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# Failure to maintain approach distance cited as root cause of Hayden accident

***The accident occurred May 19 when a four-man electrician crew was servicing equipment at the substation in northwest Colorado.***

A recent accident at Hayden Substation in northwest Colorado occurred when an electrician failed to maintain the minimum approach distance to energized parts, according to the Accident Investigation Board report.

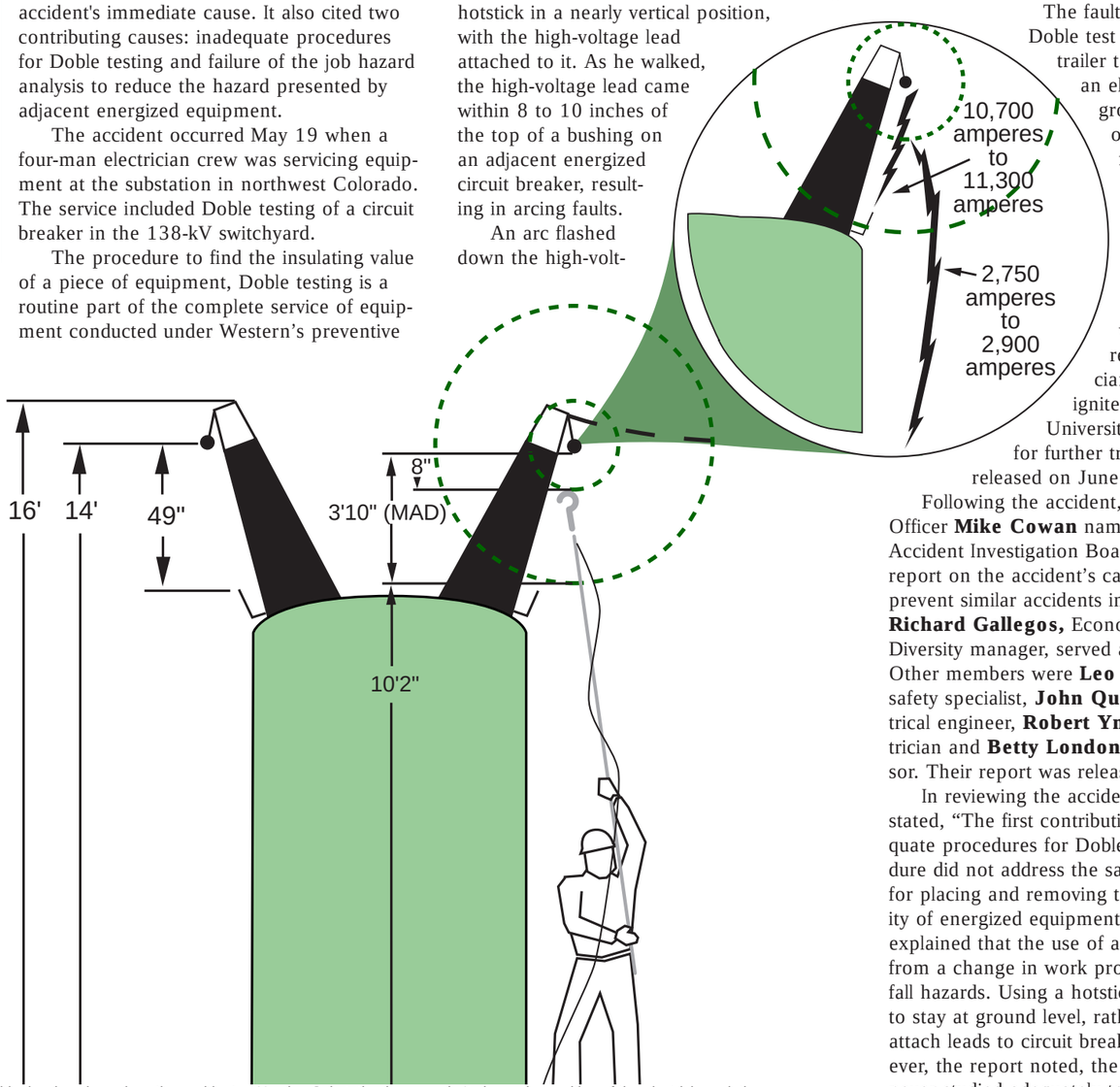
The board identified that failure as the accident's immediate cause. It also cited two contributing causes: inadequate procedures for Doble testing and failure of the job hazard analysis to reduce the hazard presented by adjacent energized equipment.

The accident occurred May 19 when a four-man electrician crew was servicing equipment at the substation in northwest Colorado. The service included Doble testing of a circuit breaker in the 138-kV switchyard.

The procedure to find the insulating value of a piece of equipment, Doble testing is a routine part of the complete service of equipment conducted under Western's preventive maintenance program. Its name comes from the company that manufactures the testing equipment, Doble Engineering Co.

As the electrician was moving the Doble test set's high-voltage lead from one side of the breaker to the other, he walked backward to take up slack. He carried an 11-foot-long hotstick in a nearly vertical position, with the high-voltage lead attached to it. As he walked, the high-voltage lead came within 8 to 10 inches of the top of a bushing on an adjacent energized circuit breaker, resulting in arcing faults.

An arc flashed down the high-voltage lead, launching the lead's hook 120 feet. The electrician holding the lead fell to the ground, his clothing ignited and on fire. The arc blast knocked another electrician from a ladder. A third electrician who was crouching in front of the breaker cabinet received burns to his shoulder.




*This drawing shows how the accident at Hayden Substation happened. It shows the position of the electrician relative to the circuit breaker's bushing.*

The faults also caused the Doble test set in a nearby test trailer to explode, knocking an electrician to the ground. He crawled out of the trailer as it filled with smoke and wasn't injured.

The three injured men were taken to Routt County Hospital via ambulance. Two were treated and released. The electrician whose clothing ignited was airlifted to University Hospital in Denver for further treatment. He was released on June 10.

Following the accident, Chief Program Officer **Mike Cowan** named a five-member Accident Investigation Board to prepare a report on the accident's causes and ways to prevent similar accidents in the future. **Richard Gallegos,** Economic Impact and Diversity manager, served as chairperson. Other members were **Leo Wandler,** a UGP safety specialist, **John Quintana,** a CSO electrical engineer, **Robert Yniguez,** a DSW electrician and **Betty London,** a CSO legal advisor. Their report was released July 2.

In reviewing the accident, the Board report stated, "The first contributing cause was inadequate procedures for Doble testing. The procedure did not address the safe use of a hotstick for placing and removing test leads in the vicinity of energized equipment." The report explained that the use of a hotstick resulted from a change in work procedures to minimize fall hazards. Using a hotstick allows electricians to stay at ground level, rather than climbing to attach leads to circuit breaker bushings. However, the report noted, the new procedure was never studied adequately to determine if it would create other hazards.

On May 27, the Board issued a recommendation to maintenance personnel for an immediate corrective procedure to address safe use of hotsticks when placing and removing Doble test leads.

Regarding the job hazard analysis, the report noted that the crew identified the boundaries of the clearance. "Identifying the hazard is half the process; the other half is to develop solution(s) that would eliminate, modify or prevent such hazards or accidents."

## Judgments of Needs identified

The Accident Investigation Board issued nine Judgments of Need following its investigation. They are:

1. The job hazard analysis process needs to be examined and revised where necessary. Job hazard analyses must address minimum approach distances to energized equipment, identification of other hazards and take appropriate actions to eliminate the hazards.
2. Management must communicate, abide by and enforce strict adherence to *Power System Safety Manual.*
3. All managers (including supervisors) are accountable for the timely integration of all safety- and maintenance-related policies, procedures and programs, including but not limited to Judgments of Need identified in accident reports.
4. All new, changed or modified work procedures must be evaluated to determine if the new procedure creates new hazards and corrective measures must be incorporated in the appropriate manuals (all affected manuals must be cross-referenced).
5. When using a hotstick to place or remove the high voltage lead during Doble testing of breakers and transformers, a procedure should be developed such as the Board's immediate corrective procedure recommendation to ensure that all areas of safety are considered.
6. The following sections of the *Power System Safety Manual*—7.14, 8.7, 11.1.2 and 17.2—must be reviewed and discussed during a series of weekly craft safety meetings.
7. There is a need to ensure all posted emergency numbers are correct and periodically verified, such as during the annual safety inspections.
8. An engineering study shall be conducted to determine if spark gaps on the 138-kV breaker bushings are required. If it is determined that they are no longer required, they shall be removed.
9. The proper clothing must be worn for work in energized substations. The strict interpretation of OSHA 1910.269 (l) (6) (iii) would require, based on this accident, employees to be in flame-resistant clothing.