



Avoiding collisions in underground mines

Robin Burgess-Limerick PhD CPE

Background

Collisions between people and equipment is a high risk in underground coal mines.

Restricted equipment operator visibility may be a common causal factor.

Video cameras and proximity detection systems have been suggested as potential control measures.



Method / Aim

Reports of all fatal collisions occurring in underground coal mines in the USA since 2000 (N=41) were examined to assess the potential role of proximity detection and other control measures in preventing these collisions.

Equipment most commonly involved: CM (15)
Haulage (10) & Scoop / LHD (5)

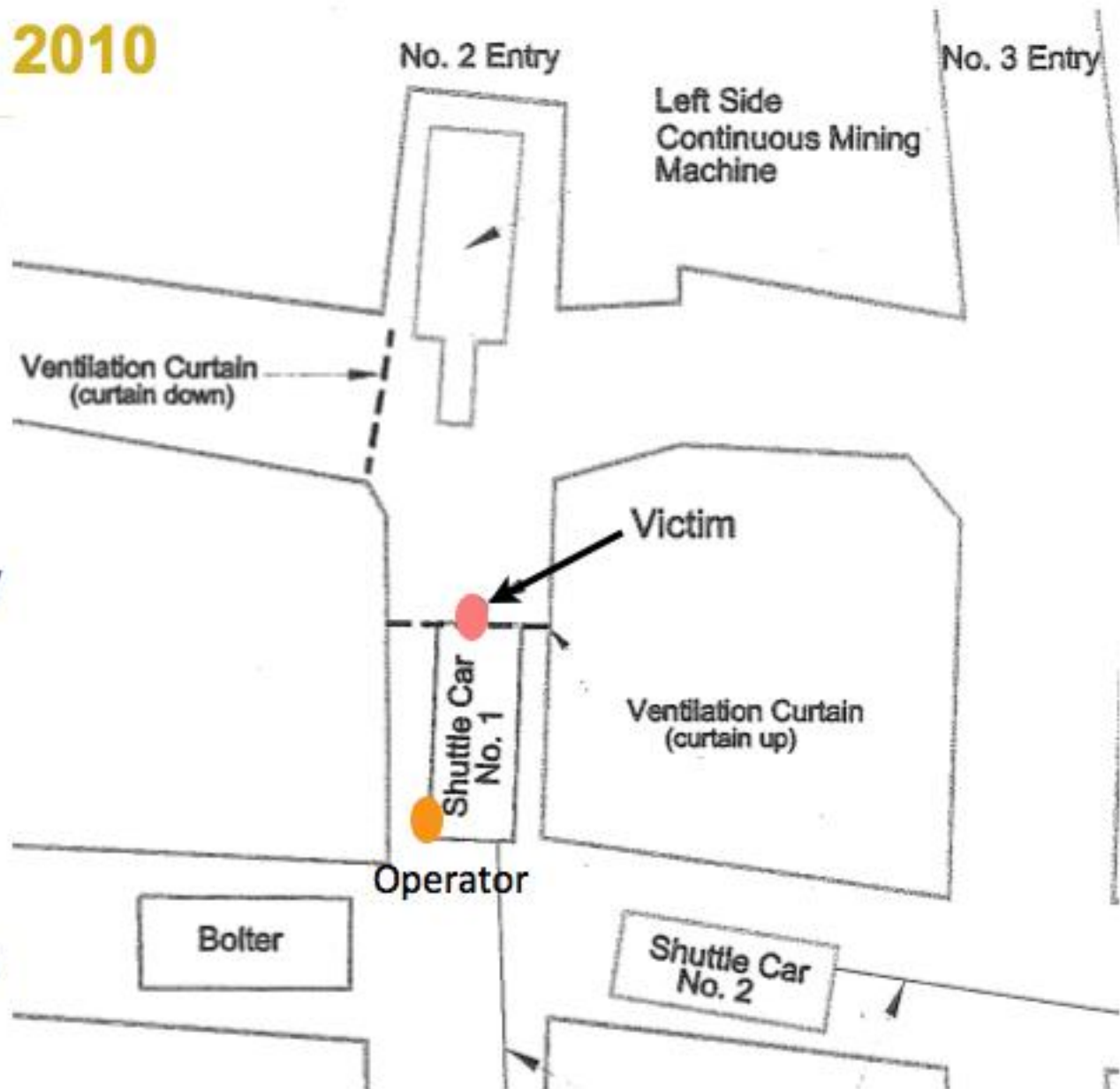
Six cases selected for discussion.



Case 1 - July 1, 2010

Unloaded shuttle car travelling inbye collided with pedestrian -

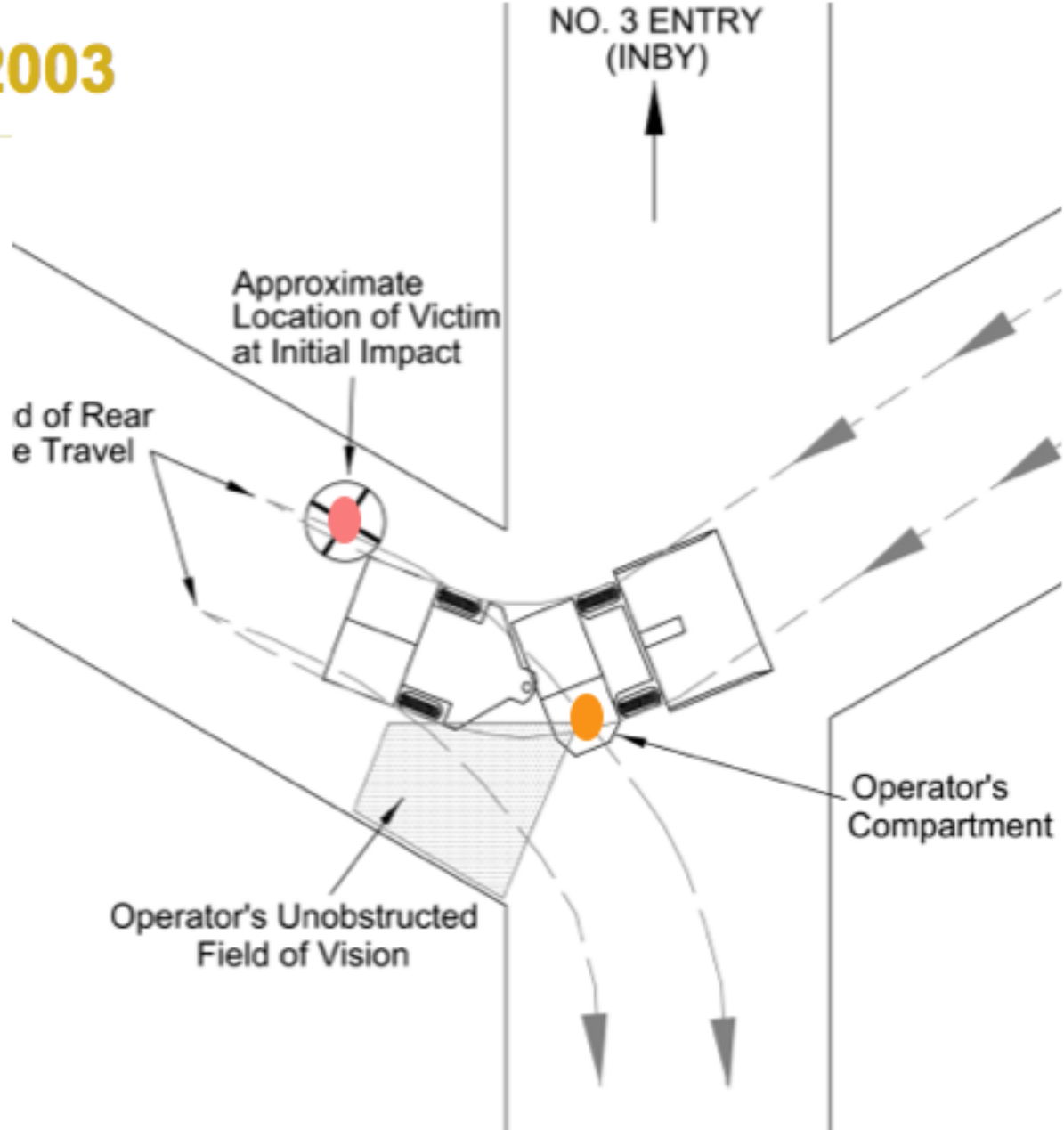
Operator visibility restricted - video camera or proximity detection are potential controls



Case 2 - June 20, 2003

Scoop collided
with pedestrian

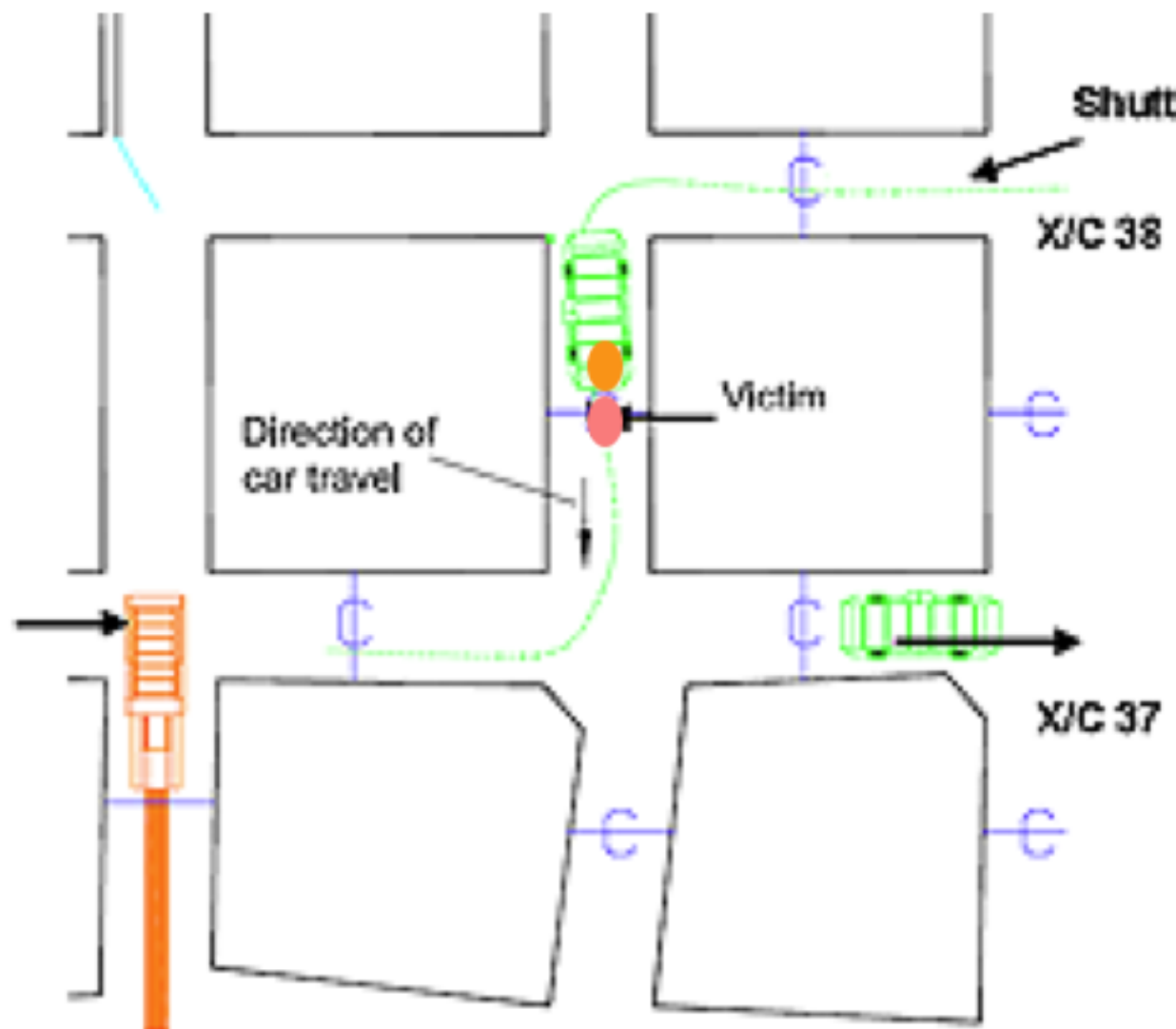
Operator visibility
restricted - video
camera or
proximity detection
are potential
controls



Case 3 - Oct 27, 2010

Loaded shuttle car
travelling outbye
collided with miner
repairing
ventilation curtain

Visibility restricted
by curtain -
proximity
detection is
potential control



Analysis so far...

Cases 1-3 have common characteristic that equipment operator was unaware of victim location.

Video cameras (cases 1 & 2) or proximity detection linked to warning may have been effective.

BUT - relies on effective interface design to allow operator to detect, understand, and act upon the information





**Tristan Cooke - MISHC, UQ
Cracow**





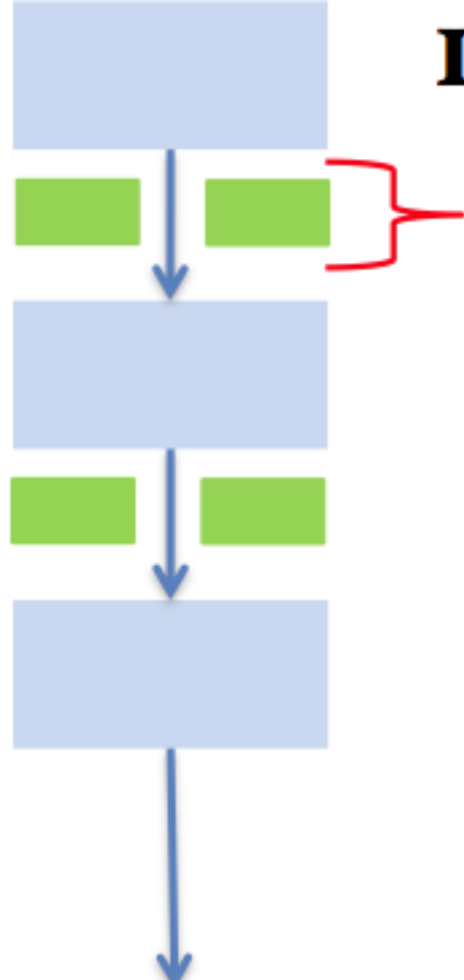




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Important opportunity to learn




At least 7
Barriers Failed

Including Proximity
Detection



Complex story involving three vehicles, contributing factors included mine design, operator assumptions and communication issues, visibility and lighting, and not saved by proximity detection. Not a “behavioural” issue.



**Driver looks
this way
when driving
forwards**

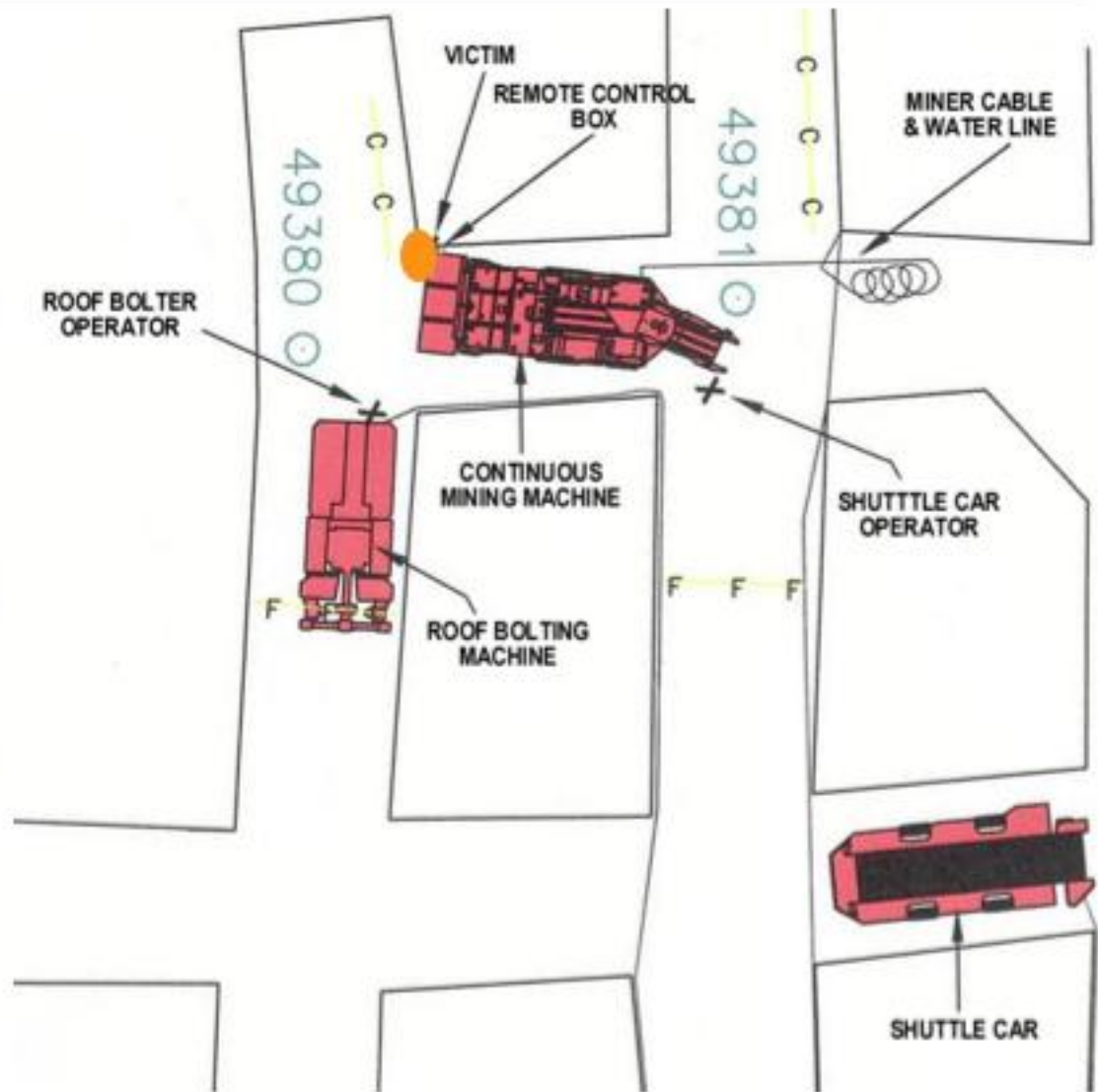
Volume turned down because
warning tones continued for each
vehicle detected until screen
touched - required taking hands
off control and looking at screen
while driving



Case 4 - April 3, 2004

CM operator
crushed between
head and rib while
tramming.

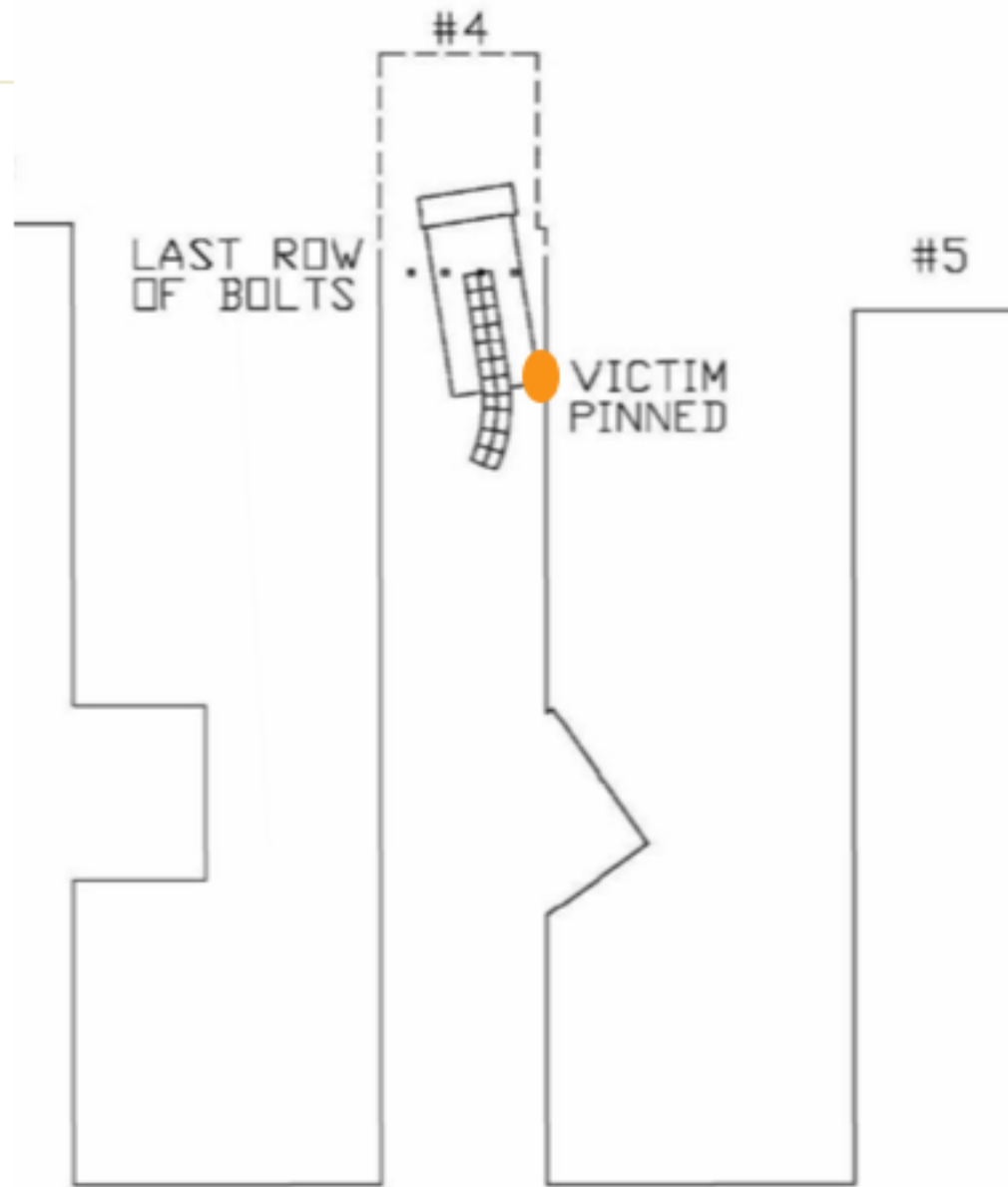
Directional control
incompatibility
likely involved, but
not restricted
visibility



Case 5 - June 4, 2010

CM operator
crushed between
rear of CM and rib
while cleaning
floor.

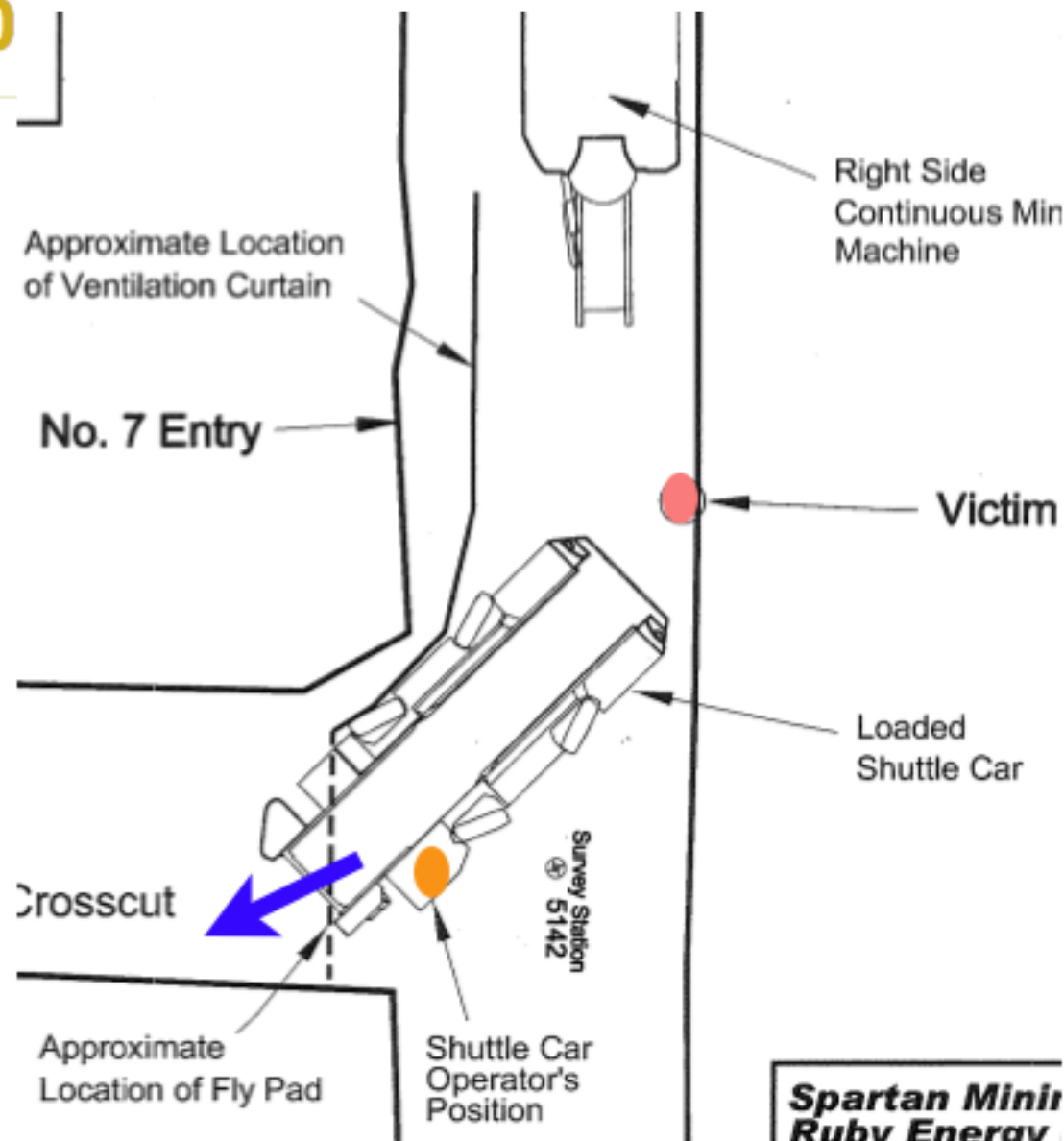
Restricted visibility
was not a causal
factor.



Case 6 - May 10, 2010

CM operator
crushed between
shuttle car and rib.

Restricted visibility
was not a causal
factor.



More analysis

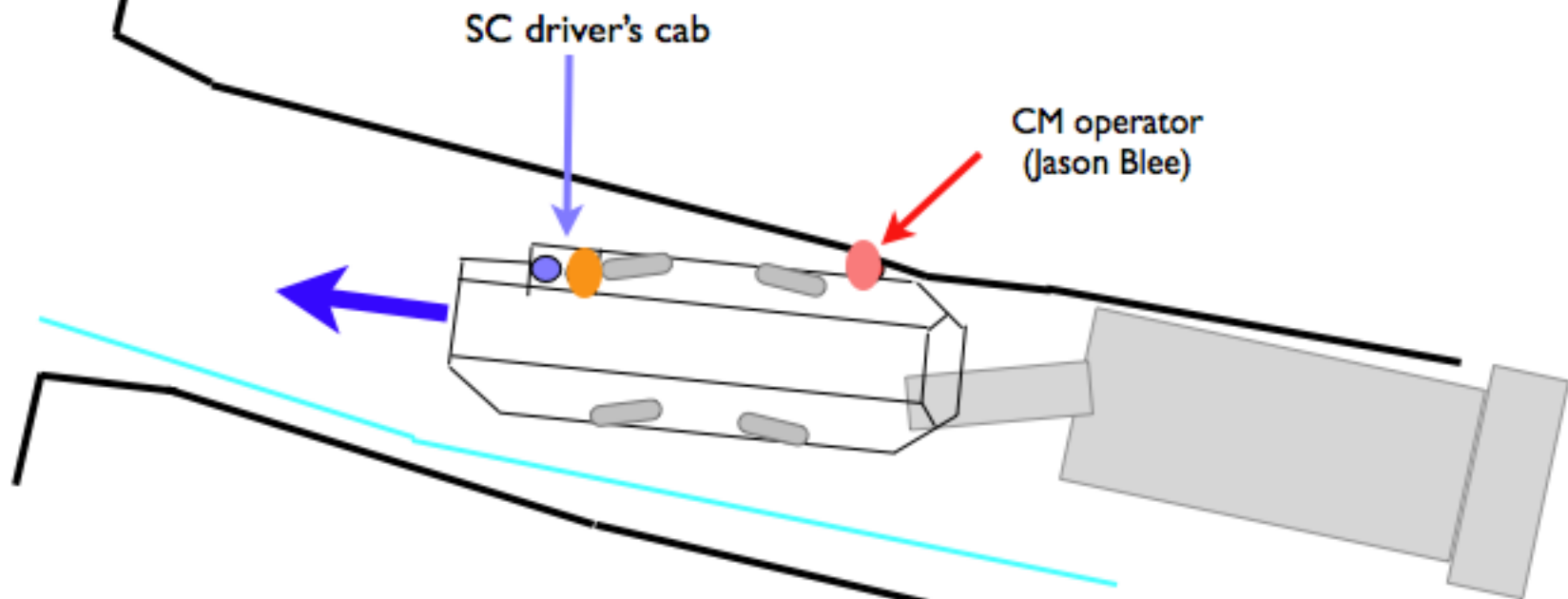
Cases 4-6 have the common characteristic that either the equipment operator was killed, or the equipment operator was aware of victim's location.

Of 41 fatal collisions in USA, this was true for 56% of situations (23 fatalities).



April 9, 2007 - Moranbah North

Following a mechanical fault on the continuous miner, Mr Blee walked to the shuttle car drivers cab and instructed the shuttle car driver to take the car to the boot end. Mr Blee was subsequently crushed between shuttle car and rib.





OFFICE OF THE STATE CORONER

FINDINGS OF INQUEST

CITATION:

Inquest into the death of Jason George
Elliott BLEE

DELIVERED ON:

10 September 2009

Recommendation 7

That coal mining operations and the Department (as the approval body) move quickly with manufacturers and other appropriate bodies to have developed, tested and approved proximity detection devices for use in underground coal mines to detect the presence of pedestrians in and around mobile equipment including shuttle cars.

Conclusion

Proximity **Detection** alone may be insufficient

Proximity detection should be interlocked with equipment control to slow and stop moving equipment in the presence of pedestrians, and prevent stationary equipment from commencing movement near pedestrians.



