy ePump Reference <sup>16</sup> Waterway Power Defender 270 <sup>17</sup> VGBA (CPSC) <sup>18</sup> Polaris PB4-60 Manual <sup>19</sup> Paramount PV3 Product Page

§ 04

# Water Features

PART I — AUTOMATION & HYDRAULICS

Water features — perimeter overflow, vanishing edge, deck-level, scuppers, laminar jets, and fire bowls — each impose dedicated pump circuits, surge tank sizing, and specialty plumbing that must be resolved before the shell is poured. Dedicated variable-speed feature pumps are the specification standard; feature pump stub-outs installed during construction are far less expensive than trenching after the deck is set.

WATER FEATURE TYPES — DESIGN REQUIREMENTS

| Feature Type                    | Pump Requirement                                                                                                    | Key Design Discipline                                                                                        |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| Perimeter overflow / deck-level | Dedicated VS feature pump; surge tank sized for perimeter overflow volume                                           | Surge tank below pool deck level; frost-protected in NJ/NY; overflow weir elevation critical                 |
| Vanishing / negative edge       | IntelliFlo XF or IntelliFlo3 VSF sized for overflow edge GPM; separate from filtration pump                         | Surge tank sizing per bather + evaporation + wave action formula; separate circuit in automation controller  |
| Scuppers (wall and fountain)    | Single VS pump per scupper bank or shared feature pump at appropriate GPM                                           | Dedicated automation relay; flow balance between multiple scuppers via adjustable valves                     |
| Laminar jets (deck jets)        | Dedicated VS pump; pressure-sensitive to laminar stream quality; low-flow precision required                        | Separate pressure line from filtration system; automation relay + speed setpoint for laminar quality         |
| Fire bowls (gas)                | No pool pump — separate gas valve and ignition; automation relay for gas valve control                              | Gas line by licensed plumber; AHJ permit; manual shutoff within sight of appliance; no feature pump required |
| Waterfall / grottos             | IntelliFlo3 VSF or IntelliFlo XF depending on flow and head; single-speed permitted if $\leq 1.0$ THP DOE threshold | Dedicated relay in load center; drain valve stub-out during construction for winterization                   |

**BEST PRACTICE****Install feature pump stub-outs during construction.**

During pool shell construction, install all conduit stubs, suction and return plumbing stubs, and automation relay wiring for any anticipated water feature — even features deferred to a future phase. The cost of concrete-encased conduit stubs at construction is measured in hundreds of dollars; the cost of deck core drilling and trenching after completion is measured in thousands. Stub-outs: 2-inch PVC for pump suction and return; 1-inch PVC conduit for automation wiring; pull string installed.

**SPECIFICATION****Surge tank freeze protection — NJ Climate Zone 4A.**

Vanishing-edge and deck-level overflow surge tanks must be sized and positioned below frost depth (36-inch minimum for NJ/NY) or must include an electric freeze-protection heating element with freeze-stat interlock. The tank must be structural concrete or gunite; fiberglass is acceptable if the installer provides freeze-expansion protection documentation. The automation controller monitors the air temperature probe and triggers the surge tank return pump at  $\leq 38^{\circ}\text{F}$  to maintain circulation.

**FIELD RULE****Single lighting brand per project — this applies to water feature lighting too.**

Decorative feature lighting (scupper lights, fiber optic, underwater LED in grottos) must be coordinated with the primary pool lighting brand to enable synchronized shows through the automation controller. Cross-brand show synchronization through a single controller is not achievable. Specify a single OEM for all water-feature and underwater luminaires on each project.

PART 2

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# Heat & Water

Sections 05–07 — Heating, Sanitization, Lighting & Underwater Optics



§ 05

# Heating

PART II — HEAT & WATER

NJ Climate Zone 4A requires freeze-protection automation, cover-detect interlocks, and COP derating for heat pump sizing below 50°F ambient. Gas heaters handle rapid heat-up and cold-snap supplementation; heat pumps provide base-load efficiency for the May–October swim season. A hybrid unit (Pentair UltraTemp ETi) combines both in one enclosure with a 93% gas efficiency rating. All gas heaters must carry ANSI Z21.56 and UL 372 listings; all heat pumps require dedicated 240V circuits with GFCI protection per NEC 680.21.

GAS HEATER SURVEY — SPECIFIED PRODUCTS

| Manufacturer / Model                                | BTU/hr           | Fuel                 | Heat Exchanger      | Automation           | Notes                                                                        |
|-----------------------------------------------------|------------------|----------------------|---------------------|----------------------|------------------------------------------------------------------------------|
| Pentair MasterTemp 400 <sup>20</sup>                | 400,000          | NG or LP             | Cupro-nickel        | RS-485 or relay      | Low-NOx; polymer enclosure; ASME HLW stamp; 2-inch water connections         |
| Pentair MasterTemp 250 <sup>20</sup>                | 250,000          | NG or LP             | Cupro-nickel        | RS-485 or relay      | Same family as 400; 4-inch Category I/III flue; electronic ignition          |
| Pentair UltraTemp ETi Hybrid 218 kBTU <sup>21</sup> | 218,000 combined | NG or LP + heat pump | Titanium HX         | RS-485 IntelliCenter | 93% gas efficiency; full-flow bypass; heat pump COP: 4.0 at 50°F             |
| Jandy JXi 260K BTU (JXI260N/P) <sup>22</sup>        | 260,000          | NG or LP             | Cu (Cu-Ni optional) | RS-485 AquaLink      | 84% thermal efficiency; low-NOx; digital display; combustible surface listed |
| Jandy JXi 400K BTU (JXI400N/P) <sup>22</sup>        | 400,000          | NG or LP             | Cu (Cu-Ni optional) | RS-485 AquaLink      | 84% efficiency; AquaLink RS native; same footprint as LXi                    |

|                                                  |                    |           |                     |                 |                                                                   |
|--------------------------------------------------|--------------------|-----------|---------------------|-----------------|-------------------------------------------------------------------|
| Hayward H-Series Universal H400FDN <sup>23</sup> | 400,000            | NG        | Cupro-nickel        | RS-485 or relay | Low-NOx Universal H-Series; millivolt or 240V; outdoor rated      |
| AquaCal HeatWave SuperQuiet SQ140R <sup>24</sup> | 114,000 (80/80/80) | Heat pump | Titanium ThermoLink | RS-485 or relay | COP 5.7 (80/80/80); COP 4.0 (80/50/63); 208–230V; 60A max fuse    |
| AquaCal HeatWave SuperQuiet SQ200R <sup>24</sup> | 138,000 (80/80/80) | Heat pump | Titanium ThermoLink | RS-485 or relay | COP 6.1 (80/80/80); adds only 2 PSI at 45 GPM; VS pump compatible |

## HEAT PUMP SIZING — NJ CLIMATE ZONE 4A COP DERATING

| Condition                          | COP (Hayward HP140) | BTU Output (HP140)      | Design Implication                                            |
|------------------------------------|---------------------|-------------------------|---------------------------------------------------------------|
| 80°F ambient / 80°F water / 80% RH | ~5.5                | 140,000 BTU/hr          | Peak summer; maximum efficiency                               |
| 60°F ambient / 80°F water / 63% RH | ~4.8                | ~118,000 BTU/hr         | NJ spring and fall shoulder; primary design condition         |
| 50°F ambient / 80°F water / 63% RH | 4.0                 | ~85,000 BTU/hr          | NJ early May / mid-October; derate heat pump by 40%           |
| Below 45°F ambient                 | ~2.5–3.0            | Significant degradation | Below heat pump efficient range; gas supplementation required |

### SPECIFICATION

#### Cover-detect interlock — heater blocked when cover is closed.

If an automatic pool cover is installed, the heater and heat pump must be interlocked to shut off when the cover is in the closed position. The cover limit switch signal connects to the automation controller (IntelliCenter cover-detect input, AquaLink RS cover circuit, OmniLogic virtual circuit). The interlock prevents heat accumulation under the cover and prevents excessive humidity or pressure buildup beneath a closed safety cover. Freeze-protection circulation pump continues operating regardless of cover position.

**FIELD RULE****Gas supply — dedicated line, manual shutoff, BTU budget.**

Each gas heater receives a dedicated gas line with a manual shutoff valve within sight of the appliance per NFPA 54 (National Fuel Gas Code) and NJ UCC. A sediment trap is required on the gas supply line per NJ UCC Title 5, Chapter 23. The installing team must calculate total BTU demand against the meter capacity before commissioning; addition of a 400K BTU heater to an existing residential meter serving a full-load home may require meter upsizing. Venting per manufacturer installation manual and NJ UCC; Category I (Type B vertical) or Category III (positive-pressure) as required by the heater model.

**BEST PRACTICE****Freeze protection — automation logic, probe placement, and pool cover.**

Automation controller detects ambient temperature via an air probe at the equipment pad. When temperature drops below 38°F, the controller activates circulation at low speed to keep water moving through the heater and exposed plumbing. Pool cover must be opened before any freeze-protection pump cycle to allow heat exchange. MasterTemp and JXi heaters include integral freeze protection; verify communication with the automation system to prevent conflict between the heater's internal freeze logic and the controller's freeze-protection sequence.

**SOURCES**

<sup>20</sup> [Pentair MasterTemp Heater Installation Guide](#) <sup>21</sup> [Pentair UltraTemp ETi Hybrid Brochure](#) <sup>22</sup> [Jandy JXi Pool Heater Product Page](#) <sup>23</sup> [Hayward HeatPro Sell Sheet](#) <sup>24</sup> [AquaCal HeatWave SuperQuiet Brochure](#)

§ 06

Sanitization

PART II — HEAT & WATER

Salt chlorine generators (SCG), ultraviolet sanitizers, ozone, and advanced oxidation process (AOP) systems each carry NSF/ANSI 50 certification requirements that must be verified and filed at closeout. The Restrepo target water chemistry for saltwater pools: FAC 1–3 ppm, pH 7.2–7.6, salt 2700–3400 ppm, ORP 650–750 mV, total alkalinity 80–120 ppm, calcium hardness 200–400 ppm, CYA 30–60 ppm. No salt cell, UV system, or AOP unit is commissioned without its NSF/ANSI 50 certificate filed in the closeout record.

SALT CHLORINE GENERATOR SURVEY

| Model                                                  | Pool Capacity | Chlorine Output (24-hr cont.) | Input Power           | Integration                                                     |
|--------------------------------------------------------|---------------|-------------------------------|-----------------------|-----------------------------------------------------------------|
| Pentair IntelliChlor IC15 <sup>25</sup>                | 15,000 gal    | 0.52 lbs/day                  | ~110W                 | IntelliCenter RS-485; app display                               |
| Pentair IntelliChlor IC20 <sup>25</sup>                | 20,000 gal    | 0.70 lbs/day                  | 115/230V<br>~110W     | IntelliCenter RS-485; self-cleaning reverse polarity            |
| Pentair IntelliChlor IC40 <sup>25</sup>                | 40,000 gal    | 1.40 lbs/day                  | 115/230V<br>~220W     | IntelliCenter RS-485; standard luxury residential               |
| Pentair IntelliChlor IC60 <sup>25</sup>                | 60,000 gal    | 2.00 lbs/day                  | 115/230V              | IntelliCenter RS-485; large pools                               |
| Jandy TruClear XL <sup>26</sup>                        | 45,000 gal    | Per MFR                       | 120/240V dual voltage | AquaLink RS; dual gas traps; transparent inspection window      |
| Jandy TruClear (compact) <sup>27</sup>                 | 11,000 gal    | Per MFR                       | 120V                  | AquaLink RS iAquaLink                                           |
| Hayward AquaRite T-Cell-9 <sup>28</sup>                | 25,000 gal    | Per MFR                       | 240V                  | OmniLogic (HLAQRPCB comm board); reverse polarity self-cleaning |
| Hayward AquaRite T-Cell-15 (W3T-CELL-15) <sup>28</sup> | 40,000 gal    | Per MFR                       | 240V                  | OmniLogic; HLAQRPCB comm board required for full integration    |

UV, OZONE, AND AOP SANITIZATION SURVEY

| System | Technology | Voltage | Flow Capacity | NSF 50 | Notes |
|--------|------------|---------|---------------|--------|-------|
|--------|------------|---------|---------------|--------|-------|

|                                            |                                                       |           |            |                     |                                                                                             |
|--------------------------------------------|-------------------------------------------------------|-----------|------------|---------------------|---------------------------------------------------------------------------------------------|
| Paramount Ultra UV2 <sup>29</sup>          | UV-C 253.7 nm; 2-lamp Series 2                        | 230V      | 80 GPM max | NSF/ANSI 50 Level 1 | Dual lamp; 99.9% Crypto kill; end-of-life alert output; assembled USA                       |
| Pentair BioShield <sup>30</sup>            | UV-C germicidal; flow-through                         | Per MFR   | Per MFR    | NSF 50 listed       | Downstream of filter; upstream of heater; IntelliCenter integration                         |
| Delta UV DUV-L (residential) <sup>30</sup> | UV-C; single or dual lamp                             | 120V      | Per model  | NSF 50              | Bypass loop install; low-pressure UV; 12–18 month lamp replacement                          |
| DEL Ozone AOP (CD + UV) <sup>31</sup>      | Corona discharge ozone + UV-C; hydroxyl radical (AOP) | 110/2 40V | 30–40 GPM  | NSF 50 Supplemental | EPDM/Viton seals required; off-gas vent to atmosphere; destruct unit upstream of pool inlet |
| Pentair ClearO3 (ozone-only) <sup>32</sup> | Corona discharge ozone; no UV AOP                     | 120V      | Per model  | NSF Supplemental    | Oxidizing system; reduces combined chlorine; not full AOP                                   |

#### SPECIFICATION

##### NSF/ANSI 50 and NSF/ANSI 60 — certificates filed at closeout.

NSF/ANSI 50 covers all pool and spa equipment: pumps, filters, heaters, chemical feeders, UV systems, and drain covers.<sup>33</sup> NSF/ANSI 60 covers pool chemicals (sodium hypochlorite, muriatic acid, cyanuric acid). Both certificates must be filed in the closeout record. All pool chemicals are sourced from NSF/ANSI 60 certified manufacturers; verify certification via the NSF online database before procurement. No salt cell is commissioned without the NSF/ANSI 50 listing document on file.

#### FIELD RULE

##### IntelliChem and Sense and Dispense — ORP and pH probe discipline.

Pentair IntelliChem and Hayward Sense and Dispense continuously monitor ORP and pH via dual sensor probes and dispense acid (or CO2) for pH control and liquid sanitizer for ORP/chlorine control. ORP target: 650–750 mV for well-chlorinated pool. pH probe replacement: every 12–18 months. ORP probe replacement: every 12–24 months. Calibration: monthly minimum using certified pH 4.0 and 7.0 buffer solutions; ORP calibration at 465 mV reference. Stenner Classic Series peristaltic pumps handle acid and hypochlorite feed; self-priming, run-dry tolerant.

**NOTE****Ozone off-gas management — enclosed equipment rooms.**

Ozone is toxic above certain concentrations. Equipment rooms or enclosed equipment pads housing DEL AOP or any ozone-injection system require minimum ventilation per ANSI Z9.2. Ozone is injected downstream of all equipment into a contact chamber with minimum 30-second dwell time. A catalytic ozone destruct unit is required upstream of the pool inlet on high-dose systems. All materials in contact with ozonated water must be ozone-compatible: EPDM, Viton, or PTFE seals; no natural rubber.

**SOURCES**

<sup>25</sup> [Pentair IntelliChlor IC15/20/40/60 Installation Guide](#) <sup>26</sup> [Jandy TruClear XL Product Page](#) <sup>27</sup> [Jandy TruClear Product Page](#)  
<sup>28</sup> [Hayward AquaRite Product Manual](#) <sup>29</sup> [Paramount Ultra UV2 Product Page](#) <sup>30</sup> [Pentair BioShield / UV Reference](#) <sup>31</sup> [CMP DEL AOP Systems](#) <sup>32</sup> [ClearO3 AOP Residential](#) <sup>33</sup> [NSF/ANSI 50 Pool and Spa Certification](#)

§ 07

# Lighting & Underwater Optics

PART II — HEAT & WATER

Underwater pool luminaires are governed by NEC 680.23 (wet-niche listings), NEC 680.24 (junction box height and placement), and NEC 680.26 (bonding of forming shells). Three OEM platforms are specified: Pentair IntelliBrite 5G Color, Hayward ColorLogic 320, and Jandy WaterColors LED Gen 2 with HydroCool. A single lighting brand must be specified per project — cross-brand color-show synchronization through a single automation controller is not achievable.

UNDERWATER LUMINAIRE SURVEY

| Fixture                                               | Voltage     | Wattage | Listing              | Color Shows         | Notes                                                                             |
|-------------------------------------------------------|-------------|---------|----------------------|---------------------|-----------------------------------------------------------------------------------|
| Pentair IntelliBrite 5G Color <sup>34</sup>           | 120V or 12V | 40–55W  | NEC 680.23 wet-niche | 5 colors + 7 shows  | RS-485 addressable via IntelliCenter; show synchronization across fixtures        |
| Pentair IntelliBrite 5G White <sup>34</sup>           | 120V or 12V | 40–55W  | NEC 680.23 wet-niche | White only          | 300W–500W equivalent lumen output; 12V version requires listed safety transformer |
| Hayward ColorLogic 320 <sup>35</sup>                  | 12V–15V     | 23W     | NEC 680.23 wet-niche | 16 colors + 7 shows | OmniDirect Mode adds 20 colors + dimming; 700 lm cloud white; 1.5-inch niche      |
| Jandy WaterColors LED Gen 2 (niched) <sup>36</sup>    | 12V AC      | 24W     | NEC 680.23 wet-niche | RGBW + shows        | HydroCool technology; 8 in shorter than prev. gen; AquaLink RS integration        |
| Jandy WaterColors LED Gen 2 (nicheless) <sup>36</sup> | 12V AC      | 24W     | NEC 680.23 listed    | RGBW + shows        | 1.5-inch return fitting; Dark Sky warm white available; no niche installation     |

NEC 680.23/680.24 — WET-NICHE AND JUNCTION BOX REQUIREMENTS

| NEC Requirement | Specification |
|-----------------|---------------|
|-----------------|---------------|

|                                   |                                                                                                                                                                  |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NEC 680.23 wet-niche listing      | Forming shell: brass or corrosion-resistant metal; conduit entries required; nonmetallic shells for LED fixtures exempt from shell bonding per NEC 680.26(B)(5)  |
| NEC 680.23 water depth            | Minimum 4 inches of water above fixture face when operating; no fixture above water surface on a wet-niche base                                                  |
| NEC 680.24(A) J-box vertical      | Not less than 4 inches above finished deck grade, or not less than 8 inches above maximum water level — whichever is greater                                     |
| NEC 680.24(A) J-box horizontal    | Not less than 4 ft from inside wall of pool; listed UL 1241 swimming pool junction box; two metal conduits threaded wrench-tight into enclosure                  |
| Low-voltage transformer placement | Listed safety isolation transformer, secondary $\leq 15V$ ; located outside pool equipment area, minimum 5 ft from pool wall (or separated by permanent barrier) |
| Conduit from niche to J-box       | PVC Schedule 40 RNC or brass RMC; no IMC in wet-niche run; no splices in conduit; J-box is only splice point; pull string in conduit at construction stub-out    |

#### SPECIFICATION

#### VA sizing for 12V luminaires — transformer sizing rule.

For Pentair IntelliBrite 5G LED at 12V: 40–55 VA per fixture depending on model. For Hayward ColorLogic 320: 23 VA. For Jandy WaterColors nicheless: 24 VA. Multi-light transformer VA must equal or exceed the sum of all connected fixture wattages plus a 25% headroom factor. 120V IntelliBrite fixtures connect directly to a GFCI-protected 120V circuit without a transformer. Verify the transformer's secondary voltage matches the installed fixture (12V vs. 120V); incorrect transformer voltage destroys LED driver boards.

#### DO NOT

#### Cross-brand LED lighting on the same pool — without written direction.

IntelliBrite 5G Color shows and Hayward ColorLogic shows use different color sequencing protocols. When multiple brands are installed on the same pool, the automation controller can trigger each independently but cannot synchronize show timing or color matching. The result is visible color mismatch during automated shows. We do not specify mixed-brand pool lighting on a single project without written direction from the owner acknowledging the synchronization limitation.



**FIELD RULE****ColorLogic transformer placement — at the J-box, not at the subpanel.**

The Hayward ColorLogic 320 transformer is installed in the listed UL 1241 junction box at the pool deck, not at the subpanel. The 120V feed from the subpanel runs to the J-box; the transformer steps down to 12–15V for the fixture. The J-box must be at the NEC 680.24 height minimums before the deck is poured. Transformer secondary voltage must match the installed fixture specification.

**SOURCES**

<sup>34</sup> [Pentair IntelliBrite 5G Color Product Page](#) <sup>35</sup> [Hayward ColorLogic 320 Brochure](#) <sup>36</sup> [Jandy WaterColors LED Gen 2 Product Page](#)

PART 3

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# Code & Bonding

Sections 08–10 — NEC 680 Bonding & Grounding, Conduit & Wiring Discipline, Smart-Home Integra

§ 08

# NEC 680 Bonding & Grounding

PART III — CODE & BONDING

NEC 2023 Article 680 governs all electrical installations for swimming pools, spas, hot tubs, and fountains. The equipotential bonding conductor (#8 AWG solid copper, NEC 680.26) equalizes voltages in the pool zone to prevent shock from voltage gradients. It is not the equipment grounding conductor (EGC). The EGC provides fault-current return to trip the overcurrent device; the bond conductor creates equipotential. Both are required; both are separate conductors. The bond grid is set before gunite. There is no corrective access after the pour.

NEC 680.26 EQUIPOTENTIAL BONDING — BONDED PARTS

| NEC 680.26 Element                       | Requirement                                                                                                                                                                             |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (B)(1) Perimeter conductors              | #8 AWG solid Cu encircling pool shell rebar; bonded to rebar at minimum four uniformly spaced points around the perimeter; all rebar tied at 12-inch max spacing <sup>37</sup>          |
| (B)(2) Perimeter surface                 | Bond grid extending 3 ft horizontally from inside walls on all surfaces (paved and unpaved); deck rebar bonded to shell bonding every 4–6 ft via brass split bolts <sup>38</sup>        |
| (B)(3)/(4) Metal fittings                | All metal ladders, handrails, diving board stands, starting blocks, and metal fittings within or attached to the pool structure                                                         |
| (B)(5) Electrical equipment metal parts  | Metal parts of pumps, filters, heaters, lighting fixtures, junction boxes, and all pool circulation and sanitization equipment                                                          |
| (B)(6) Water heating/sanitization equip. | Gas heater bonding lug on enclosure bonded to #8 AWG equipotential grid; heat pump metal enclosure bonded if within 5 ft of pool wall                                                   |
| (C) Water bond                           | Minimum 9 sq-in (5800 mm <sup>2</sup> ) conductive metal surface in contact with pool water; typically skimmer, return fitting, or underwater niche in contact with water <sup>39</sup> |

NEC 680 GFCI AND RECEPTACLE REQUIREMENTS

| NEC Section                 | Requirement                                                                                                                                 |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| 680.21(C) Motor GFCI        | All pool pump motors on branch circuits 150V or less to ground and 60A or less, single-phase, require Class A GFCI protection <sup>40</sup> |
| 680.21(D) Motor replacement | Replacement pool pump motors must have GFCI even if not originally required                                                                 |
| 680.22(A) Receptacles       | All 125V–250V, 60A or less receptacles within 20 ft of inside pool wall: GFCI protected (NEC 2023 expanded to 250V) <sup>41</sup>           |
| 680.22(A)(2) 6-ft clearance | No receptacle within 6 ft of inside pool wall                                                                                               |

|                                          |                                                                                                                                |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| 680.22(A)(3) Required convenience outlet | At least one 125V, 15 or 20A GFCI outlet 6–20 ft from inside wall, not more than 6 ft 6 in above grade                         |
| 680.12 Equipment disconnect              | Within sight from equipment; not less than 5 ft horizontally from inside pool wall; readily accessible; lockable <sup>42</sup> |
| 230.67 SPD on pool subpanel              | Type 2 SPD at pool subpanel; minimum 40 kA SCCR; parallel-connected 120/240V; status indicator <sup>43</sup>                   |

**SPECIFICATION**

**Bond grid documentation — photographed before gunite pour.**

The equipotential bond grid must be photographed with a timestamp before the gunite crew mobilizes. Photographs must show: (1) the #8 AWG conductor encircling the shell rebar at minimum four bonded points; (2) the water bond stub with its 9 sq-in conductive element in water-contact position; (3) all wet-niche conduit stubs and forming shell frames; (4) dual main drain frames centered at minimum 3 ft apart. The photo set is uploaded to the project cloud folder the same day. This is the Restrepo pre-gunite gate record; the pool does not pour without it.

**FIELD RULE**

**Bond conductor vs. EGC — these are different conductors.**

The #8 AWG solid copper equipotential bond conductor (NEC 680.26) is not required to connect back to the service panel or the subpanel neutral/ground bar. Its function is equipotential: it connects all metal parts in the pool zone to the same voltage reference to eliminate shock from voltage gradients. The equipment grounding conductor (EGC), sized per NEC Table 250.122 (minimum 12 AWG on 20A circuits), provides fault-current return to trip the overcurrent device. Both conductors run with each pool equipment circuit; confusion between them is a code violation.

**INSPECTION STANDARD**

**NEC 680.24 J-box height — stake before deck pour.**

Junction box position must be staked at the correct NEC 680.24 heights before the deck is poured: not less than 4 inches above finished deck grade, and not less than 8 inches above the maximum water level, whichever is greater; and not less than 4 ft from the inside wall of the pool. The J-box location is set during construction, not after the deck cures. AHJ inspection of the J-box stub-out location is required before the deck pour on NJ projects.

**SOURCES**

<sup>37</sup> NEC 680.26(B) Equipotential Bonding <sup>38</sup> ExpertCE: Equipotential Bonding NEC 2023 <sup>39</sup> PaCode Alliance: Pool Bonding Requirements <sup>40</sup> Leviton: NEC 680.21(C) GFCI Pool Pump Motors <sup>41</sup> Leviton: GFCI Requirements NEC 2023 <sup>42</sup> NEC Article 680 by Mike Holt <sup>43</sup> DITEK: NEC 230.67 Surge Protection

§ 09

# Conduit & Wiring Discipline

PART III — CODE & BONDING

Pool wiring discipline begins with conduit type and ends with subpanel labeling. PVC RNC Schedule 40/80 is the default for all in-deck and buried pool circuits. No BX/MC armored cable is used in any pool-deck or buried application without written direction. The pool subpanel is listed for wet location (NEMA 3R minimum), carries a Type 2 SPD per NEC 230.67, and every breaker is labeled with equipment description, voltage, amperage, and room designation at commissioning.

CONDUIT TYPE BY LOCATION — POOL CIRCUITS

| Location                                     | Required Conduit                                         | Notes                                                                     |
|----------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------------------|
| Underground from panel to equipment pad      | PVC RNC Schedule 40 or 80 (preferred); RMC/IMC permitted | PVC preferred for corrosion resistance; burial depth per NEC Table 680.10 |
| In-deck and under deck concrete              | PVC RNC Schedule 40 or 80                                | No BX/MC in pool deck or buried conduit without written direction         |
| Equipment pad — above grade pump connections | PVC Schedule 80 (impact-resistant) above grade           | Mechanical protection; stub above pad surface for final connection        |
| Wet-niche conduit run (in pool shell wall)   | PVC Schedule 40 RNC or brass RMC                         | No IMC in wet-niche run; no splices in conduit                            |
| Final flexible connection to pump motor      | Liquidtight flexible nonmetallic conduit (LFMC)          | Maximum 3 ft per NEC 680.21(A)(2); listed fittings                        |
| Above-grade runs in pool mechanical room     | IMC or RMC (preferred); EMT in dry zones                 | Metal conduit for mechanical protection; EMT not embedded in concrete     |
| Pool cover motor wiring (in-deck conduit)    | PVC Schedule 80 in deck; LFMC for final connection       | GFCI-protected branch circuit per NEC 680.27(A)                           |

NEC TABLE 680.10 — UNDERGROUND BURIAL DEPTHS

| Wiring Method                            | Minimum Cover                                                           |
|------------------------------------------|-------------------------------------------------------------------------|
| PVC Schedule 40/80 (nonmetallic raceway) | 18 inches (direct burial under landscape); 6 inches under concrete slab |
| RMC or IMC (metallic conduit)            | 6 inches under concrete; 6 inches under landscape                       |
| Under concrete driveway or parking       | 24 inches (NEC Table 300.5)                                             |
| Low-voltage landscape wiring (<30V)      | 6 inches                                                                |

|                      |                                              |
|----------------------|----------------------------------------------|
| Under pool deck area | 6 inches (concrete slab cover) <sup>44</sup> |
|----------------------|----------------------------------------------|

POOL SUBPANEL AND EQUIPMENT PAD INFRASTRUCTURE

| Element                        | Specification                                                                                                                                                            |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Subpanel enclosure rating      | NEMA 3R minimum for wet location; NEMA 4 preferred in exposed locations; main breaker sized for total pool load plus 25% headroom                                        |
| Surge Protective Device (SPD)  | Type 2 SPD per NEC 230.67; minimum 40 kA SCCR; 120/240V parallel-connected; status indicator and remote monitoring capability; Siemens FS140 or equivalent <sup>43</sup> |
| Circuit breaker labeling       | Every breaker labeled: equipment description, voltage, amperage, room designation; verified against load schedule at commissioning                                       |
| Ground bus                     | Insulated copper EGCs terminate on ground bus; ground bus bonded to neutral bus at main panel only (not subpanel)                                                        |
| Bonding bus                    | #8 AWG solid copper bond conductors from pool elements, equipment metal parts, water bond, and heater lug terminate on dedicated bonding bus at equipment pad            |
| Cat6A stub to automation panel | All-Cu shielded Cat6A pulled through dedicated 1-inch PVC conduit from MDF to equipment pad; static IP assigned; pull string in conduit for future expansion             |

DO NOT

**BX/MC in pool deck or buried conduit — without written direction.**

Type BX (MC armored cable) is not permitted in NEC Article 680 applications. NEC 680.21(A) specifies permitted wiring methods for pool pump motors: RMC, IMC, PVC, or liquidtight flexible conduit. MC cable is not on this list. The Restrepo field standard: no BX/MC cable on any pool or spa circuit, buried, in deck, or in any pool equipment area, without written direction from the AHJ specifying it for the specific project. Verbal direction does not satisfy this requirement.

SPECIFICATION

**Insulated copper EGC with every pool equipment circuit.**

An insulated copper equipment grounding conductor (EGC), green or green/yellow, sized per NEC Table 250.122 (minimum 12 AWG on 20A circuits), runs with every circuit feeding pool equipment. The EGC is separate from the #8 AWG bond conductor. Low-voltage pool circuits (RS-485 data, thermistor leads, cover limit switch, Cat6A stub): 12 AWG minimum in a separate low-voltage conduit from power circuits; shielded cable for RS-485 runs exceeding 50 ft; shield drain at load center only.

SOURCES

<sup>44</sup> [NEC 680 Underground Wiring — NESPA NJ Reference](#)

## § 10

# Smart-Home Integration

## PART III — CODE & BONDING

Crestron Home, Lutron RA3, and Control4 are the integration platforms for luxury pool and spa automation on Restrepo projects. All three execute scene sequences locally on the LAN processor without cloud dependency; a cloud outage at the pool OEM does not interrupt automation. Five locked scenes are programmed at commissioning on every project. Scene logic, trigger conditions, and sequence documentation are archived with the owner closeout package and committed to cloud and local media.

### FIVE LOCKED SCENES — REQUIRED ON ALL PROJECTS

| Scene          | Trigger                                         | Sequence of Operations                                                                                                                                                                                               |
|----------------|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Evening Swim   | Scheduled 7:00 PM or user-initiated             | Pool pump high speed; SCG 50%; heater to 82°F pool / 84°F spa; IntelliBrite Ocean Blue; waterfalls ON; landscape (Lutron RA3) pool surround 70%; cover OPEN if deployed; push notification to owner app              |
| Cocktail Hour  | User-initiated — Pico keypad, TSW-770, or voice | Pump filtration speed; spa heater 102°F; spa blower ON; lights Sunset Red show; waterfalls 50% reduced flow; landscape ambient 40%; audio zone ON via Crestron audio subsystem                                       |
| Cleaning Cycle | Scheduled daily 10:00 AM                        | Pool pump at max speed (3450 RPM / 2 hours); booster pump Polaris ON; waterfall OFF; heater OFF; SCG 100% during high-speed cycle; lights OFF                                                                        |
| Winter Mode    | Owner-initiated or automated calendar trigger   | Heater OFF; all features OFF; waterfall drain valve OPEN; cover CLOSED; SCG OFF; UV/ozone OFF; pump freeze-protect mode only (38°F threshold); notification: Winter Mode active                                      |
| Storm Lockdown | Weather alert or manual activation              | Cover CLOSE immediately; deck lighting OFF; waterfalls/fountains OFF; retractable awnings retract (Lutron shading); outdoor audio OFF; pump continue filtration at low speed; notification: Storm Lockdown activated |

### PUSH NOTIFICATION MATRIX — ALL PROJECTS

| Alert                   | Source                           | Threshold                                  |
|-------------------------|----------------------------------|--------------------------------------------|
| Low salt level          | IntelliChlor / AquaRite          | <3000 ppm (yellow indicator)               |
| Very low salt — SCG off | IntelliChlor / AquaRite          | <2600 ppm (red indicator; cell shuts down) |
| High ORP                | IntelliChem / Sense and Dispense | >800 mV                                    |
| Low ORP                 | IntelliChem / Sense and Dispense | <650 mV                                    |

|                     |                                         |                                                  |
|---------------------|-----------------------------------------|--------------------------------------------------|
| pH high / pH low    | IntelliChem / Sense and Dispense        | >7.8 / <7.0                                      |
| Pump VFD fault      | IntelliFlo3 / TriStar VS                | Drive fault code — logged to Crestron / Control4 |
| Freeze warning      | Air temp probe at equipment pad         | <38°F                                            |
| Heater fault        | MasterTemp / JXi / HeatPro error code   | Fault code — push notification + log             |
| Cover fault         | Coverstar limit switch                  | Cover stall or incomplete travel                 |
| UV lamp end of life | Paramount UV2 / BioShield hours counter | Hours counter threshold reached                  |

#### SPECIFICATION

##### **Crestron Home native pool driver — ControlWorks license required.**

The ControlWorks Pentair IntelliCenter driver for Crestron Home provides real-time bidirectional control of all IntelliCenter circuits, pump speeds, heater setpoints, chemical dosing status, and light scenes directly within the Crestron Home processor. Each IntelliCenter instance requires a separate driver license from ControlWorks. Crestron TSW-770 touch panel: pool page with pump speed slider, temperature display, circuit buttons, light color selector, and heater setpoint control. Hayward OmniLogic and Jandy iAquaLink IQ900 are Crestron Home certified natively.<sup>8</sup>

#### FIELD RULE

##### **Geofencing is a secondary trigger only — never primary.**

GPS geofencing events from smartphones are unreliable in NJ/NY suburban locations due to tree cover and multi-dwelling proximity. A false geofence exit or entry can trigger unnecessary heater-on cycles. Geofencing is appropriate only as a confirmatory secondary trigger paired with a time-of-day component: 'if home + 30 minutes to sunset, activate Evening Swim scene.' Pool chemistry dosing must be triggered by ORP/pH sensor feedback, not location. Heating pre-conditioning via Crestron Home calendar + weather forecast API integration is the preferred primary trigger for time-sensitive warm-up cycles.



**DO NOT****Voice control of pool cover — without written direction.**

Voice activation of the pool cover open/close from inside the house — where the pool is not in full view of the operator — is not permitted per NEC 680.27(A). The cover operating switch must be located such that the pool is in full view. Voice commands may activate lights, adjust temperature setpoints, and change pump speed. Cover automation is limited to the key-switch override at the equipment pad and the automation touch panel in sight of the pool. Cloud-dependent voice commands for cover control are an NEC violation and a safety hazard.

**BEST PRACTICE****Chemistry pre-conditioning via Crestron Home weather forecast.**

For scheduled pool use, Crestron Home integrates a third-party weather API to retrieve the next-day forecast. If predicted high temperature is above 75°F, the system pre-conditions the pool chemistry at midnight by pulsing the SCG to 100% for two hours and verifying ORP is above 650 mV before the morning session. If ORP is low at pre-conditioning, a push notification prompts the owner to test and adjust manually before swimming. This replaces the unreliability of geofencing with a deterministic calendar-weather trigger.

**SOURCES**

<sup>8</sup> [Crestron Home Pool Controllers Documentation](#) [Lutron RadioRA 3 Integration Resources](#)

PART 4

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# Discipline & Closeout

Sections 11–13 — Without Written Direction, Pre-Gunite & Pre-Deck Checklist, QC · Audit · Closeout

## § 11

# Without Written Direction

## PART IV — DISCIPLINE & CLOSEOUT

This section catalogs the practices we do not perform on a Restrepo pool or spa installation without written direction from the engineer of record, the architect of record, or the AHJ. None of these are universally wrong — many are common practice in other markets or under different project conditions. They require explicit, documented written direction in advance. Verbal direction does not satisfy this requirement.

### FIELD RULE

#### **BX/MC encapsulated in pool deck or buried conduit — without written direction.**

PVC RNC Schedule 40/80 is the default for all in-deck and buried pool wiring. Type BX (MC armored cable) is not used in any pool equipment area, pool deck, or buried conduit without written direction from the engineer of record specifying it for the specific project. NEC 680.21(A) does not list MC cable as a permitted wiring method for pool pump motors. The AHJ may permit it in limited conditions above grade and in dry zones; document the written direction before any MC cable is used on a pool or spa circuit.

### FIELD RULE

#### **Copper conductors on saline path without coated or listed fittings — without written direction.**

Salt water is corrosive to standard copper piping, copper heat exchangers, and copper fittings in the circulation path. All pool plumbing in contact with salt-chlorinated water uses CPVC, Schedule 80 PVC, or NSF/ANSI 50 listed polymer unions and fittings. Heaters specified for saltwater use carry cupro-nickel or titanium heat exchangers. We do not install uncoated copper plumbing in a saltwater pool circuit without written direction from the equipment manufacturer confirming the material is rated for the installed salt concentration.

### FIELD RULE

#### **Shared neutral on bedroom and equipment circuits — without written direction.**

Pool equipment circuits are not shared on a multi-wire branch circuit (MWBC) with any residential bedroom, bathroom, or habitable space circuit. The GFCI protection required on pump motor circuits (NEC 680.21(C)) and the AFCI protection required on habitable space circuits (NEC 210.12) create protection conflicts when shared neutrals are used. We do not share neutrals between pool equipment and habitable space circuits without written direction from the engineer of record.



**FIELD RULE****GFCI omitted on any pool pump motor branch circuit — without written direction.**

NEC 680.21(C) requires Class A GFCI protection on all pool pump motor branch circuits rated 150V or less to ground and 60 amperes or less, single-phase. This expanded requirement covers all residential 240V single-phase pump motors. Any omission of GFCI protection on a pool pump motor branch circuit is without written direction. GFCI circuit-breaker at the subpanel is the preferred implementation; in-line GFCI receptacle at the motor is not an acceptable substitute for a hardwired pump motor branch circuit.

**FIELD RULE****Pool light transformer fed above 120V to wet niche — without written direction.**

The 12V wet-niche transformer secondary voltage must not exceed 15V per NEC 680.23(A)(2) low-voltage contact limit definition. A transformer configured or miswired to deliver more than 15V to the wet niche is a shock hazard. We do not feed a wet niche at above-120V primary or configure any transformer for above-15V secondary to a pool light without written direction from the engineer of record. Confirm secondary voltage before energizing.

**FIELD RULE****Single-speed pump above 0.711 THP — without written direction.**

DOE 10 CFR 431 Subpart Z (effective July 19, 2021) prohibits single-speed pool pumps above 0.711 THP for filtered residential pools. Specifying or installing such a pump is a federal violation. We do not specify or install a single-speed pump above 0.711 THP on any filtered pool without written direction from a licensed engineer documenting a specific DOE exception applicable to the project.

**FIELD RULE****Surge protection omitted from pool subpanel — without written direction.**

NEC 230.67 (NEC 2020 and 2023) requires a Type 1 or Type 2 SPD at all new or upgraded residential service equipment. For pool subpanels downstream of the service panel, NEC 230.67 exception permits the SPD at the next downstream distribution point. A pool subpanel without a Type 2 SPD exposes the VS pump drives, automation controllers, SCG power centers, and heat pump compressor contactors to transient overvoltages from lightning events in the NJ/NY high-lightning-density region. We do not omit surge protection from a pool subpanel without written direction.

## § 12

# Pre-Gunite & Pre-Deck Checklist

## PART IV — DISCIPLINE & CLOSEOUT

The pre-gunite and pre-deck gates are the two most consequential quality control events in the Restrepo pool sequence. No gunite crew mobilizes without the pre-gunite gate signed off. No deck pour proceeds without the pre-deck gate signed off. Both gates are documented with timestamped photographs uploaded to the project cloud folder the same day the gate is cleared. The pool is bonded once — wire it before the gunite cures.

### PRE-GUNITE GATE — BOND GRID AND SHELL INFRASTRUCTURE

- ☐ **VERIFY** #8 AWG solid copper bond grid encircling shell rebar — confirmed at minimum four bonded points; all rebar tied at 12-inch max spacing; photographed before pour
- ☐ **VERIFY** Water-bond conductor pre-installed — minimum 9 sq-in metal-in-water contact element at each skimmer or return; conductor routed to equipment bond bar; location on as-built drawing
- ☐ **VERIFY** All wet-niche conduit stubs verified — PVC RNC to each niche location; pull string installed; conduit end capped; niche forming shell plumb and at correct depth
- ☐ **VERIFY** Dual main drain frames pre-set — level; centers  $\geq 3$  ft apart; ASME/ANSI A112.19.8 or APSP-16 anti-vortex covers rated for installed pump GPM; photographed before gunite
- ☐ **VERIFY** VGBA compliance confirmed — dual drains or SVRS documented; drain cover flow ratings verified against maximum pump speed in GPM
- ☐ **VERIFY** Bond conductor to all metal fittings within 5 ft of pool interior — skimmers, handrail anchors, ladder anchors, lights — all connected and photographed

### PRE-DECK GATE — CONDUIT AND INFRASTRUCTURE BEFORE POUR

- ☐ **VERIFY** Pump pad concrete elevation signed off — pad dimensions and elevation verified for pump, filter, heater, and heat pump clearances; embedded conduit stubs at correct height
- ☐ **VERIFY** NEC 680.24 J-box position staked — 4 inches above finished deck grade and 8 inches above maximum water level (whichever governs) and 4 ft from inside pool wall; AHJ pre-verified
- ☐ **VERIFY** Pool subpanel location approved by AHJ before deck pour — NEMA 3R enclosure position confirmed; conduit stubs to subpanel set in form
- ☐ **VERIFY** Cat6A drop conduit from MDF to equipment pad pulled and capped — dedicated 1-inch PVC conduit with pull string; separate from power conduit
- ☐ **VERIFY** All spare conduit stubs installed — 2-inch for future feature pump; 1-inch for future UV/ozone and smart-home low-voltage; caps and pull strings on all stubs
- ☐ **VERIFY** Owner archive package assembled — bond grid photos, niche conduit photos, drain frame photos, J-box stake photos, AHJ inspection date on file



**INSPECTION STANDARD****Pre-gunite gate sign-off requirement.**

The pre-gunite gate sign-off form is signed by the GC project manager, MEP lead, and Restrepo AV/smart-home lead before gunite is placed. The signed form is filed in the project record. Timestamped photographs of all pre-gunite items are uploaded to the project cloud folder the same day. No gunite crew mobilizes without the completed gate record on file. This is a contractual Restrepo requirement on every pool project regardless of scope.

**SPECIFICATION****Spare hardware — order placed before deck pour.**

The spare hardware order for all pool consumables ( $\geq 5\%$  of installed equipment value) must be placed before the deck is poured. Items: IntelliChlor IC40 replacement cell (or equivalent), pump seal kit (IntelliFlo3 shaft seal and o-rings), one replacement LED light module matching installed SKU, two pH electrodes, two ORP electrodes, IntelliChlor power center fuses, automation controller battery backup, pool cover cable spool, valve actuator backup, two replacement APSP-16 anti-vortex drain covers (matching installed). Delivered and labeled at project completion per Restrepo spare hardware policy.

## § 13

# QC · Audit · Closeout

## PART IV — DISCIPLINE & CLOSEOUT

Commissioning is the bridge between an installed pool automation system and a warranted, measured, owner-operated pool. Every Vol 19 project passes through the same closeout sequence: verify, document, register, train, deliver. The pool is bonded once, sanitized per chemistry specification, and programmed to five locked scenes. Nothing leaves Restrepo's hands until all ten QC gates are closed and the owner receives the complete documentation package.

### TEN QC GATE ITEMS — ALL REQUIRED AT CLOSEOUT

- ☐ **VERIFY** Bonded grid resistance reading — equipotential bond measured with calibrated ohmmeter at all bond conductor junctions; reading logged and filed in closeout record; typical passing: <1 ohm point-to-point
- ☐ **VERIFY** NEC 680 J-box height verified — field-measured at 4 in above deck grade and 8 in above maximum water level and 4 ft from inside pool wall; measurement and photograph in closeout file
- ☐ **VERIFY** NEC 680.21 motor GFCI installed — every pool pump motor branch circuit: GFCI breaker tested (trip tested with test button + GFCI tester); result logged for each pump circuit
- ☐ **VERIFY** VGBA dual-main-drain certificate filed — ASME/ANSI A112.19.8 or APSP-16 certification and maximum rated GPM for all installed drain covers submitted with closeout package; pump maximum GPM verified against cover rating
- ☐ **VERIFY** Salt cell NSF/ANSI 50 certificate — IntelliChlor, TruClear, or AquaRite NSF/ANSI 50 listing document confirmed and filed; UV system NSF/ANSI 50 certificate included if UV installed
- ☐ **VERIFY** Pump VFD commissioning report — variable-speed drive programmed speed setpoints (RPM or GPM) documented; maximum current draw at each programmed speed measured and logged; DOE 10 CFR 431 compliance label confirmed on pump nameplate
- ☐ **VERIFY** Heater venting and gas pressure test — gas line pressure tested to AHJ requirements before connection to heater; venting verified per manufacturer installation manual and NJ UCC; heater fired at full rate; output water temperature logged
- ☐ **VERIFY** Pool cover automation tested — open/close limit switches verified (controller receives open and closed state feedback); key-switch override tested; heater interlock tested (heater blocked when cover closed limit switch is active)
- ☐ **VERIFY** Crestron/Lutron/Control4 scene archive committed — five locked scenes programmed, demonstrated to owner, and tested; automation backup on cloud and local USB media; owner app account transferred to owner email at owner walkthrough
- ☐ **VERIFY** Spare parts ≥5% delivered + labeled — salt cell, pump seal kit, light module, pH/ORP electrodes, power center fuses, drain covers, valve actuator backup, cover cable; all in labeled bin in equipment room; list signed by owner at handoff

#### INSPECTION STANDARD

### Final QC gate — all ten items verified and signed.

All ten QC items are verified, documented, and signed before project handover. No QC item is waived without written direction from the Restrepo project manager. The commissioning report is delivered to the homeowner in writing with copies of all test results, resistance readings, certificate documents, and spare parts delivery photographs. The signed commissioning report is filed in the project record. Owner training covers all automation scene controls, maintenance schedules, spare hardware location, and emergency shutoff procedures.

#### BEST PRACTICE

### Owner handoff package — complete documentation discipline.

The owner handoff package includes: (1) Pentair Pool / iAquaLink / OmniLogic app account credentials transferred to owner email; (2) static IP assignments for all pool devices with VLAN number and switch port assignments; (3) as-built RS-485 bus diagram showing all connected devices, addresses, and termination points; (4) as-built electrical one-line diagram; (5) complete equipment list with model numbers, serial numbers, and warranty registration confirmations; (6) scene programming documentation for all five locked scenes; (7) spare parts inventory with storage location; (8) annual service schedule — electrode replacement dates, SCG cell inspection, UV lamp cycle, filter media; (9) emergency procedures: cover manual operation, equipment shutoff, pump isolation, emergency contacts.

#### CLOSING

The pool is bonded once. Wire it before the gunite cures. Every bond conductor was set and photographed before the pour. Every conduit stub was positioned and capped before the deck closed. Every pump is variable-speed and DOE-compliant. Every light is a single brand. Every scene was programmed, tested, and committed to the owner archive. Vol 19 is the standard. Vol 19 is the discipline.



# Bonded. Sealed. Signed.

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