

Low Voltage Lighting Technical Sheet

Typical Lighting System Equipment

- Transformer, multi-strand wire (12/2, 10/2 or 8/2), direct-bury wire connectors, lamps and fixtures. Miscellaneous accessories also available to enhance lighting portraits (lenses, louvers, shrouds, etc.).

Key Points / Best Practices

- Call Before You Dig (utilities). "811"
- Use volt/amp meter to verify voltage at outlet, transformer and fixture (120V but can vary +/-).
- Verify amps on transformer and wire.
- Verify available power at electrical panel prior to installation (work with licensed electrician when needed).
- Illuminate changes in direction, elevation (height), surface material, as well as architectural and landscape focal points.
- Don't overwhelm customers with too many fixture choices. Most are not educated about what sort of fixtures they need to achieve a desired look.
- Use less wattage and multiple fixtures for more depth and contrast.

Calculations

- Watts = Amps x Volts (Ohm's Law)
 - Voltage Drop = $\frac{\text{Total Watts} \times \text{Wire Length} \times 2}{\text{Cable Constant}}$
- Cable Constants: 12G = 7500
10G = 11,920
8G = 18,960
- Ways to alleviate/lessen voltage drop:
 - Use higher voltage tap
 - Use thicker gauge wire
 - Use larger or multiple transformer(s)
 - Shorten wire runs
 - Reduce wattage/fixtures on each run
 - Install 120V outlet closer to needed area
 - Convert incandescent to LED

Fixtures

- Maintain voltage at incandescent fixture between 10.8 ~ 12.0 volts. LED has a wider range.
- Install fixtures away from pedestrian and yard maintenance traffic.
- Minimize glare by properly aiming and hiding fixtures in discreet areas.
- Use lids on well lights to keep debris, animals and children away from lamps.
- Install fixtures so that irrigation systems don't spray water directly inside fixtures.
- Grease lamp base/socket to prevent corrosion.

Lamps

- Primary wattages used are 20 and 35 (incand). LED wattages are 4W – 7W typically.
- The wider a beam spread is the shorter its beam length, and vice versa.
- Commonly available beam spreads are: Wide Flood, Flood, Spot, and Narrow Spot
- Do not install or move fixtures with incandescent lamps installed or electrified (can do with LED).
- MR16 lamps cannot get wet; must be in a sealed fixture. PAR36 lamps can get wet as the lamp itself is sealed.

Transformers

- Load to a maximum of 80% of capacity.
- Do not over-load; do not exceed max amperage.
- Balance wattage loads on each common tap on multi-core transformers.
- Install a minimum of 12" above ground.
- Enclose wires between ground and transformer in conduit.
- Install wires tightly to prevent arcing.
- Best to post-mount transformers to avoid damaging exterior surface of house, etc.

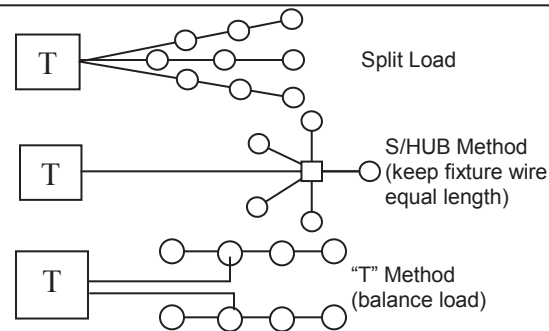
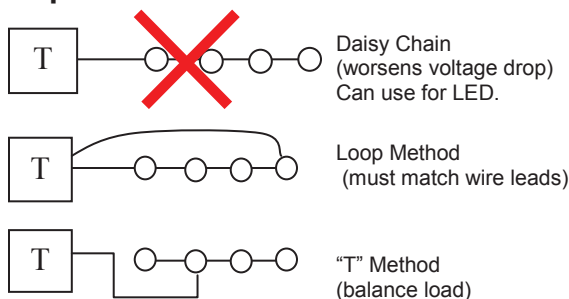
TOOLS NEEDED:

- Volt/amp meter, screwdriver (+/-), hammer/sledge, wire strippers, shovel, and hack saw (for conduit pipe).

Wire

- Rule of Thumb: can run 100 watts on 30' of 12-gauge wire at the 12-volt tap.
- Connect wire to transformer so no copper wire is visible.
- Use waterproof wire connectors.
- Measure twice – cut once!
- Bury wire 6" deep per NEC code.
- Make sure connections are tight.
- Color-code or number wire runs at both ends.
- Do not pre-twist wires before attaching wire nut.
- Multiple wires can be installed in a single voltage tap hole.
- Avoid daisy chain wiring with incandescent fixtures; daisy chain is okay with LED fixtures.

Sample Wire Runs



Multi-Meter

Measure volts / amps; make adjustments



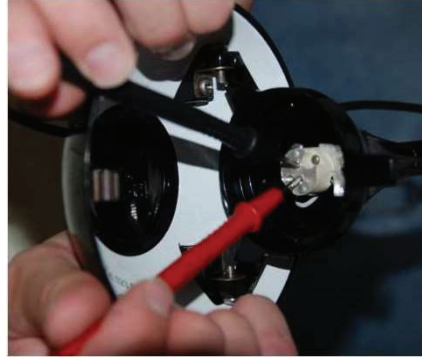
Primary Voltage
Volt Probes



Secondary Voltage



Voltage @ Fixture



Do not insert probes into socket holes...enlarges holes so bi-pin contact is compromised.

Primary Amperage



Secondary Amperage



Amperage @ Fixture



Amp Clamp