

RESTREPO STANDARD

Sleeved. Sealed. Signed.

Pre-Hardscape Conduit & Sleeve Standard

Light · Sound · Heat · Sleeve

The yard is wired before the hardscape sets. Sleeves before stone. Conduit before concrete.

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PREFACE

The hardscape is permanent. The conduit beneath it is either there or it is not. Once the pool deck is poured, once the patio stone is mortared, once the driveway apron cures — the window closes forever. This standard codifies the pre-hardscape conduit and sleeve discipline that makes the outdoor living system survivable: nine domain sections, a QC gate, and citations. The yard is wired before the hardscape sets. Sleeves before stone. Conduit before concrete.

This standard does not replace manufacturer instructions, code authorities, or professional licensing. NEC 300.5, NEC 411, NEC 225, NJ UCC NJAC 5:23-3.16, IDA DarkSky criteria, IP55/IP65 ingress ratings, NEC 640, NEC 210.8(F), NEC 230.67, NEC 250.94, NJAC 7:10-10.3, and UL 1838/UL 1480/UL 1951 govern. Verify all specifications against current product data sheets prior to procurement. See Citations for primary source URLs. Residential-only scope.

The yard is wired before the hardscape sets.

Sleeves before stone. Conduit before concrete.

01 SLEEVE PLAN & NAMING

Five sleeve planning disciplines, executed before hardscape is set. Each sleeve is identified on a signed schedule, photographed before pour, and carried through to as-built documentation. Nothing goes under hardscape without a name, a photo, and a signature.

Red-Line Duct Bank

All conduit sleeves under hardscape are encased in a minimum 2-inch concrete envelope poured in-place as part of the hardscape sub-base. The concrete envelope is painted red or embedded with red-pigmented mix at the top surface to mark location. Red-line duct banks are photographed before any paving or stone is set. Photo is archived to the project record and signed by the GC and the Restrepo PM before hardscape proceeds.

3-inch PVC Sched 80 — Primary Sleeve

Primary sleeves for line-voltage branch circuits, home-run conduit bundles, and irrigation mainline crossing paths use 3-inch Schedule 80 PVC. Schedule 80 wall thickness provides impact and crush resistance at the hardscape transition zone. Spacers center-to-center 3 inches on-center where two or more sleeves run parallel in a common duct bank trench. Minimum 18-inch burial to top of concrete envelope.

Detectable Warning Tape

Non-metallic conduit runs under hardscape and in landscape receive detectable warning tape installed 6-8 inches above the top of the conduit run at time of burial. Tape color: red for electrical, blue for water/irrigation, orange for communications/data/audio. Tape is embossed 'CAUTION BURIED ELECTRICAL LINE' or equivalent per applicable utility marking standard.

Tracer Wire

Each buried non-metallic conduit run receives 14 AWG solid copper tracer wire pulled alongside the conduit and terminated at accessible access points at each end. Tracer wire enables locating of buried conduit with standard utility locating equipment. Tracer wire is bonded at each end to the intersystem bonding block per NEC 250.94.

Sleeve Schedule by Zone

A sleeve schedule is produced at design phase identifying every sleeve by zone designation (e.g., AUDIO-01, LV-LT-02, TV-03, IRR-04), conduit type and size, buried depth, crossing path, both end termination locations, and contents. Sleeve schedule is included in as-built documentation and signed by the Restrepo PM and the GC prior to hardscape pour.

SPEC · SLEEVE SCHEDULE LOCK

No hardscape pour proceeds before: (1) red-line duct bank photographed, (2) sleeve schedule completed and signed by GC and Restrepo PM, (3) all unused sleeves capped and labeled, (4) detectable tape and tracer wire confirmed installed. Sleeve deviations require written direction from the Restrepo principal.

SLEEVE NAMING & NOTES

- Unused sleeves are capped above grade on both ends with conduit plugs and documented on the sleeve schedule as 'spare.' Spare sleeves are labeled at both ends with the project ID and zone designation.
- Long-radius sweep elbows (minimum 24-inch radius for 1-inch and larger conduit) at all direction changes. No standard 90-degree elbows underground. Pull boxes at all access points.
- Sleeve naming convention: [SYSTEM]-[ZONE]-[SEQ], e.g., AUDIO-PATIO-01, LVLT-FRONT-02, TV-POOL-01, IRR-REAR-01. Consistent naming carried through sleeve schedule, as-builts, and panel schedule.
- BX/MC cable under hardscape requires written direction from the Restrepo principal. Default is PVC Schedule 40 or 80 for all runs under paving, decking, concrete, or mortar-set stone.
- Where sleeves cross the pool deck zone, PVC Schedule 80 is required per NEC 680.10 and Restrepo field standard. Refer to Vol 19 for pool-zone conduit discipline.

02 CONDUIT TYPE & BURIAL DEPTH

NEC 300.5 Table 300.5(A) governs minimum cover by wiring method and location. PVC Schedule 80 in pool deck and hardscape transition zones. PVC Schedule 40 at 18 inches in unprotected ground. RGS 6 inches at exposed risers. LFNC at moveable or vibration-isolated equipment final connection.

WIRING METHOD	MIN COVER	CODE REF	NOTES
PVC Sched 80 (pool deck, hardscape)	6 inches under concrete	NEC 300.5 / 680.10	Schedule 80 PVC in pool deck and areas with mechanical exposure. 6-inch cover under 2-inch concrete slab.
PVC Sched 40 (unprotected ground)	18 inches	NEC 300.5 Table	Standard residential landscape burial. 18-inch minimum in unprotected ground for all circuits above 30V.
RGS / IMC (exposed riser)	6 inches	NEC 300.5 Table	Rigid galvanized steel or IMC at exposed above-grade risers and where AHJ requires metal conduit.
LFNC / Sealtite (moveable equipment)	18 inches if buried	NEC 356	Liquidtight flexible nonmetallic conduit at final connection to motorized or vibration-isolated equipment.
UF Cable / Class 2 LV (<30V)	6 inches	NEC 300.5 Table Col 5	Low-voltage landscape lighting at 30V or less in UF cable. 6-inch minimum. PVC conduit requires 18 inches.
Under driveway / roadway (all types)	24 inches	NEC Table 300.5	All conduit crossing driveway or roadway requires 24-inch minimum regardless of conduit type.

CONDUIT DISCIPLINE

- NEC 300.5 Table 300.5(A) governs minimum cover by wiring method and location. Column 5 applies to Class 2/3 landscape wiring at 30V or less in UF cable or identified cable: 6-inch minimum cover.
- NEC 300.50 underground spacing: where raceways are installed in parallel, separation is maintained per NEC 300.50 and conduit fill per NEC Chapter 9 Tables 1 and 4 (40% max fill for 2 or more conductors).
- PVC Schedule 80 is required where conduit exits concrete slabs, at transition points subject to physical damage, and in pool-deck zones per NEC 680.10.
- LFNC at moveable or vibration-isolated equipment: maximum 2-3 ft at final connection point. Not used for underground runs. Schedule 40 or 80 PVC terminates at above-grade transition fitting.
- BX/MC cable under hardscape or in landscape burial requires written direction. Default conduit is PVC Schedule 40 or 80 for all Restrepo Vol 20 project runs.
- Spare hardware: minimum 5% spare PVC fittings, couplings, pull-box covers, and caps delivered at closeout, serialized and labeled per project closeout standard.

03 LV LIGHTING STUB-OUTS

FX Luminaire Luxor ZD/ZDC transformer stub-outs are set before hardscape. Hub or daisy-chain topology, 12-15V tap selection, voltage drop verification, IP68 Coastal Source connectors, and NEC 411/UL 1838 compliance are addressed here.

FX Luminaire Luxor ZD/ZDC Transformer Locations

FX Luminaire Luxor LZD-150-M / LZD-300-M or LZDC-150 / LZDC-300 transformers are mounted at finished grade at minimum 12 inches above finished grade per FX installation manual. Transformer location stub-outs are set before hardscape at each transformer mounting post. Each stub-out is 1-inch PVC Schedule 40 with a GFCI-protected 20A 120V circuit per NEC 210.8 and a weatherproof in-use cover per NEC 406.9(B)(1). Transformer locations are documented on the sleeve schedule.

Hub vs. Daisy-Chain

Systems with 20 or more fixtures or where consistent color temperature is critical use the hub method: hub junction nodes placed in the field with multiple fixture leads at equal lead-wire lengths. Hub nodes eliminate wire-nut splices in the landscape and reduce long-term failure points. Daisy-chain is acceptable for systems under 20 fixtures where run-end voltage remains at or above 10V at the last fixture under full load.

12V vs. 15V Tap Rules

FX LED fixtures require 10-15V at the fixture. Close Zone 0-40 ft: 12 AWG max 160W at 12V tap. Mid Zone 40-80 ft: 12 AWG max 120W; select 13 or 14V tap to compensate run voltage drop. Far Zone 80-120 ft: use 10 AWG and 14 or 15V tap. End-fixture voltage measured under load must not drop below 10V. Operating below 10V causes color shift, reduced lamp life, and LED driver failure.

Voltage Drop Calculation

Voltage drop formula: $VD = (2 \times \text{Length} \times \text{Total VA}) / \text{Cable Constant}$. Cable constants: 12 AWG = 7,500; 10 AWG = 11,920; 8 AWG = 18,960. End fixture voltage = transformer tap voltage minus VD. Select the next higher tap if end voltage is below 10V. Document the voltage drop calculation for each zone in the project record. Verify with true-RMS voltmeter at the last fixture under full zone load at commissioning.

IP68 Coastal Source Connectors

Where Coastal Source Premier Edition or Plug+Play system is specified, all field splices use Coastal Source IP68 In-Field Splice Connectors (IFSCCF/IFSCCM). IP68 rated for continuous submersion; patented threaded coupling replaces wire nuts. All connections mechanically secured and gasket-sealed. No unprotected wire nuts in direct-burial landscape applications on Restrepo Vol 20 projects.

NEC 411 Class 2/3, UL 1838

NEC Article 411 governs listed low-voltage lighting systems. Output circuits: 25A maximum; secondary voltage 30V maximum AC. Components must be listed per 411.4(A) or 411.4(B). UL 1838 is the primary listing standard for the transformer and system assembly. All FX Luminaire Luxor transformers carry ETL listing per UL 1838 and UL 379. Supply circuit to transformer must be GFCI-protected per NEC 210.8(A)(3). Secondary Class 2 wiring does not require conduit but conduit is used at all Restrepo Vol 20 projects for long-term serviceability.

INSPECT · TRANSFORMER LOAD VERIFICATION

Verify transformer load at or below 80% of rated wattage under full zone load at commissioning. Measure end-fixture voltage with true-RMS voltmeter under load. End voltage must be at or above 10V. Document tap setting, measured voltage, and VA load for each transformer zone in the project record.

04 AUDIO SLEEVE & SUB BURIAL

Sonance SLS sub burial per BMK procedure, 30-40 ft satellite spacing, Cat6 PoE pull for amp control, NEC 640/UL 1480 compliance, and AWG sizing for outdoor 70V and 8-ohm speaker runs.

Sonance BMK Sub Burial Procedure

Sonance Landscape Series LS12T SUB (SKU 93371) or LS15T SUB (SKU 93372) buried per Sonance BMK (Buried Mount Kit) installation procedure. Excavate to minimum enclosure depth plus 6-inch gravel bed below canopy. Orient canopy flush with or up to 1 inch above finished grade. Backfill with native soil. BMK accessory ensures proper waterproofing seal and canopy elevation. Sub burial location photographed before grade restoration and filed in project record.

30-40 ft Satellite Spacing

Sonance SLS satellite-to-satellite spacing: 30-40 ft center-to-center at ear level or slightly above, oriented with driver axis directed at the primary listening area. Place satellites 8-12 ft from patio or seating area edge, angled inward 20-30 degrees. A single LS12T or LS15T sub provides sufficient bass for areas up to 2,000-3,500 sq ft when properly EQ'd through Sonance DSP 2-150 MKIII. Sub centered within the listening area or at the perimeter equidistant from multiple seating zones.

Cat6 PoE Pull for Amp

Sonance DSP 2-150 MKIII amplifier: Cat6 pull from network rack to amplifier location for SonARC v2 IP control integration. PoE is not required for the amp itself but Cat6 in a dedicated sleeve enables future PoE-powered AV distribution nodes adjacent to the amplifier. Pull Cat6 in 1-inch PVC Schedule 40 sleeve with 12 AWG speaker cable in a separate adjacent sleeve (Class 2/3 conductors may share conduit with other Class 2/3 but not with line-voltage circuits per NEC 640.9).

NEC 640, UL 1480, AWG Sizing

NEC Article 640 governs audio signal processing and reproduction equipment. Outdoor speaker cables above 30V (70V or 8-ohm runs) are not Class 2 and require burial in Schedule 40 PVC at 18-inch minimum depth. AWG sizing: 14 AWG 4-conductor direct-burial rated for SLS satellite daisy-chain runs up to 100 ft. 12 AWG 2-conductor for runs 100-200 ft and subwoofer lines. 10 AWG beyond 200 ft or high-current 8-ohm subwoofer applications. UL 1480 covers outdoor speaker environmental survivability; Sonance SLS is listed or tested per UL 1480 or equivalent IEC 60529 IPx66 standards.

NOTE · AUDIO CABLE SEPARATION

Speaker cable (70V or 8-ohm) is not Class 2 at residential levels and is buried in Schedule 40 PVC at 18-inch minimum depth per NEC 300.5. Speaker cable sleeves are separate from line-voltage conduit. Cat6 and speaker cable may share a Class 2/3 sleeve but may not share with line-voltage circuits.

05 DISPLAY STUB-OUTS

SunBriteTV Veranda 3 and Pro 2 mount prep, dedicated 20A GFCI circuit per NEC 210.8(F), weatherproof in-use cover per NEC 406.9(B)(1), and Cat6 + HDMI 2.1 ARC low-voltage sleeve pull.

SunBriteTV Veranda 3 / Pro 2 Mount

SunBriteTV Veranda 3 (SB-V3-xx-4K-BL): 1,000 nits, IP55, shade-rated, Android TV with Chromecast built-in, HDMI 2.1 on ports 1-2, eARC on port 3, 4K Quantum Dot HDR. SunBriteTV Pro 2 (SB-P2-xx-4K): 1,000 nits, IP55, full-sun rated, no built-in smart OS, HDBaseT input for long-run 4K signal. Both require VESA-compatible articulating or tilting outdoor mount. Mounting surface must accommodate dynamic load for wind uplift; pergola or exterior wall structural attachment required.

Low-Voltage Box + 20A Circuit + GFCI

Each outdoor TV stub-out: one 20A 120V dedicated GFCI-protected circuit per NEC 210.8(F) terminated in an outdoor-rated weatherproof box adjacent to the display; one low-voltage rough-in box (1-gang, 2-gang, or single-gang extension) for cable management. Weatherproof box with extra-duty in-use cover per NEC 406.9(B)(1). Weather-resistant (WR) and tamper-resistant (TR) receptacle per NEC 406.12. Dedicated circuit means no other outlet or load shares the branch circuit. Circuit breaker sized 20A max.

Cat6 + HDMI 2.1 ARC Pull

Each TV stub-out sleeve pulls: minimum one Cat6 pull for IP control (Crestron or Control4 two-way feedback requires Ethernet to TV), one HDMI 2.1 cable pulled in the low-voltage sleeve for direct source connection where run is under 50 ft, and one spare Cat6 for future use. Runs over 50 ft use HDBaseT extender pair (SunBriteTV Pro 2 has built-in HDBaseT input). All cables pulled in minimum 1.5-inch PVC Schedule 40 sleeve separate from the power circuit sleeve. Sleeve labeled TV-LV-[ZONE] on sleeve schedule.

DONOT · OUTDOOR TV POWER

A standard indoor-rated 15A circuit is not acceptable for any outdoor TV installation. Each outdoor TV receives a dedicated 20A GFCI-protected circuit per NEC 210.8(F). Sharing a circuit with any other outdoor load is not permitted without written direction.

06 PERGOLA, HEAT & FAN BRANCH CIRCUITS

Bromic dedicated 240V NEMA contactor, Infratech CD-CONTROL 0-10V interface, StruXure and Renson 120V motor feeds, NEC 406.9 WP in-use covers, and freeze blow-out tee at each irrigation hardscape crossing.

Bromic Dedicated 20A NEMA Contactor

Each Bromic Platinum Smart-Heat Electric heater requires a dedicated 240V circuit: 20A for 2300W (9.6A) and 3400W (14.2A) models; 30A for 4500W (18.8A). Each circuit has a dedicated NEMA-rated contactor in a NEMA 3R outdoor enclosure activated by the Lutron or Crestron relay for On/Off and Hi/Lo staged control. Two-stage control: Contactor A for full power; Contactor B for half-power tap. Contactor enclosure location set before hardscape at pergola column base or adjacent wall. Conduit stub for 240V circuit set in same operation.

Infratech CD-CONTROL

Infratech INF-CD-CONTROL module interfaces CD and WD series heaters to Lutron 0-10V controllers. Lutron Application Note 587 documents the integration path: EPC-2-D (LVS Controls) interrupts the 0-10V signal and interfaces to the heater contactor. Infratech WD series dual-element models (WD-3024 through WD-6024) are the preferred specification for NJ outdoor installations requiring Hi/Lo staged heat. Marine-grade stainless variants (CD6024MG, CD4024SS) for coastal or covered pool applications.

StruXure / Renson 120V Control Feeds

StruXure Pergola X and Renson Camargue motorized louver systems require 120V dedicated circuits for motor control: typically one 15A or 20A circuit per pergola bay via Somfy RTS receiver and motor. Conduit stub to pergola column base with weatherproof junction box set before concrete footing pour. StruXure uses Somfy RTS motors; Crestron Home integrates via Somfy driver. Renson Camargue uses IO Homecontrol protocol via Somfy Connexoon or TaHoma bridge. Pergola motor conduit: 3/4-inch or 1-inch PVC Schedule 40 with LFNC at final motor termination for vibration isolation.

NEC 406.9 WP In-Use Covers

All pergola column receptacles and equipment connection boxes in wet locations use extra-duty weatherproof in-use covers per NEC 406.9(B)(1). In damp locations (covered pergola, canopy, marquee) weatherproof enclosure with plug not inserted per NEC 406.9(A). WR/TR receptacles throughout per NEC 406.12. Leviton or Hubbell WR/TR GFCI duplex receptacles at all pergola receptacle locations. Dedicated 20A duplex WR receptacle on each pergola column for general use, heater, fan, and AV loads on separate dedicated circuits.

Dedicated Freeze Blow-Out Tee

Each irrigation mainline crossing the hardscape zone includes a dedicated above-grade blow-out tee with ball valve at the accessible end of each sleeve. NJ Climate Zone 4A freeze blow-out deadline: October 15 annually or at first forecast of sustained temperatures below 32 degrees F. Blow-out tee location documented on sleeve schedule and identified in the client maintenance agreement. Backflow preventer body blow-out port and drain petcock accessible at finished grade.

SPEC · HEATER CIRCUIT SIZING

Bromic Platinum 2300W: 20A dedicated 240V circuit minimum. Bromic Platinum 4500W or Tungsten 6000W: 30A dedicated circuit. Infratech WD-5224 (5200W, 21.6A): 30A dedicated circuit. All heater circuits are NEMA 3R enclosed contactors, labeled at panel and at contactor box with heater model and zone ID.

07 IRRIGATION TWO-WIRE & BACKFLOW

RPZ backflow preventer per NJAC 7:10-10.3, two-wire decoder vs. conventional zone wiring, Hunter Hydrowise + Rain-Click sensor integration, NJ October 15 freeze blow-out protocol, and UL 1951 compliance.

RPZ Backflow Preventer — NJAC 7:10-10.3

New irrigation system installations in NJ require a backflow preventer per NJAC 7:10-10.3. RPZ (reduced pressure zone) valve is required where irrigation water is in contact with chemicals (fertilizer injection, pesticide application). RPZ installed above-grade requires insulated enclosure or foam wrap for NJ winter survival. Double check valve assembly (minimum) where contamination risk is low. All backflow preventer replacements require a NJ construction permit. Annual testing recommended; NJ DCA Bulletin 99-2 governs testing requirements for one- and two-family dwellings.

Two-Wire Decoder vs. Conventional

Two-wire decoder architecture (Hunter HCC EZ Decoder or Rain Bird ESP-LXIVM): single pair of 14 AWG direct-burial wire throughout the property; decoders at each valve tap the two-wire path and receive addressed commands. Advantages: minimal wire, Self-Healing fault recovery (Rain Bird ESP-LXIVM), scalable to 240 stations. Burial depth: 6-8 inches in open landscape, 18 inches minimum in hardscaped areas in conduit per NEC 300.5. Conventional wiring: individual home-run conductor from controller to each valve solenoid; preferred for systems under 12 zones.

Hunter Hydrowise + Rain-Click

Hunter HCC controller with Hydrowise cloud management for residential sites up to 54 stations; Hunter Pro-HC for simpler 6-24 zone systems. Hunter WR-CLIK wireless rain/freeze sensor kit (433 MHz, 800 ft range) with Quick Response technology shutting off irrigation within 2-5 minutes of rain onset; freeze shutoff at 37 degrees F. Hydrowise REST API enables Crestron Home integration via TCP driver for zone run commands, schedule suspension, and status polling. UL 1951 governs irrigation controller safety compliance; Hunter HC, HCC, and Hydrowise platform are all UL 1951 listed.

Freeze Blow-Out October 15 NJ Deadline

NJ Bergen County frost depth: 36 inches. Blow-out protocol: (1) controller to manual rain delay or off; (2) close main irrigation shutoff; (3) open drain petcock; (4) attach compressor at blow-out port (50 CFM minimum for rotor heads, 20-25 CFM for drip); (5) blow each zone individually at 50 PSI max rotors, 30 PSI max spray; (6) repeat 2-3 passes per zone; (7) blow out backflow preventer body; (8) wrap backflow with insulating cover; (9) log blow-out date and technician in client service record. Blow-out scheduled annually as part of Restrepo Innovations maintenance agreement.

NOTE · TWO-WIRE BURIAL DEPTH

Two-wire decoder cable burial: 6-8 inches in open landscape (exceeds NEC 6-inch minimum, provides protection against shallow aeration equipment). 18 inches minimum where two-wire path passes through hardscaped areas, in conduit. Rain Bird ESP-LXIVM Self-Healing diagnostic identifies decoder wire-path faults by address; run 2-Wire Mapping diagnostic at commissioning and file report.

08 SURGE & GROUNDING

Type 1 SPD at outdoor subpanel per NEC 230.67, intersystem bonding termination per NEC 250.94, DITEK MRJ-POE outdoor PoE protection at all Cat6-fed outdoor endpoints, and generator inlet at exterior of meter.

Type 1 SPD at Outdoor Subpanel — NEC 230.67

NEC 230.67 (2020/2023 NEC) requires a Surge Protective Device at all new service entrances and service replacements in dwelling units. For the outdoor subpanel feeding exterior loads: install Type 1 SPD rated minimum 40 kA SCCR (Square D FSPD140 at 140 kA per phase, NEMA 4X, or equivalent listed device). Type 1 SPD can be installed on the line side of main overcurrent protection. Verify AHJ adoption of 2020/2023 NEC at each project. Type 2 SPD (minimum 40 kA) at the outdoor subpanel load side as a secondary layer for all outdoor AV equipment branch circuits.

NEC 250.94 Intersystem Bonding

NEC 250.94 requires an intersystem bonding termination at the service equipment for telephone, coax, low-voltage cables, and other systems. Provide intersystem bonding block accessible and within 3 ft of the outdoor subpanel. All tracer wires, coax cable shields, data cable shields, and Category cable drain wires terminate at the intersystem bonding block. Block bonded to the equipment grounding bus. Per NEC 250.94(A), the intersystem bonding termination must be accessible and have a minimum of three terminals.

DITEK MRJ-POE Outdoor Variants

DITEK DTK-MRJPOEX: outdoor NEMA 4X PoE surge protector for outdoor cameras, access points, and AV distribution nodes. Liquid-tight cordgrips; field-replaceable protection module; 20 kA per pair surge rating; UL 497B listed; 10 GbE capable; 144W PoE power handling. Install at each PoE-powered outdoor endpoint: Luxor Wi-Fi module connection, outdoor access point, IP-controlled TV, and any Cat6-connected outdoor AV device exposed to lightning ground paths. DTK-MRJPOE (indoor version) at each rack-mounted PoE switch port feeding outdoor cables.

Generator Inlet Outside Meter

Portable generator connection: Generac Model 6338 (50A, NEMA 3R, CS6364 plug) or Model 6347 (50A, CS6365, corrosion-resistant aluminum, spring-loaded flip lid) mounted at the exterior of the meter enclosure or adjacent to the main service entrance. Manual transfer switch or interlocked main breaker per NEC 702 required to prevent back-feed to utility. For automatic standby generator (Kohler 14RCA, 14 kW): Kohler Model RXT Automatic Transfer Switch and OnCue Plus management system provide remote monitoring. Generator inlet conduit stub set before exterior finishes and integrated into the outdoor subpanel sleeve plan.

INSPECT · SPD COMMISSIONING

Verify SPD indicator light is active at outdoor subpanel after energization. Document SPD make, model, kA rating, and indicator status in project record. Intersystem bonding block accessible, within 3 ft of subpanel, and populated with tracer wire, coax shield, and Cat6 drain wire terminations before closeout.

09

PRE-HARDSCAPE CHECKLIST

Every item below is verified before hardscape paving, stone, or concrete is placed. Any unchecked item holds the schedule until remediated. This checklist is the gate between rough-in and the hardscape pour.

- ☐ Red-line sleeve plan photographed before pour: all sleeves in red-line duct bank photographed before any paving, stone, or concrete is placed; images indexed and filed in project record
- ☐ Sleeve schedule signed: sleeve schedule completed, signed by GC and Restrepo PM, and included in as-built documentation package before hardscape schedule approval
- ☐ Transformer load at or below 80% rated: each FX Luminaire Luxor or Coastal Source transformer load verified at or below 80% of rated capacity at commissioning under full zone load
- ☐ GFCI verified at all outdoor receptacles: each 15A and 20A outdoor receptacle tested with GFCI tester; all outdoor TV, heater, fan, and LV transformer circuits verified GFCI-protected per NEC 210.8(F)
- ☐ NEC 230.67 Type 1 SPD installed: Type 1 or Type 2 SPD installed at outdoor subpanel; indicator light confirmed active; installation documented in project record
- ☐ BMK buried and photographed: Sonance BMK sub burial photographed at correct burial depth and canopy elevation before grade restoration; filed in project record
- ☐ Coastal Source IP68 connectors used: all field splices in LV lighting landscape system use Coastal Source IP68 or listed equivalent waterproof connectors; no wire nuts in direct-burial applications
- ☐ Freeze blow-out scheduled: annual October 15 irrigation freeze blow-out service included in client maintenance agreement and confirmed in writing before project closeout
- ☐ Scenes archived: all Luxor ZD/ZDC lighting scenes, Crestron/Lutron zone assignments, and irrigation schedule profiles archived to cloud and client backup record at commissioning
- ☐ Spare hardware $\geq 5\%$ delivered and labeled: minimum 5% spare PVC fittings, couplings, connectors, lamp modules, and pull-box covers delivered at closeout, serialized and labeled per project closeout standard

QC

QC GATE · 10-ITEM PRE-HARDSCAPE PASS/FAIL

All 10 items must be PASS before hardscape proceeds and before system is delivered to owner. Every item is reviewed by the project lead. Any failed item holds the schedule until resolved.

#	QC GATE ITEM	PASS	FAIL
1	Red-line sleeve photographed pre-pour All sleeves in duct bank photographed and filed before backfill.	PASS / SIGN	FAIL / HOLD
2	Sleeve schedule signed GC and Restrepo PM signatures on sleeve schedule; included in as-builts.	PASS / SIGN	FAIL / HOLD
3	Transformer load below 80% rated True-RMS voltmeter verified at each zone under full load; end-fixture voltage above 10V.	PASS / SIGN	FAIL / HOLD
4	GFCI verified at all outdoor receptacles GFCI tester pass at every outdoor 15/20A receptacle; TV, heater, transformer circuits	PASS / SIGN	FAIL / HOLD
5	NEC 230.67 Type 1 SPD installed SPD at outdoor subpanel; indicator confirmed lit; documented in as-built record.	PASS / SIGN	FAIL / HOLD
6	BMK buried and photographed Sonance BMK sub burial photo filed before grade restoration.	PASS / SIGN	FAIL / HOLD
7	Coastal Source IP68 connectors used All field splices use Coastal Source IP68 or listed waterproof connectors and outdoor-rated.	PASS / SIGN	FAIL / HOLD
8	Freeze blow-out scheduled Annual blow-out confirmed in client maintenance agreement and signed before closeout.	PASS / SIGN	FAIL / HOLD
9	Scenes archived All lighting scenes, zone assignments, and irrigation profiles backed up to cloud and included in as-built record.	PASS / SIGN	FAIL / HOLD
10	Spare hardware >=5% delivered + labeled 5% spare hardware for all systems staged, labeled, and delivered to owner.	PASS / SIGN	FAIL / HOLD

PROJECT LEAD SIGN-OFF

Signature / printed name

DATEMM/DD/YYYY

PROJECT

REF CITATIONS & PRIMARY SOURCES

1 FX Luminaire · Luxor ZD/ZDC Transformer Resource Guide (FXLIT187)

Technical specifications for LZD and LZDC transformer controllers, 150W and 300W; cable load tables.
https://www.fxl.com/sites/fxl.com/files/resource_guide_luxor_zdc_fxlit187.pdf

2 FX Luminaire · Luxor ZD/ZDC Installation Manual

Installation procedures, zone wiring methods, astronomical timing, voltage drop guidance.
https://www.fxl.com/sites/fxl.com/files/manual_luxor_zdc_fxlit187.pdf

3 FX Luminaire · NP Up Light Product Page

3LED, 6LED, 9LED, ZDC versions; lumen output, beam angle, CRI, L70 life ratings.
<https://www.fxl.com/product/up-lights/designer/np>

4 Coastal Source · Outdoor Landscape Lighting Overview

Plug+Play cabling system, IP68 connectors, triple-jacketed cable, design-test credentials.
<https://coastalsource.com/outdoor-lighting/>

5 Crutchfield · Coastal Source In-Field Splice Cable Connector (Female)

IP68 rated, accepts up to 12 AWG, female-to-bare-wire field splice; connector system overview.
https://www.crutchfield.com/p_216IFSCCF/Coastal-Source-In-Field-Splice-Cable-Connector-female.html

6 ExpertCE · Theory of Low Voltage Transformers for Landscape Lighting

NEC Article 411 compliance, daisy chain vs. hub, transformer types, Class 2 requirements.
<https://expertce.com/learn-articles/theory-low-voltage-transformers-landscape-lighting/>

7 Electrical License Renewal · NEC Article 411 Content

Code text for NEC 411 low-voltage lighting requirements, 2014-2017 revisions.
<https://www.electricalicenserenewal.com/Electrical-Continuing-Education-Courses/NEC-Content.php?sectionID=317>

8 UL 1838 Standard · Low Voltage Landscape Lighting Systems

Third Edition (2003), UL Standard for Safety for Low Voltage Landscape Lighting Systems.
<http://fs.gongkong.com/files/technicalData/201106/2011060300195900001.pdf>

9 SuperBrightLEDs · NEC Code for Outdoor Buried Electrical Wiring

Burial depth table by conduit type; 6-inch rule for low-voltage landscape; PVC 18-inch rule.
<https://www.superbrightleds.com/blog/understanding-the-nec-code-for-outdoor-buried-electrical-wiring.html>

10 ExpertCE · NEC 300.5 Underground Burial Depths Guide

Table 300.5 categories, wiring method differentiation, step-by-step depth determination.
<https://expertce.com/learn-articles/nec-300-5-underground-burial-depths/>

11 Sonance · Landscape Series Collection Page

SLS satellite and subwoofer lineup, IP66 rating, Laminated Core Transformer, laminar flow port design.
<https://sonance.com/collections/sonance-landscape-series>

12 Sonance · DSP 2-150 MKIII Product Page (SKU 93542)

150W x 2 at 8 ohms, 473W bridged, SonARC v2, fan cooling, 24-bit/96 kHz DAC.
<https://sonance.com/products/93542>

13 Sonance · SLS Subwoofers (LS12T, LS15T, HS12T) Product Page

Detailed specifications for all three SLS subwoofer models including dimensions and power handling.
<https://dmg-mg.com/sonance/new-sonance-landscape-series/sls-subwoofers/>

14 Electrical Contractor Magazine · NEC Article 640 Audio Systems

Class 2 vs. Class 3 wiring methods, 640.6 cable support, 640.7 grounding, conductor bundling.
<https://www.ecmag.com/magazine/articles/article-detail/codes-standards-sounds-good-audio-signal-processing-amplifi...>

15 Intertek · UL 1480/ULC-541 Standards Update Notice

Outdoor speaker impact testing at -40 degrees C, SUN rev 5-26-2023, scope and listing criteria.
<https://www.intertek.com/siteassets/resources/sun/2024/ul-1480-ulc-541-sun-rev-5-26-2023-ed-11-23-2027.pdf>

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IP55, 1,000 nits, Android TV, Google Assistant, Chromecast, IMAX Enhanced, Quantum Dot, Dolby Vision.
<https://www.sunbrite.tv.com/veranda-3-series/>
- 17 SunBriteTV · 55-inch Pro 2 Full Sun Outdoor TV (SB-P2-55-4K)**
Full specifications: 1,000 nits, 4K, HDMI 1.4/2.0, RS232, IP Control, -24 to 122 F.
<https://www.sunbrite.tv.com/solis-and-pro-series-full-sun-outdoor-tvs/55-pro-2-led-hdr-4k-outdoor-tv-full-sun-sb-p2-55-4k/>
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Damp vs. wet location distinctions, 90-degree hinged cover requirement, WR type specification.
<https://captaincode2023.leviton.com/node/338>
- 20 StruXure · Pergola X PDF Specification**
140-degree motorized louver range, Somfy RTS integration, technical dimensions and load data.
<https://struxure.com/PDFs/pergolax.pdf>
- 21 Renson · Camargue Motorized Pergola Product Page (US)**
Blade rotation to 150 degrees, S-Drive technology, Rencon Connect App, IO/RTS controls.
<https://renson.net/en-us/products/pergolas/camargue>
- 22 Bromic Heating · Platinum Smart-Heat Electric Product Page**
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<https://www.bromic.com/product/platinum-smart-heat-electric/>
- 23 Lutron Support · RadioRA 3 Integrating Outdoor Heaters**
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NEC 230.67 mandatory SPD at service entrance, 2023 NEC changes, Type 1 and 2 SPD explained.
<https://www.ditekurgeprotection.com/understanding-the-2023-nec-rules-for-surge-protection/>
- 25 Cornell Law · NJ Admin Code NJAC 7:10-10.3**
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