Seatbelt performance in quarry vehicle incidents

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Aims

- To review current standards and practices in seatbelt wearing and types
- To evaluate the performance of different restraint systems in different vehicle types and incident scenarios
- To make recommendations as to the most effective restraint systems in order to minimise injury over a range of accident situations

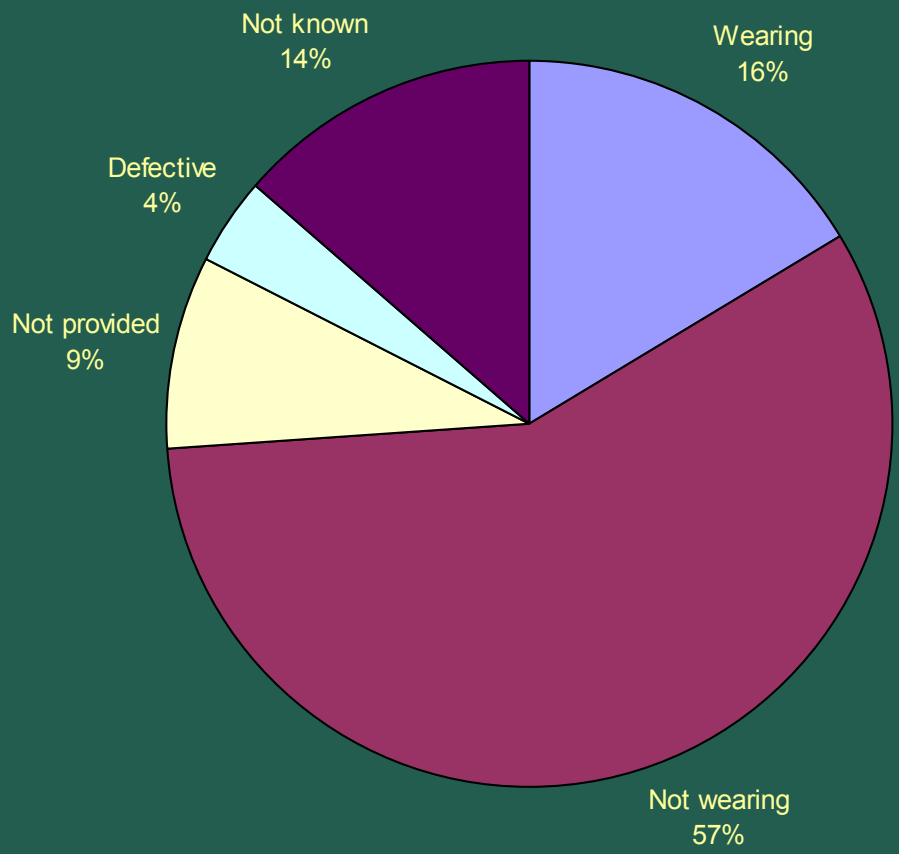
Research methods

- Review of international standards, practices and accident data
- Full scale testing to calibrate computer simulations
- Risk assessment of vehicle cab designs

International standards

- Seatbelts: two point non-retractable belt
- ROPS survival space: based on 95th percentile Arctic clothed operator who does not move from the seated position – unlikely if only a lap belt is worn

MSHA 80 fatal accidents (coal, metal, non-metal)



Causes (sometimes combined)

- Brake defects
- Inadequate edge protection
- Loss of control
- Excess speed
- Driving too close to the edge
- Edge collapse

Prevention

- Preventing brake defects and adequate edge protection could potentially have saved 5 lives (38%) in those who were wearing seatbelts
- Wearing a lap belt could potentially have saved up to 45 lives (80%)
- Roll over protection to SAE standards plus a harness restraint could potentially have saved up to 53 lives (95%)

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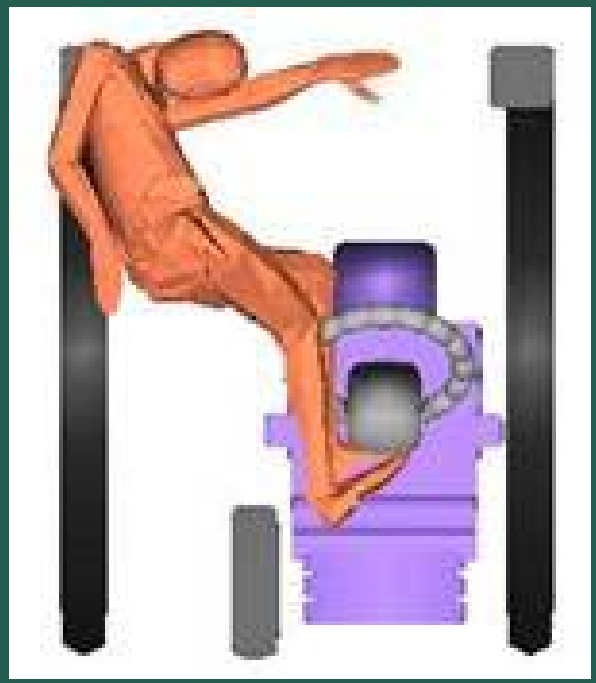
Full scale testing

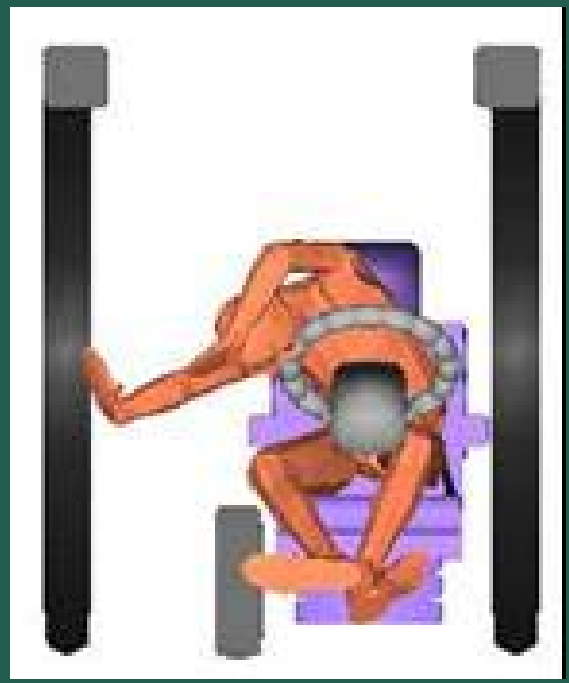
Full scale testing

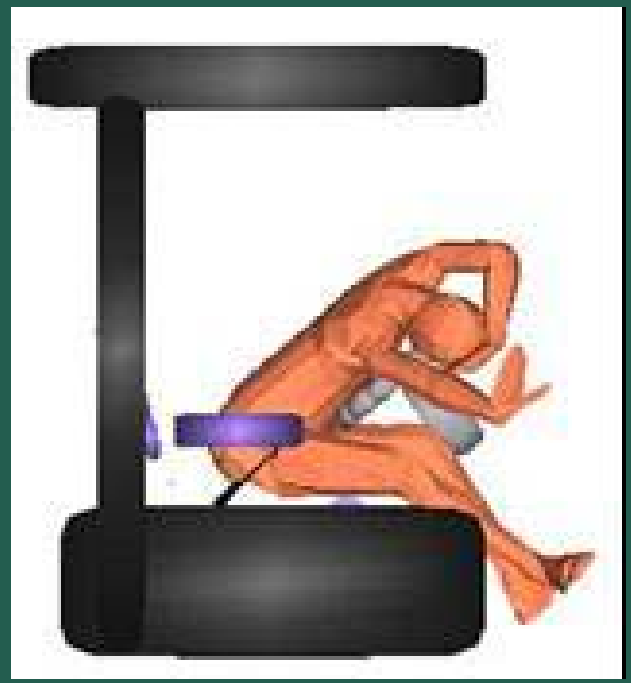
270 degree rollover simulation, dumper

Driver in 270 degree rollover, no belt

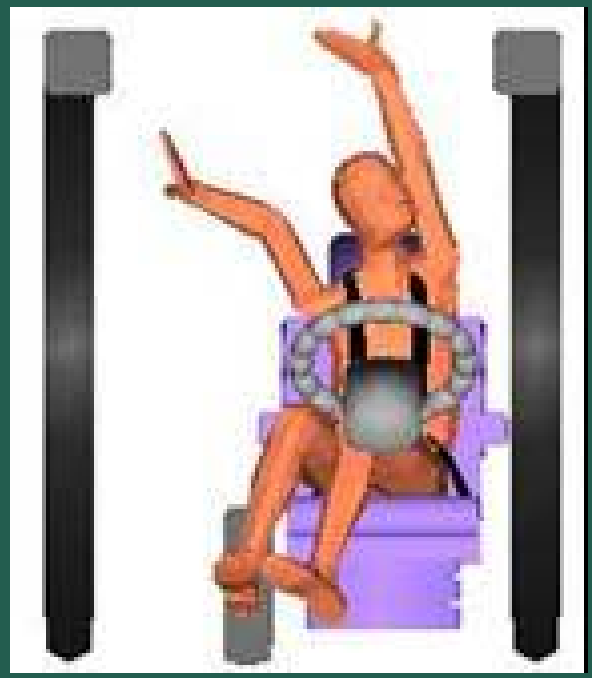


Driver in 270 degree rollover, lap belt





Driver in 270 degree rollover, harness



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Brake testing in GB

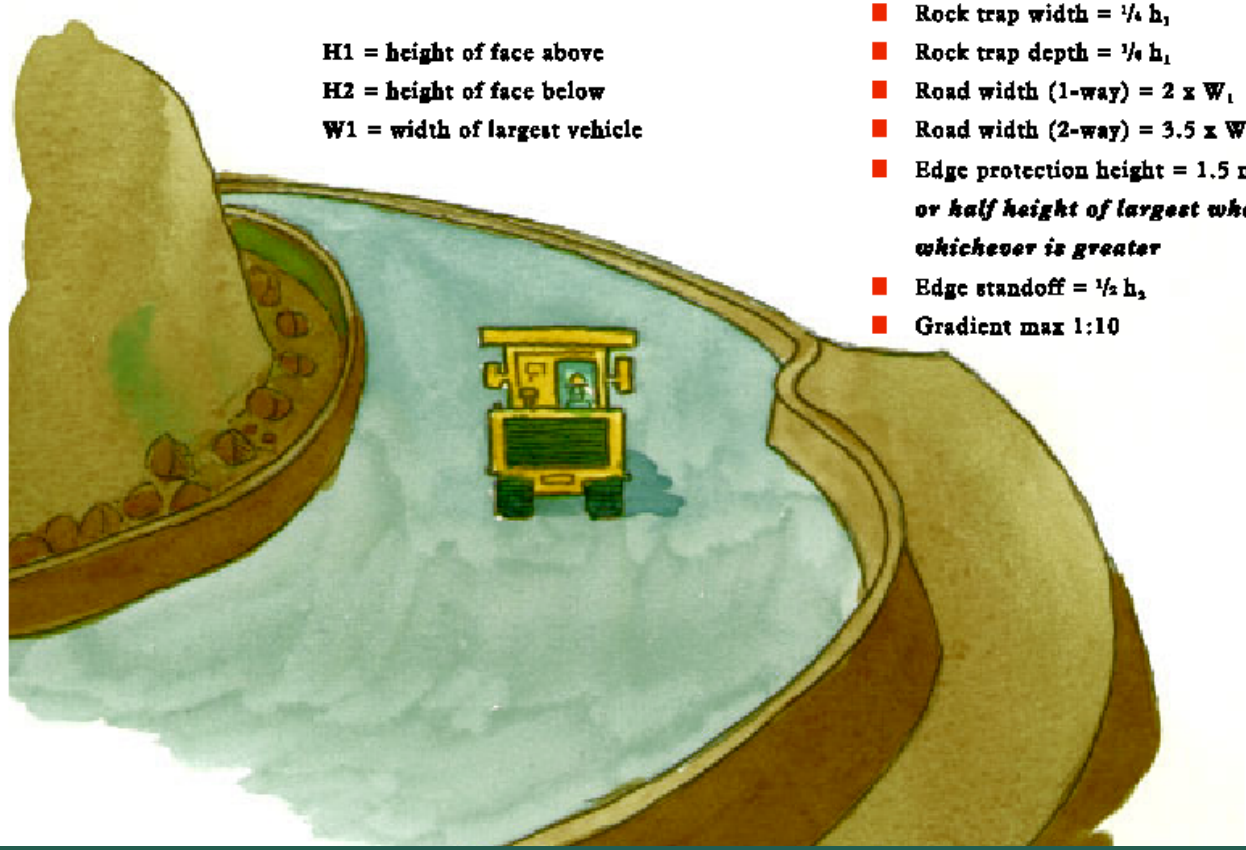
- Development of SIMRET by HSE's Health and Safety Laboratory, 1983
- Adoption as standard practice 1996
- Leaflets in delegate pack – Simret and Bowmonk

Brake testing in GB

Edge protection in GB

Haul road design and maintenance

H1 = height of face above
H2 = height of face below
W1 = width of largest vehicle



Check the details of your quarry design, but as a guide:

- Rock trap width = ¼ h_1
- Rock trap depth = ⅛ h_1
- Road width (1-way) = 2 x W_1
- Road width (2-way) = 3.5 x W_1
- Edge protection height = 1.5 metres ***or half height of largest wheel, whichever is greater***
- Edge standoff = ½ h_2
- Gradient max 1:10

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Further seatbelt considerations in GB

- Lap belt retractor locking
- Standard spec for harness seatbelts
- Operator working and comfort issues
- Cab interior design
- Use of features already used in cars

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