



**SUBJECT**

Fire Alarm Voltage Drop and Testing

**PIN: 63**

**Effective: 4/28/2016**



**BACKGROUND**

Individual notification appliances are approved and listed by the California State Fire Marshal for a range of operating voltages. However, excessive voltage drops in the notification appliance circuits may cause both audible and visible devices to function outside the required performance parameters of the California Fire Code (CFC) and the National Fire Alarm and Signaling Code, NFPA Standard 72.

Low voltage to audible notification devices will cause them to operate below minimum decibel levels. Likewise, low voltage to visible notification devices will cause them to operate below minimum flash rate parameters.

The following guideline is provided to assist the industry in achieving compliance with the performance and testing requirements for fire alarm notification appliances.

**POLICY**

All fire alarm drawings submitted for approval shall include calculations demonstrating that the voltage at each notification appliance does not fall below its listed minimum nameplate voltage. For the purpose of voltage drop calculations, the voltage applied to the notification appliance circuit shall be assumed to be the control unit's output voltage with a fully depleted battery. An additional 10% spare capacity shall be provided for visible notification device circuits to account for the potential of adding visible notification appliances in the future to accommodate hearing impaired employee(s).

For example:

For a typical control panel that has a nominal output voltage of 24 VDC, the output voltage when operating on a fully depleted battery would typically be 20.4 VDC. Using this as the starting point, the voltage at each appliance must not drop below its listed minimum operating voltage. This would typically be 16.0 VDC. Therefore, the maximum voltage drop on the notification appliance circuit would be:

a) Panel output voltage with fully depleted battery	20.4	VDC
b) Minimum appliance listed operating voltage	16.0	VDC
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c) Maximum voltage drop for present design (a-b)	4.4	VDC
d) 10% voltage drop spare capacity for future	0.4	VDC
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e) Maximum voltage drop (c-d)	4.0	VDC

In addition to the above calculations, and as a portion of the field acceptance testing of the fire alarm system installation, the contractor shall demonstrate that each notification appliance circuit, as installed, meets the above criteria. The test method for such determination shall include the following steps:

1. All notification circuits must be tested. On each notification circuit, the appliance at the furthest distance from the source voltage shall be used for voltage drop testing. Remove the end-of-line appliance, keeping the wiring intact.
2. Activate the fire alarm system to cause the notification appliance circuit to operate.
3. Using a voltmeter, measure the actual voltage being applied to the circuit at the control panel. Subtract the maximum voltage drop calculated in (e) above. This would be the minimum acceptable voltage at the end-of-line notification device. To continue the above example:

f) Actual panel output voltage at time of test	24.0	VDC
g) Maximum voltage drop from (e) above	4.0	VDC
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h) Minimum voltage at end-of-line device (f-g)	20.0	VDC

4. Measure the voltage at the end-of-line notification device. The measured voltage shall not be below the minimum voltage calculated in h) above. Any circuit(s) failing such field tests shall be reevaluated, repaired, and retested prior to acceptance of the system.

Automated and listed testing arrangements that provide equivalent means of testing appliances to those steps identified above shall be permitted to be used to comply with these requirements.

Original Signed 4/28/16  
Paul Coleman Date