Strata’s solutions for surface, underground, and surface-to-underground

Proximity Detection & Collision Avoidance
Strata Worldwide has years of R&D and real-life experience with proximity detection and collision avoidance technologies. Working closely with mine managers and personnel around the world, the company continues to expand and enhance its safety technologies.

**HazardAVERT®** - Near-field electromagnetic detection, alarm and interlocking system for surface and underground

**HAZARDAVERT®** is an electromagnetic proximity detection system designed to increase personnel safety and awareness while working in and around mobile machinery. It was developed to prevent vehicle-to-vehicle and vehicle-to-pedestrian accidents and collisions, particularly crushing- and pinning-type accidents in underground environments.

HazardAVERT® detects people and/or vehicles entering potentially dangerous areas around machinery and automatically sends out warning alerts. Audible and visual alarms bring attention to a situation prior to contact or collision. If no corrective action is taken, or in the event of a sudden emergency, HazardAVERT® can be interlocked into the controls of the equipment to automatically slow and/or stop the machinery completely.

HazardAVERT® has been effectively used on all types and sizes of mobile machinery, vehicles and equipment in surface and underground mining and heavy construction operations.

**FEATURES & USER EXPERIENCE**

- No operator interaction required
- No line-of-sight required
- Direction of travel is irrelevant
- 100% perimeter coverage
- Unaffected by daylight/darkness, weather conditions, airborne debris
- Penetrates rock, coal, gravel, mud, water, ventilation curtains and barriers
- Monitoring and reporting capabilities
## HazardAVERT® System Components

### ON-DASH LED DISPLAY SCREEN
- 5 inch J1939-Based LCD display
- IP67 Rating
- Graphical representation of zone operating status, fault conditions and active alarms
  - Warning or Hazard. Front or rear or both
- 2-camera inputs and live camera views
  - Front or rear depending on direction of travel

### PROXIMITY GENERATOR
- Generates electromagnetic zones
  - Multiple generators enable zone shaping
  - GPS for time and position recording
  - Adjustable zone sizes
- Detects electromagnetic zones of other equipment

### INTERFACE MODULE
- Control unit for the system
- Power supply to Generators, On-Dash Display and/or sounder
- Controls equipment interlocking
  - Automatically slows or stops vehicle in an emergency
- Generates Silent Zone
  - Exclusion zone within hazard zone to enable operators to work
- Memory storage to monitor and log events
- Contains Wi-Fi board for data transmission

### PERSONAL ALARM DEVICE (PAD)
- Personnel worn device which interacts with electromagnetic zones to determine proximity and emit warning alerts to the wearer
- Works to prevent vehicle-to-person contact
- Warning alerts increase safety awareness and reinforce training to maintain safe working distances from machinery

#### 1. PAD with Warning Module
- Small, lightweight unit attaches to hard hat and Warning Module with flashing LED light and audible sounder attaches to hard hat brim

#### 2. PAD
- Lightweight and ergonomically designed to be worn on the belt or arm. Flashing LED light and in-built audible sounder

#### 3. TPL-Eco
- LED cap lamp powered by a small rechargeable battery pack worn on the belt. Proximity detection technology and sounder alarm located in the head piece
How do the components work together?

**Proximity Generator**
- Installed on machinery
- Create electromagnetic fields around entire vehicle

**On-Dash LED Display Screen**
- Installed in driver’s cab
- Driver is alerted when person or vehicle is detected within marker zones generated by Proximity Generator

**Belt-, arm-, or hard hat-worn personal alarm device**
- Alerts worker of potential danger
HAZARDAVERT® MARKER ZONES

- HazardAVERT® Proximity Generators installed on equipment create two levels of marker zones that completely surround the equipment, covering blind spots and turning radius.
- Warning Zone – Outer-most zone
- Hazard Zone – Inner-most zone
- Silent Zone – Exclusive zone within Hazard Zone to enable personnel to work as usual on machinery; such as the equipment operator
- Breach of the Warning and Hazard Zones by vehicles or pedestrians trigger audible and visual warning alarms to equipment operator(s) and pedestrian(s)

On-Dash Display Screen

- Five inch LCD display screen designed for use in harsh working environments. Installed in vehicle cabs, the screen displays HazardAVERT® zone status and activity, warning alarms and live camera feeds.
- HazardAVERT® Zones
  - ON/OFF Icon displays system status
  - Compass Icon displays direction of travel
  - Orange – Warning Zone breached
  - Red – Hazard Zone breached
  - Indication of front or rear of vehicle
- Camera views
  - Live feed from front and rear facing cameras
  - Operate depending on direction of travel

Personal Alarm Device

- Pedestrian PAD or TPL-Eco LED flashes and audible sounder alarms

Cameras

- Strata has integrated two wide-angle-lens cameras for front and rear viewing
- Live feed displayed on On-Dash Display Screen
- Front versus back camera activity based on direction of travel
- Front view when stationary
- IP67 rating
- NTSC format

System Interlock & Equipment Override

- If HazardAVERT® has been interlocked into the controls of the equipment, configuration options include:
  - Warning Zone breach: All vehicles involved will be slowed
  - Hazard Zone breach: All vehicles involved will be slowed, stopped or hydraulics fully or partially disabled
- Machine functions that may be controlled by the proximity system relays are determined by the customer and the equipment OEM.

ELECTROMAGNETIC DETECTION

Key Features

- Can be interlocked into equipment controls to automatically slow, stop and/or disable hydraulics
- High-resolution coverage extending up to 100 ft (30 m) at the front and rear of equipment
- Functions both on the surface and underground
- Does not require line of sight
- Detects pedestrians and vehicles of all sizes, even when stationary
- Stable, reliable and repeatable zones
- Does not affect production and enables workers to operate safely and effectively
- Capacity to function with hundreds of vehicles and pedestrians in close proximity without latency or delay

SURFACE APPLICATIONS

Inherent dangers of this working environment for which HazardAVERT® is intended:

- The large scale and volume of machinery
- The diverse scale of vehicles and machinery
- Significant blind-spots on large machinery
- Requirement for people to work in close proximity to machinery
- Large equipment starting up and/or moving in reverse
- Restricted vision due to time of day and weather conditions

Studies show that a large majority of accidents and injuries occur when machinery and vehicles are traveling at lower rates of speed and in reverse due to close proximity. HazardAVERT® can be programmed to stop or disable equipment at specified speeds determined by the OEM and customer.

UNDERGROUND APPLICATIONS

Inherent dangers of this working environment for which HazardAVERT® is intended:

- Restricted visibility
- Confined work spaces
- Out of site pedestrians or vehicles around corners
- Mobile equipment and pedestrians working in close proximity
- Pedestrians interacting with numerous pieces of equipment at the same time
- Difficulty determining travel speeds
- Visual obstructions such as equipment, ventilation curtains and/or barriers

HazardAVERT® Underdog & Surface
HAZARDAVERT® MONITORING AND REPORTING

All vehicle-to-vehicle and pedestrian-to-vehicle interactions that trigger alarms and equipment overrides, are logged and stored in the Interface Module. This data can be downloaded for analysis and reporting via Wi-Fi or cable connection. In underground applications, data can also be wirelessly transmitted to dispatch over Strata’s communication networks.

StrataConnect GUI features and capabilities

- Individual facility mine-map
- Easy view navigation with layers and tabs
- Ability to monitor at system level or zoom in to individual people and equipment
- High resolution tracking including direction of travel
- Personnel tracking
- Asset tracking
- Critical safety data reports
- Productivity trends
- HazardAvert system operating status and maintenance

REPORTING

- Safety Reports
  - Worker and machinery operator safety practices
  - Zone breaches – frequency and duration
- Productivity reports
  - Machinery tracking
  - Travel time
  - Stop time
  - Interactivity time

HAZARDAVERT® SEES WHAT PEOPLE CAN’T, AND REACTS WHEN PEOPLE DON’T.