Switchgear Control and Secondary Wiring Protection

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Although a common belief, Metal-Clad Switchgear (MC) wiring is not covered by the National Electric Code (NEC). Metal-Clad switchgear control and secondary control wiring is defined by C37.20.2. This applies to the switchgear only; the components used in switchgear such as circuit breakers and relays are governed by standards specific to those devices.

C37.20.2 states all wiring shall be:

- Type SIS or equivalent
- Rated 600 V
- Rated 90 C
- All shunt trip circuits be wired with a minimum of 14 AWG regardless of load

C37.20.2 also provides a current rating table for the specified wire. From that table, 14 AWG is rated for a steady-state loading of greater than 10 A but less than or equal to 15 A.

All control and secondary circuits are required to have short-circuit protection. Overcurrent protection may be supplied, but is not required for all circuit loads. The requirements are:

- Circuits supplying heaters, receptacles and lighting are required to have both short-circuit and overload protection.
- Circuits on critical loads where loss of voltage could create a hazardous condition are not required to have overcurrent protection.

The switchgear for Powell circuit breakers uses a standardized wiring arrangement that takes into account the largest current load on any circuit breaker control component. For example, for PowlVac circuit breakers, the highest current load is found on the 48 V control circuit where the trip and close coils draw approximately 10 A and the charging motor approximately 12.6 A. Powell supplies the control circuits with 30 A fuse blocks. The closing and motor circuit uses a 15 A fuse in the 30 A block. This coordinates with the highest load current (found on the 48 V control circuit) and matches the limit of 15 A for 14 AWG wire found in C37.20.2. The trip circuit is also fed from a 30 A fuse block, but because the tripping function is a critical process, potentially causing a hazardous condition should it fail, the fuse selected is 30 A. It is not intended to coordinate with overload protection for the connecting wire. The 30 A fuse will provide short-circuit protection without overload protection in accordance with the IEEE standards governing switchgear.

PowlVac circuit breakers typically use DC control circuits at 125 V. The coils for both the trip and close functions draw approximately 3.2 A for a duration of 80 ms or less and the charging motor draws approximately 3.6 A steady state for about 7 seconds. The fuses described above provide the over-current and short-circuit protection for all variations of control voltage.

PowerVac switchgear utilizes the same concept for fuse sizing based on circuit breaker component current loads and the requirements found in IEEE C37.20.2.

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