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Eliminating Confusion:

Underwriters Laboratories Revises UL 1971,
Signaling Devices for the Hearing Impaired

UL revises UL 1971, standardizing measurements.

The proper method for calculating voltage drop on a notification appliance circuit is illustrated under the Implementing UL Max Current Specifications section.

UL's intent was for the worst case current draw specification to be used in all calculations relating to notification appliance circuits.

For manufacturers, fire marshals, AHJs and inspectors in the fire protection community, standards are continually changing. Until new standards or revisions are communicated, understood and routinely executed, fire protection professionals searching for product information may be confused by the array of specifications on data sheets. This document details key aspects of the May 2004 revisions to UL 1971, Signaling Devices for the Hearing Impaired. The revisions standardize how operating currents are measured and how voltage ranges are listed and published.

Industry Challenges

- Industry professionals seeking current draw information for notification appliances may be confused by the various ways specifications are presented on data sheets. Despite the revision to UL 1971 standardizing current draw measurements, manufacturers continue to show multiple specifications.
- Because the fire protection community is so large and widespread and standards are continually changing, communicating revisions to codes or standards is difficult.

The purpose of this document is to inform fire protection professionals of the revision to UL 1971, Signaling Devices for the Hearing Impaired.

Standardizing Operating Current and Voltage Specifications

In May 2004, Underwriters Laboratories (UL) revised UL 1971, standardizing operating current measurements to provide uniformity among manufacturers. They now require strobe operating current to be measured using root mean square (RMS) rather than peak and average values, and surge currents must be maintained within levels that the system power supply can tolerate. The operating current must be measured at the voltage where the current draw is at its maximum.

By and large, these requirements have been implemented by the industry. However, confusion is present across the fire industry because current draws can no longer be specified at the nominal operating voltage of the system.

Depending on its location on the loop and the many tolerances involved throughout a notification system, a device designed for 24 volt operation may end up operating at a voltage considerably higher or lower. UL has defined this worst case voltage range to be between 16 and 33 volts. Since device currents vary considerably with applied voltage, the only way to guarantee that the power supply can provide enough current under all conditions is to specify individual device currents at their highest values. Based on this logic, UL implemented the requirement that the current rating published in the installation manual must represent the maximum current

draw of the device across that range. Unfortunately, since UL has no control over most printed materials and web sites, some manufacturers continue to provide current draws taken at 24 volts. While this provides an illusion of lower current draws, it increases the risk of system failure during an emergency situation.

Notes:

- The maximum RMS current may or may not occur at the endpoints of the voltage range.
- UL has acknowledged that the voltage of a notification appliance is not usually 24 volts. This is due to the inherent voltage drop in the circuit. Depending where the appliance is positioned on the circuit, the voltage will likely drop to its minimum operating voltage.

Benefits of Standardizing Operating Current & Voltage Specifications

- RMS measurements better reflect the power consumption of a product because the entire current draw profile is considered.
- Regulated devices are compatible with regulated outputs on the control panel, regardless of manufacturer.
- Fire protection professionals can easily compare manufacturers’ current draw specifications.

Implementing UL Max Current Specifications

| Candela Setting | System Sensor Strobe Current Draw | | | |
|-----------------|-----------------------------------|-----|----------------------|-----|
| | FWR Operating Current | | DC Operating Current | |
| | 12V | 24V | 12V | 24V |
| 15 | 112 | 64 | 127 | 59 |
| 15/75 | 135 | 74 | 127 | 69 |
| 30 | | 93 | | 90 |
| 75 | | 158 | | 160 |
| 110 | | 208 | | 209 |

Current is in milliamps

Example:

- 24 VDC Class B NAC circuit (regulated)
- 250 foot circuit
- 12 AWG wire
- Five 110 candela strobes (regulated)
- What is the worst case voltage at the end of the loop?
- How much current must the NAC supply be able to furnish?

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Implementing UL Max Current Specifications

Start with the NAC supply voltage at the minimum voltage allowed by UL under battery back-up. This value is 20.4 volts (15% below 24 VDC).

For a quick calculation, assume that all of the devices are at the end of the line. Multiply 0.209 amps (for 110 cd) by 5 (number of strobes). That calculation produces 1.045 amps total current draw. This total current draw plus a factor for “overhead” will tell you what size supply to use. Different designers have different rules of thumb for the amount of overhead needed. In this case, you may decide to use a 1.5 amp NAC output.

The total resistance of the wire is determined by the amount of resistance per foot for 12 AWG wire (2 ohms per 1000 ft.) for the length of the circuit. In this case, the circuit length is 500 feet (250 ft. times 2, for the supply and return wires). The resistance of the wire is 1 ohm.

Voltage is equal to resistance times current. The voltage drop, due to the five devices, is 1.045 volts (1 ohm times 1.045 amps). The voltage at the end of line is 19.36 volts (20.4 minus 1.045). This is an acceptable condition since the EOL voltage is greater than 16 volts.

Conclusion

As with any major change to standards in the fire protection industry, there is inevitable confusion at first. With time, however, standards are communicated, understood and routinely executed and enforced by code officials and/or the authority having jurisdiction. Amendments similar to UL 1971 have been proposed for UL 464, Audible Signal Appliances.

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