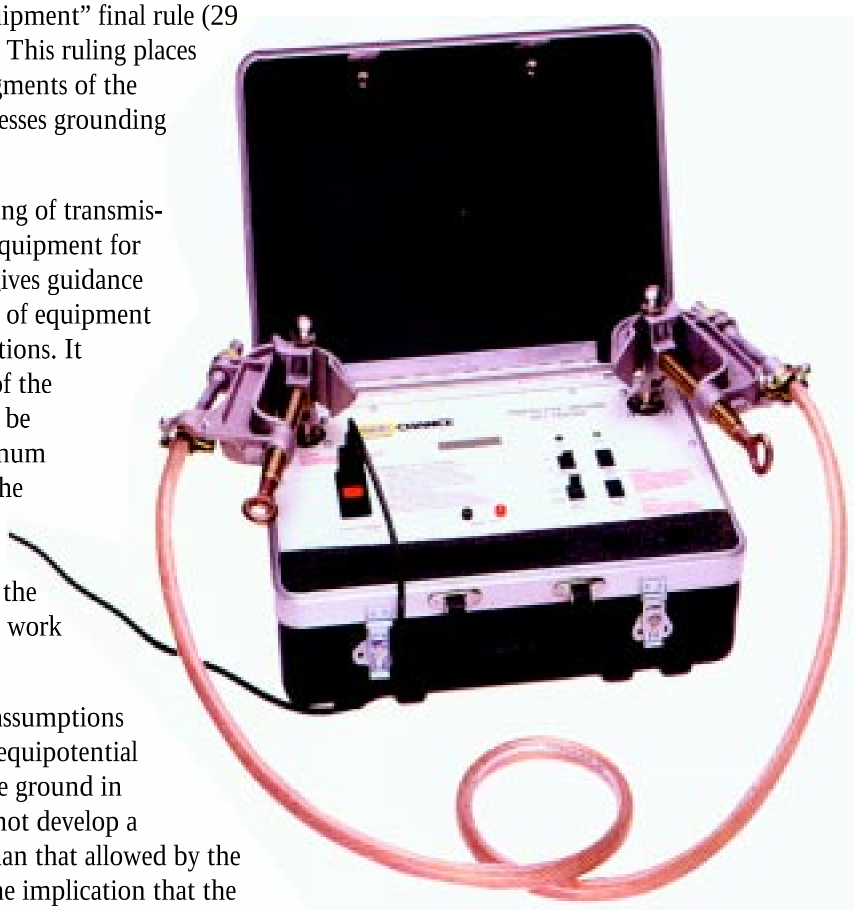
TESTING IS ESSENTIAL
FOR GROUNDING EQUIPEMNT

Protective grounding during maintenance of de-energized power lines has long been a practice used by the electric utility industry. During January 1994, OSHA issued the “Electric Power Generation, Transmission, and Distribution, Electrical Protective Equipment” final rule (29 CFR Part 1910.269 Subpart R). This ruling places broad requirements on many segments of the industry and Paragraph (n) addresses grounding for the protection of workers.

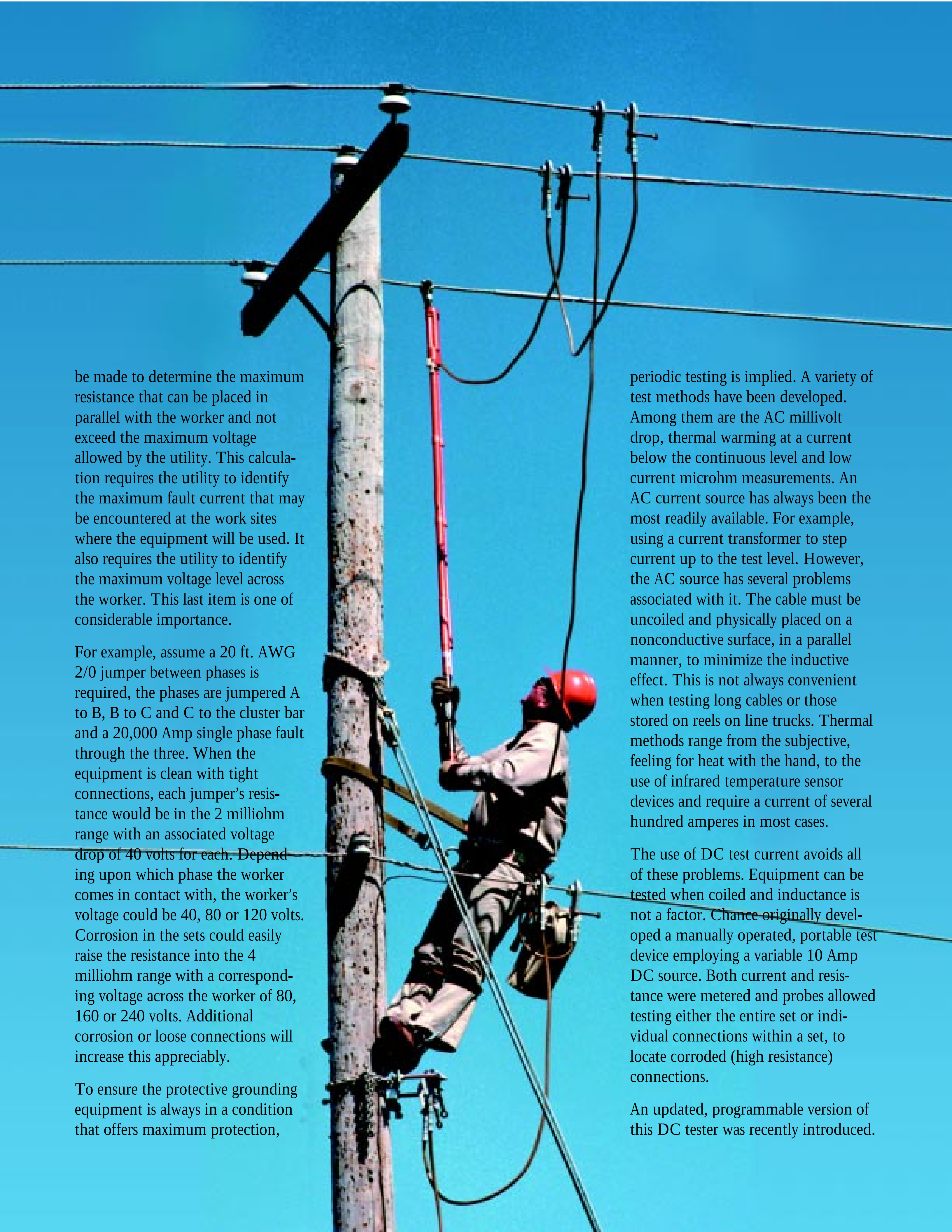
Paragraph (n) applies to grounding of transmission and distribution lines and equipment for the protection of employees. It gives guidance regarding the use and placement of equipment but there are underlying assumptions. It requires that for the protection of the worker the “. . . equipment shall be capable of conducting the maximum fault current that could flow at the point of grounding for the time necessary to clear the fault”. The preferred method of use given is the development of an equipotential work zone.



Chance Grounding Set Tester comes with easy-to-use instructions and how-to video.

The OSHA ruling leads to two assumptions beyond cable fusing. First, if an equipotential zone is established, the protective ground in parallel with the worker should not develop a voltage across the man greater than that allowed by the worker’s utility. The second is the implication that the protective grounding equipment should be tested periodically, to ensure it always meets the protection requirements.

Concerning the first; the jumper and the worker form a parallel circuit. By making some assumptions regarding the resistance of the worker, calculations can



be made to determine the maximum resistance that can be placed in parallel with the worker and not exceed the maximum voltage allowed by the utility. This calculation requires the utility to identify the maximum fault current that may be encountered at the work sites where the equipment will be used. It also requires the utility to identify the maximum voltage level across the worker. This last item is one of considerable importance.

For example, assume a 20 ft. AWG 2/0 jumper between phases is required, the phases are jumpered A to B, B to C and C to the cluster bar and a 20,000 Amp single phase fault through the three. When the equipment is clean with tight connections, each jumper's resistance would be in the 2 milliohm range with an associated voltage drop of 40 volts for each. Depending upon which phase the worker comes in contact with, the worker's voltage could be 40, 80 or 120 volts. Corrosion in the sets could easily raise the resistance into the 4 milliohm range with a corresponding voltage across the worker of 80, 160 or 240 volts. Additional corrosion or loose connections will increase this appreciably.

To ensure the protective grounding equipment is always in a condition that offers maximum protection, periodic testing is implied. A variety of test methods have been developed. Among them are the AC millivolt drop, thermal warming at a current below the continuous level and low current microhm measurements. An AC current source has always been the most readily available. For example, using a current transformer to step current up to the test level. However, the AC source has several problems associated with it. The cable must be uncoiled and physically placed on a nonconductive surface, in a parallel manner, to minimize the inductive effect. This is not always convenient when testing long cables or those stored on reels on line trucks. Thermal methods range from the subjective, feeling for heat with the hand, to the use of infrared temperature sensor devices and require a current of several hundred amperes in most cases.

The use of DC test current avoids all of these problems. Equipment can be tested when coiled and inductance is not a factor. Chance originally developed a manually operated, portable test device employing a variable 10 Amp DC source. Both current and resistance were metered and probes allowed testing either the entire set or individual connections within a set, to locate corroded (high resistance) connections.

An updated, programmable version of this DC tester was recently introduced.

It is microprocessor controlled, eliminating the requirement for manual setting of the variable power supply. This feature alone represents a significant reduction in testing time. The elimination of the manually adjusted variable power supply provides a much lighter and more portable unit. The 10 Amp DC current source and the probe feature to locate individual corroded connections remain. Cable sizes being tested and the utility's maximum voltage allowed across the worker are easily programmed from front panel switches. The digital readout shows an accurate measured resistance and is accompanied by pass/fail lights to help operator identify a hazardous condition. The lights compare the utility's maximum allowed worker voltage to the tested resistance at the ASTM F855 grounding equipment standard's withstand current for the programmed cable size. The tester is now housed in a molded impact resistant case with the electronic circuitry fully contained on a state-of-the-art printed circuit board.

In summary, the new unit is easier to use, more accurate, more portable and less fragile. It is expected to meet the assumed requirements of OSHA described above. ■

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NOTE: Because Hubbell has a policy of continuous product improvement, we reserve the right to change design and specifications without notice.