TVILIGHT

Overvoltage and Undervoltage Protector (OVP)

Knowledge Base & Installation Guideline

Part I: What is the difference between fuse (MCB), SPD and OVP in terms of outdoor lighting application?

In the context of street lighting applications, it's important to understand the differences between a fuse (often replaced by a Miniature Circuit Breaker or MCB), a Surge Protection Device (SPD), and an Over-Voltage Under-Voltage Protector (OVP). Each device serves a distinct purpose in protecting the electrical infrastructure and ensuring the longevity and reliable operation of street lights.

1. **Fuse / Miniature Circuit Breaker (MCB)**:

   - Purpose: A fuse or MCB is designed to protect an electrical circuit from damage caused by overcurrent or short circuit. Its essential function is to interrupt current flow after a fault is detected.
   - Operation: A fuse contains a wire or strip of metal that melts when too much current flows through it, thereby interrupting the circuit. An MCB, on the other hand, is a mechanical device that trips and breaks the circuit when the current exceeds a certain threshold, which can be reset without needing replacement.
   - Use in Street Lighting: In street lighting, fuses or MCBs protect the wiring and fixtures from damage due to excessive current that can be caused by faults in the circuit such as short circuits or overloads. Fuse/ MCB is often installed at the bottom of the street pole, inside the junction box.

2. **Surge Protection Device (SPD):**

   - Purpose: SPDs are designed to protect electrical devices from voltage spikes. They limit transient over-voltages and divert surge currents away from sensitive equipment. SPD react quickly to transient events such as lightning strikes or power surges.
   - Operation: SPDs typically use components like metal oxide varistors (MOVs), gas discharge tubes, or silicon avalanche diodes to shunt the excess voltage away from the protected circuit.
   - Use in Street Lighting: SPDs are used to protect street lighting systems from voltage spikes that can be caused by lightning or switching surges on the power grid. They help to prevent damage to the electronic components such as Nema/ Zhaga controllers and Driver (ballast), which can be sensitive to high voltage levels. SPD is often installed inside the streetlight fixture.

3. **Over-Voltage Under-Voltage Protector (OVP):**

   - Purpose: OVPs are designed to protect circuits from sustained over-voltage conditions which could cause overheating / damage. They are not as fast-acting as SPDs. They are meant to handle longer durations of over-voltage.
   - Operation: OVPs monitor the voltage-level and either block or reduce the incoming voltage, once it exceeds a predefined threshold. They can employ various technologies, including zener diodes, transzorbs, or more complex electronic circuits that disconnect the power supply.
   - Use in Street Lighting: OVPs protect street lighting equipment from low or high voltages that might occur due to malfunctions in the power supply system or incorrect connections. They ensure that the voltage supplied to the street lighting fixtures does not exceed safe levels for the equipment. OVP can be installed either at the junction box (typical) or inside the streetlight fixture. OVP is highly recommend where the voltages can deviate +/- 10% from the standard values.

In summary, while all three devices are used to protect electrical circuits, they serve different roles: fuse/MCB protect against over-current, SPDs guard against transient over-voltages due to surges, and OVP defend against sustained under-voltage/ over-voltage.

For a long duration and good performance of street lights, it is recommend to use all three protection equipment's to safeguard against various electrical anomalies.

Part II: What is the sequence of placing (MCB), SPD and OVP in terms of outdoor lighting application?

In an outdoor lighting application, such as street lighting, the sequence of installing a fuse (or MCB), an SPD, and an OVP is typically as follows:

1. Incoming Power Supply Line: This is where the electrical supply enters the lighting system.
2. Fuse / Miniature Circuit Breaker (MCB): Installed right after the power supply, typically at the base of the street pole within a junction box. The MCB protects against over-currents due to faults like short circuits or overloads.

3. Surge Protection Device (SPD): Positioned after the MCB to guard against transient surges from events such as lightning strikes or power grid switching. The SPD is crucial for protecting sensitive components within the lighting system. SPD is often installed inside the streetlight fixture to also protect the Nema/Zhaga controller and the LED driver.

4. Over-Voltage Under-Voltage Protector (OVP): Designed to handle sustained over-voltages and under-voltages. If OVP is placed inside the street-pole junction box, it should be installed after the MCB. The power then flows from the MCB to the OVP, then to the SPD, and onward to the Nema receptacle and LED driver. If the OVP is placed inside the LED streetlight fixture, it comes after the SPD, with power flowing from the MCB to the SPD, then to the OVP, and finally to the Nema receptacle and LED driver.

5. Street Lighting Fixture: This includes components like the Nema receptacle, LED driver, and LED module, which are connected at the end of the above protective sequence.

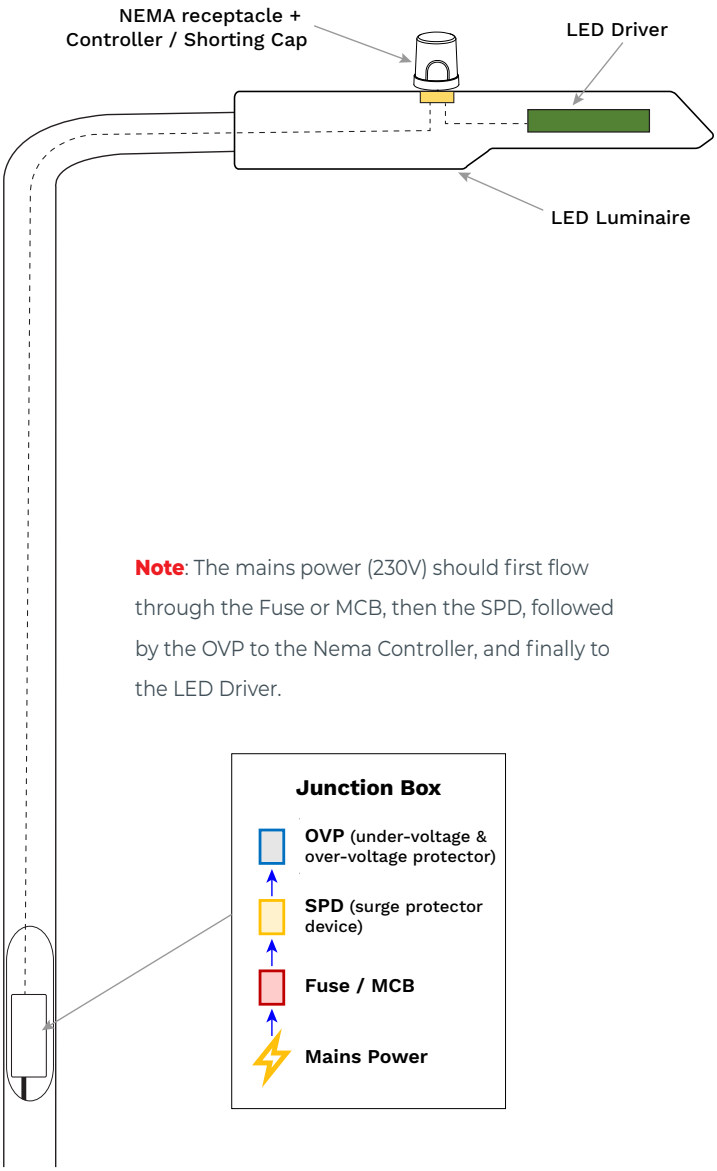
The sequence is designed to provide comprehensive protection: the MCB prevents damage from over-currents, the SPD shields against transient voltage spikes, and the OVP protects against longer-duration under-voltage and over-voltage situations.

It is important to note that while this is a typical setup, the exact configuration can vary based on local regulations, specific equipment used, and manufacturer recommendations. Always follow the guidelines provided by equipment manufacturers and adhere to local electrical codes and standards when installing these devices.

Part III: Specific Installation Notes for OVP

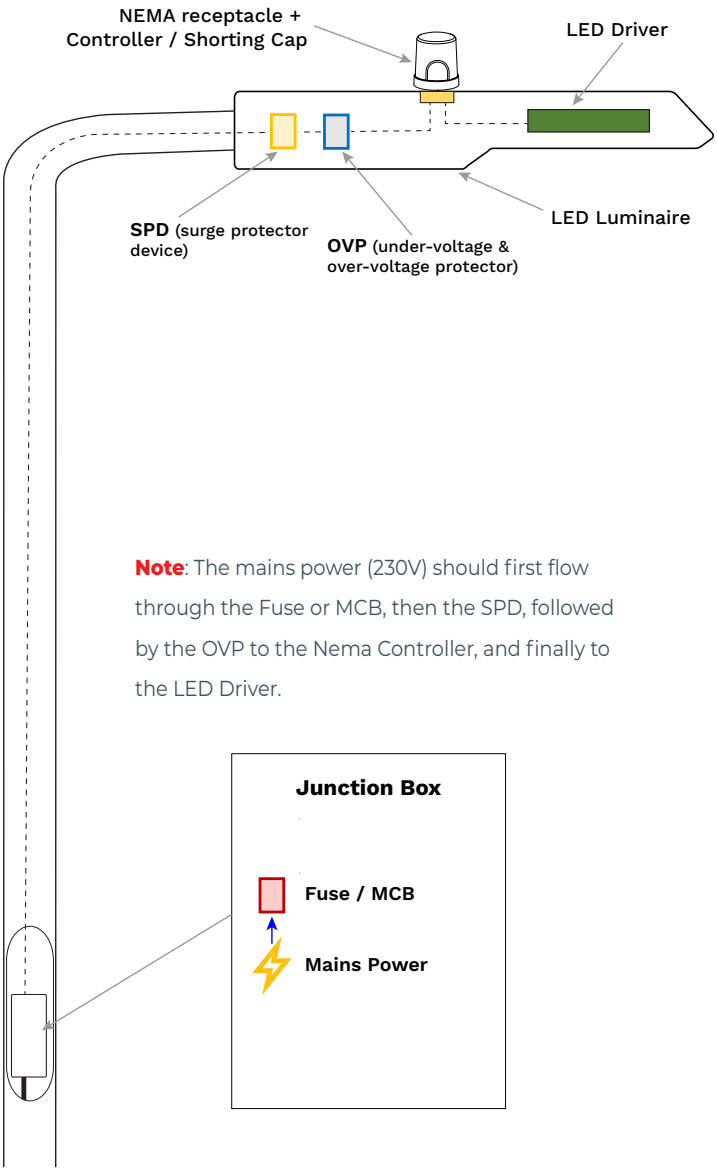
a. Placement in Dry Areas: The OVP must be installed in a dry location. It is crucial to keep the OVP away from water, rain, and excessive humidity to prevent damage or failure.
b. Current Capacity: The OVP has a maximum current capacity of 40A. This rating includes the initial surge current experienced when the LED streetlight is powered on. It's important to ensure that the OVP's capacity is not exceeded to maintain protection efficacy.
c. Installation within Fixtures: If an OVP is installed inside the streetlight fixture, it should not be in direct contact with hot surfaces. An air gap should be maintained between the OVP and the surface of the LED Driver or LED modules to prevent heat transfer. Direct contact with these components should be avoided to ensure proper functioning of the OVP.

Installation Instruction: When SPD & OVP are installed inside the Junction Box.



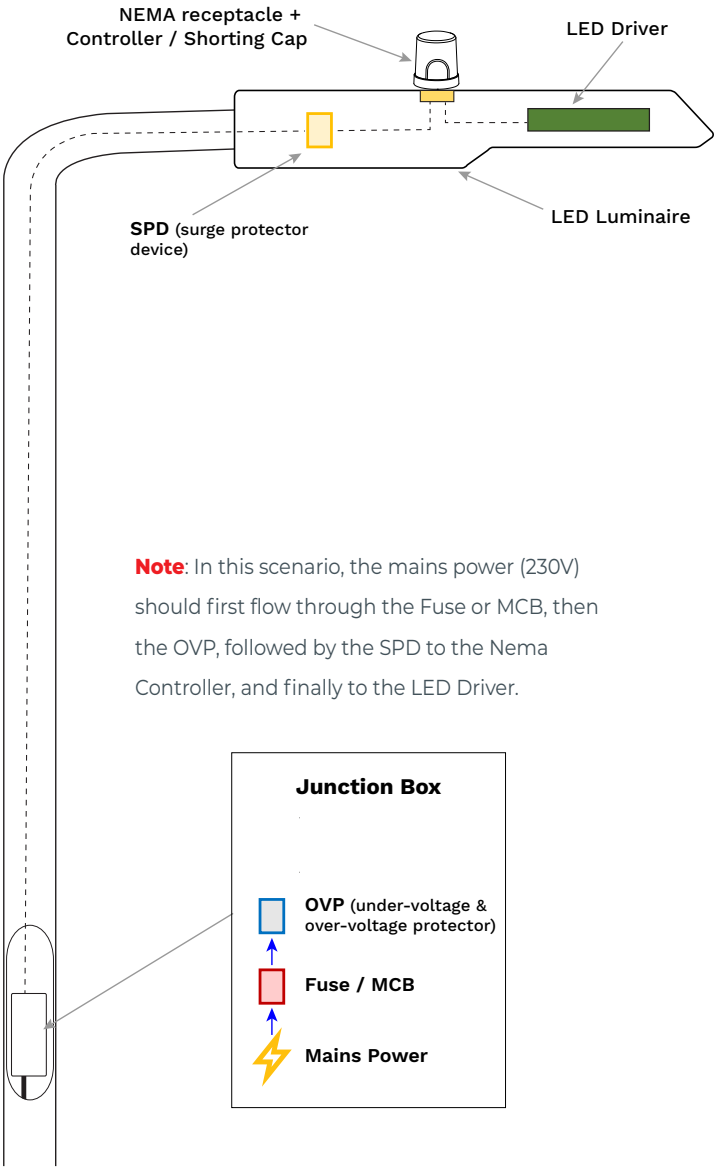
Note: The mains power (230V) should first flow through the Fuse or MCB, then the SPD, followed by the OVP to the Nema Controller, and finally to the LED Driver.

Installation Instruction: When SPD & OVP are installed inside the Luminaire.



Note: The mains power (230V) should first flow through the Fuse or MCB, then the SPD, followed by the OVP to the Nema Controller, and finally to the LED Driver.

When SPD is installed inside the Luminaire and OVP in the Junction Box.



Note: In this scenario, the mains power (230V) should first flow through the Fuse or MCB, then the OVP, followed by the SPD to the Nema Controller, and finally to the LED Driver.