

## 21. A Workplace Safety Device for Operators of Remote-Controlled Continuous Mining Machines

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Many accidents and fatalities have occurred involving operators of remote-controlled continuous mining machines (RCCM). The NIOSH Pittsburgh Research Laboratory (PRL) has focused on this problem by creation of a project called, "Proximity Detection and Collision Avoidance" (PDCA). PDCA objectives include: studying the habits of the operators, determining what areas around mining equipment are dangerous, and developing and/or acquiring devices that have the potential to minimize the hazards.

This paper focuses on one promising NIOSH-developed device called the Hazardous Area Signaling and Ranging Device (HASARD). HASARD is basically a two-part system composed of a transmitter and a receiver.

The HASARD transmitter generates a low-frequency magnetic field using one or more wire loop antennas. Each antenna is adjusted to establish a magnetic field pattern for each area about the RCCM which has been identified as hazardous to the operator. The magnetic fields can be molded into virtually any shape as dictated by the shape of the wire loops and the strength of the signal provided by the transmitter.

The HASARD receiver is basically a magnetic field strength meter. The low-frequency magnetic field picked up by a small antenna is filtered, amplified, and then measured. The measured signal is compared against preset levels which are calibrated to identify levels of danger, relative to distance from the machine. The receiver combines visual, audible, and vibration types of output indicators. Additionally, the receiver can disable RCCM functions, such as tramming, when using the remote pendant. Field trials will determine which indicators will be the most safe and effective in a mine production environment.

The experiments performed, the conclusions derived, and the modifications implemented in the evolution of HASARD into a viable system are detailed. The prototype system has been refined and tested at the NIOSH surface and underground facilities. Field trials of the system are planned. The author notes that HASARD is not limited to use in mining situations. Other possible implementations of HASARD are discussed.

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