

Safety on Gravel Roads

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Safety Issues on Gravel Roads

- Safety during maintenance operations
- Roadway shape
- Surface conditions

Types of Gravel Roads Crashes

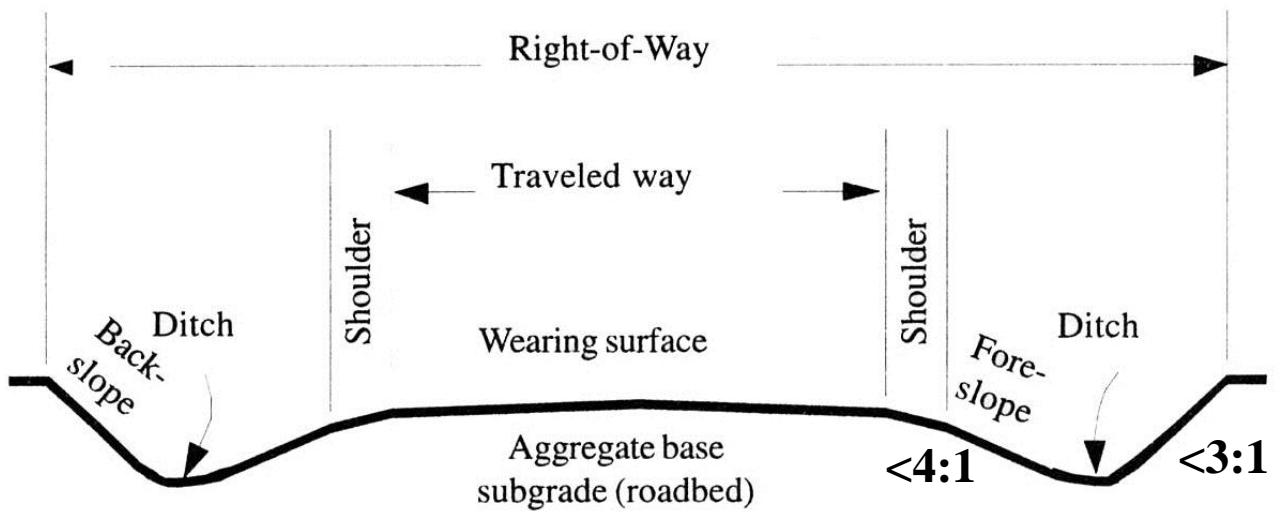
- Single Vehicle
 - Rollovers and Ejections
- Curves
- Wildlife
- Maintenance equipment

Factors that contribute to crashes and fatalities on gravel roads

- Driver behavior
 - Inattentiveness
 - Impairment
 - Inexperience
 - High speeds
- Minimal law enforcement
- Long emergency response times
- Trucks
- Wildlife
- **Poor surface conditions**
- **Poor geometry**
 - Inconsistencies and surprises
 - Clear zones
 - Sight distance

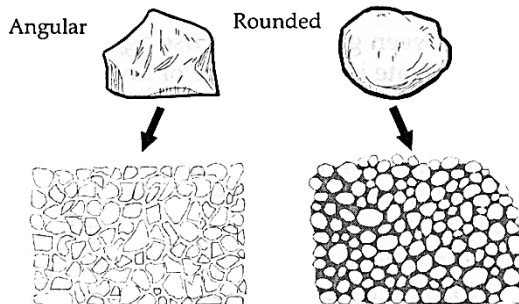
Hazards on Gravel Roads

- Geometric
 - Poor alignment
 - Inconsistent design
 - Limited sight distance
 - Poor superelevations
 - Curves
 - Poor transitions
 - Cattleguard, bridge and RR approaches
 - Narrow bridges
 - Blind intersections
 - Inadequate and unsafe clear zones
 - Too narrow
 - Too steep
 - Overturning hazards
 - Fixed objects
 - Variable roadway widths
 - Edge deterioration
 - Washouts
 - Culverts too short
- Surface
 - Loss of vehicle control
 - Slippery surface
 - Wet clay
 - Snow and ice
 - Dust suppressants
 - Washboards/corrugations
 - Loose aggregate
 - Potholes
 - Ruts
 - Erosion
- Visibility and Warnings
 - Dust
 - Lack of signs
 - Lack of delineation
 - Lack of object markers
 - Inadequate retroreflectivity
 - Vegetation



Surfacing Gravel Issues

- Good when Wet
 - Drainage
 - Ruts
 - Potholes
 - Washboards
- Good when Dry
 - Dust
 - Raveling
 - Loose aggregate
 - Washboards
- Strength
 - Well-graded
 - Angular
- Cohesion
 - Plasticity
 - “Stickiness”



Gravel Roads Shape Issues

- Drainage
 - Crown
 - Not too much, not too little
 - Shoulders and Foreslopes
 - Ditches
- Roughness
 - Washboards, ruts, potholes
- Superelevations
- Intersections

Maintenance Safety

- Warning!!!
 - Lights working
 - Signs
- Limit windrows

Safe Transportation Research & Education Center
 Institute of Transportation Studies – UC Berkeley, School of Public Health, 2010,
<http://www.tsc.berkeley.edu/research/ruralroads.html>

Gravel Roads Management Final Report, Implementation Guide, and Programming Guide, Wyoming Technology Transfer Center/LTAP, October 2011, <http://www.weng.uwyo.edu/wyt2/> [Special Projects].

Gravel Roads Maintenance and Design Manual, South Dakota LTAP, November 2000,
<http://www.mnltap.umn.edu/publications/videos/gravelroadmaintenance/documents/manual.pdf> or
<http://www.epa.gov/owow/NPS/gravelroads/intro.pdf>

Australian Road Safety Audit Toolkit, <http://www.engtoolkit.com.au/>

Unsealed roads manual: Guidelines to good practice, 3rd Edition, March 2009, ARRB