ACCOMMODATING LARGE TRUCKS IN WORK ZONES

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Topics

- Truck collisions in work zones
- Dynamic performance of large trucks
- Considerations for safer work zones

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Truck Collisions In Work Zones

Truck collisions in work zones

- Large trucks are over-represented in total and fatal collisions in work zones, compared to non-work zones

30% of all collisions in work zones involve large trucks

21% of all fatal ped collisions in work zones involve large trucks

Increasing trend in large truck collisions in work zones

Source: FARS data

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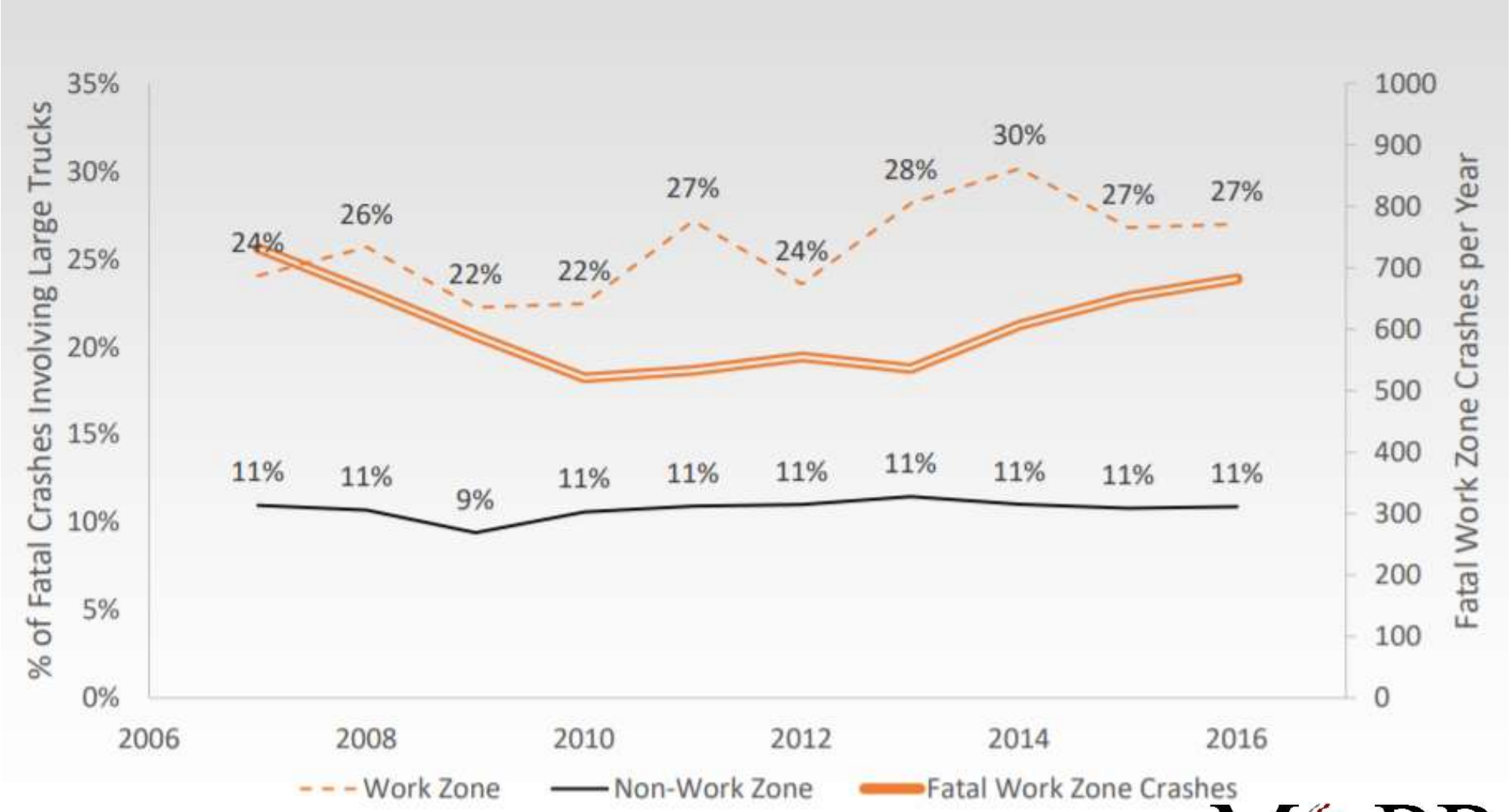
Fatal truck collisions and work zones



Source: U.S. FHWA, Design and Operation of Work Zone Strategies to Improve Large Truck Safety, 2016

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Common fatal collision types involving large trucks in work zones

Rear-end (57%)

- Unexpected stopping

Single vehicle (28%)

- Driving too fast for work zone layout

Sideswipe (6%)

- Vehicles in blind spot

Right-angle (5%)

- Turning into work spaces without enough gaps

Head-on (3%)

- Crossing centerline at night
- Swerving to avoid objects

Source: U.S. FARS (2014-2016)

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Factors contributing to collisions

- Driver expectation and workload
- Roadside objects and activities
- Pavement condition
- Geometric elements
- Environmental conditions

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Dynamic Performance of Large Trucks

Common truck types

Basic characteristics

- Longer and wider
- Higher center of mass
- Large blind spots
- Heavier
- Lower acceleration and deceleration rates
- Greater distance between driver eye and vehicle headlights
- Unique stability and control characteristics

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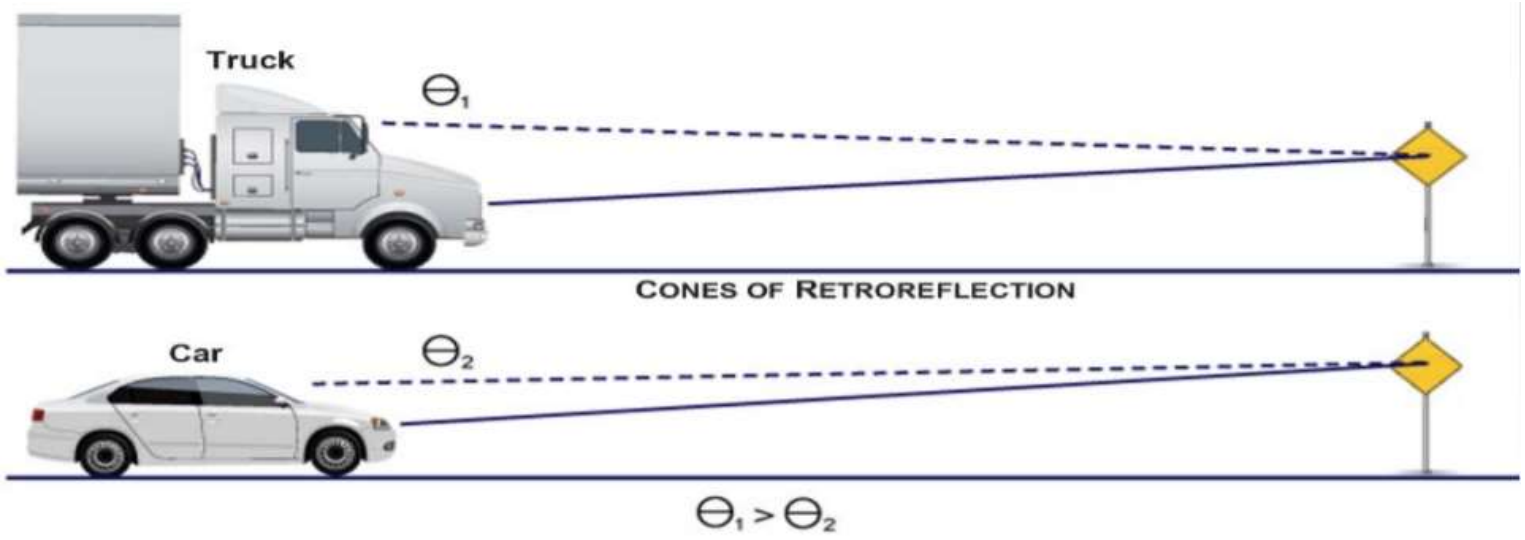
Observation angle

- As observation angle increases, signs appear less bright
- Large trucks can have twice the observation angle of passenger vehicles at the same distance



Vehicle stability and control

- Low speed off-tracking
- Roll stability
- Rearward amplification
- Braking

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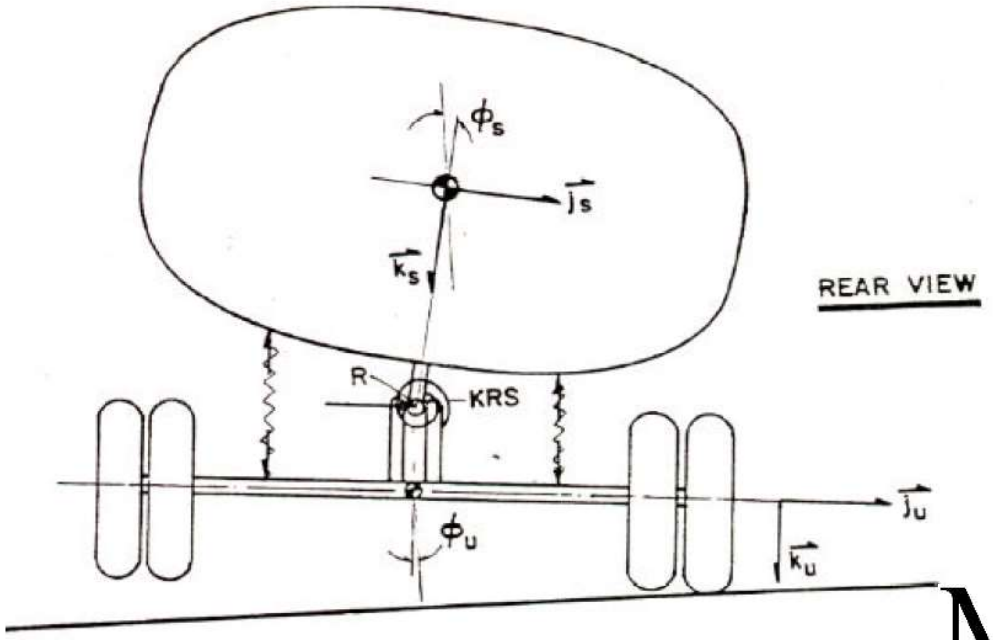
Low speed off-tracking

- Measure of swept path of vehicle and lateral road space required when turning at intersections

Roll stability

- The magnitude of lateral acceleration required to produce vehicle rollover
- Height of COG is most important factor



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Rearward amplification

- It is the ratio of the lateral acceleration at the COG of the rearmost unit to that at the hauling unit in a dynamic maneuver
- Increased side forces or lateral acceleration acting on the rear trailer

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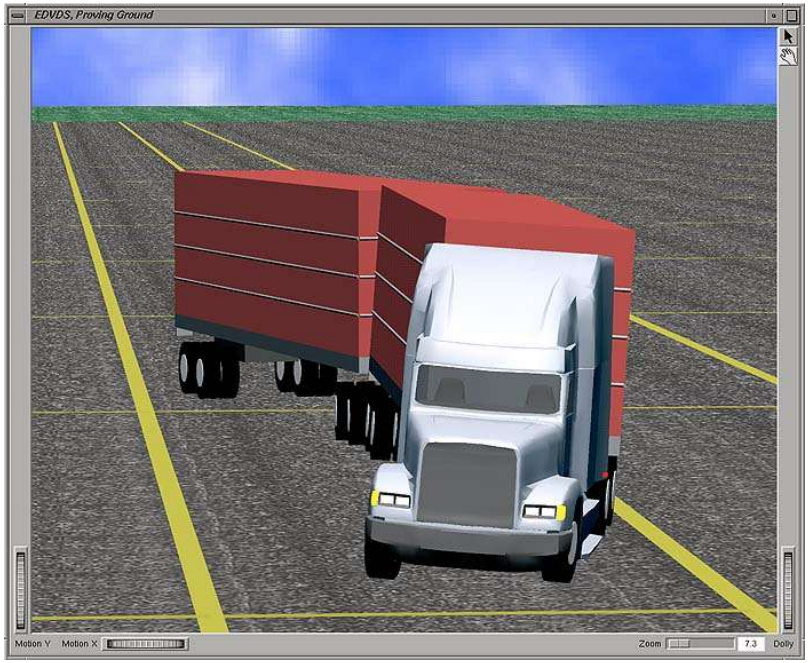
Rearward amplification by truck type

- 5-axle tractor semitrailer
- Turnpike double
- B-train double
- Truck + trailer
- Standard double

Increasing stability



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Braking efficiency

- Braking is the key mechanism to avoid a collision
- The braking distance required for a large truck traveling at 90 km/h is almost 50% greater than that needed for a car
- This applies even in best road and weather conditions with good tires, brakes and dry pavement

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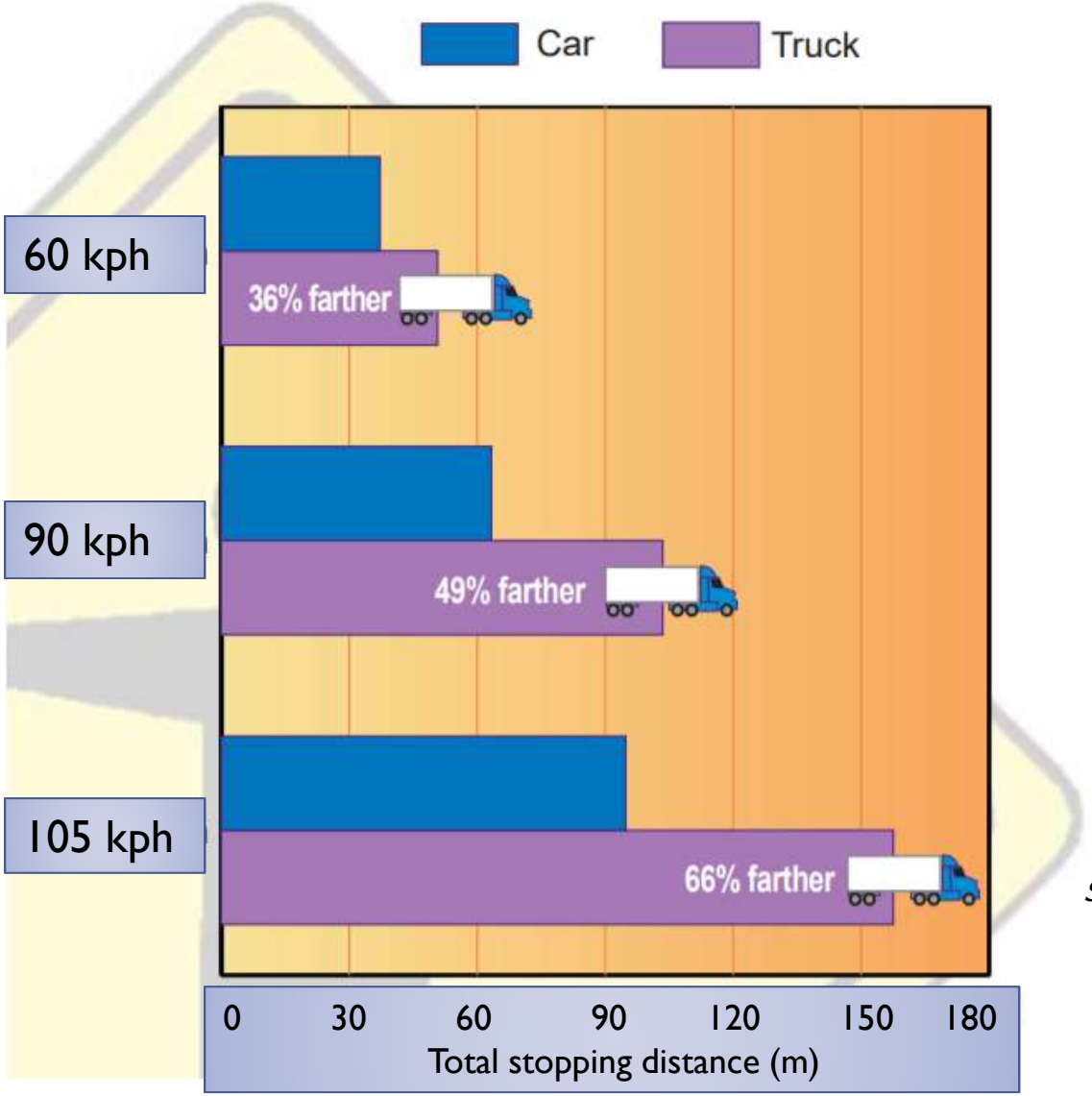
Stopping distance of car vs truck



Source: U.S. National Safety Council

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Factors influencing stopping distance

- Weather – rain, snow
- Equipment condition – worn tires/brakes
- Type of load
- Terrain
- Road surface condition
- Time of day
- Human factors
- Familiarity with area

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Considerations for Safer Work Zones

General considerations

- Inform road users well in advance about what to expect in the work zone
- Design must be clear and simple
- Provide road users with adequate visibility distance and time to make the required lane and speed changes
- Explicitly include large truck characteristics into work zone design plans

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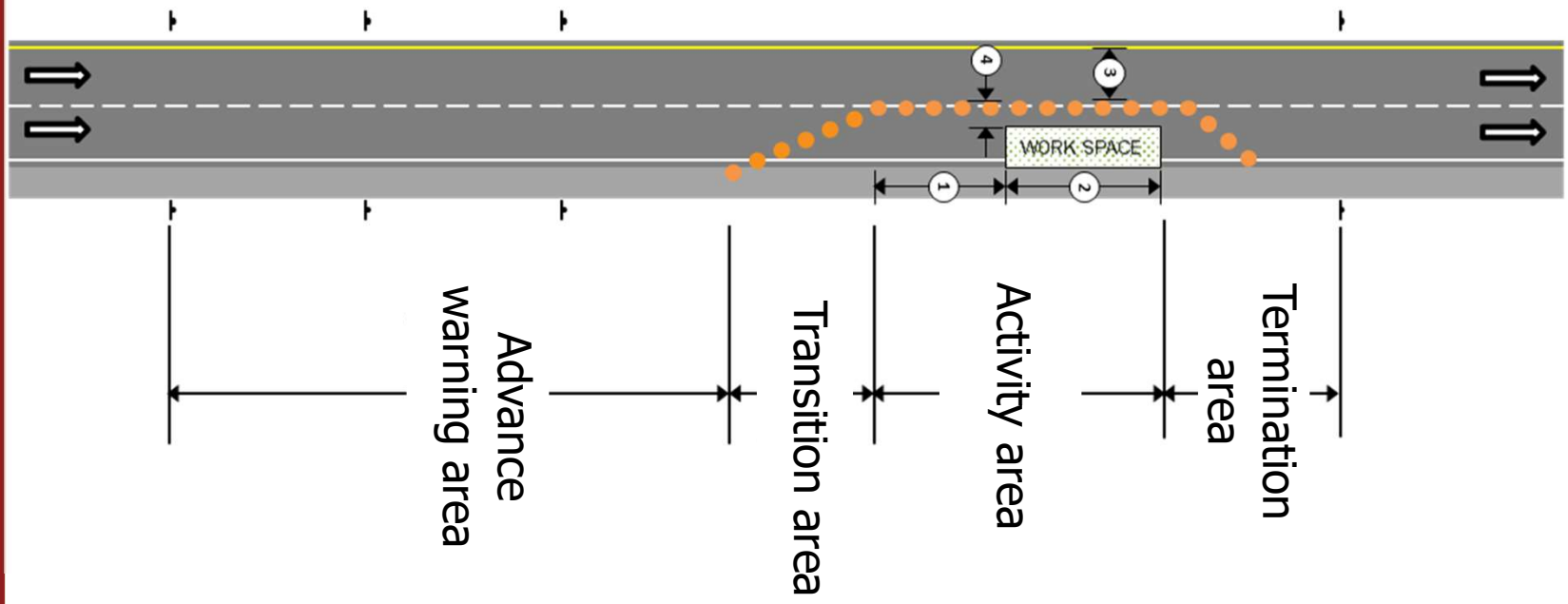
Large truck considerations



Source: TAC Work Zone Safety Guide

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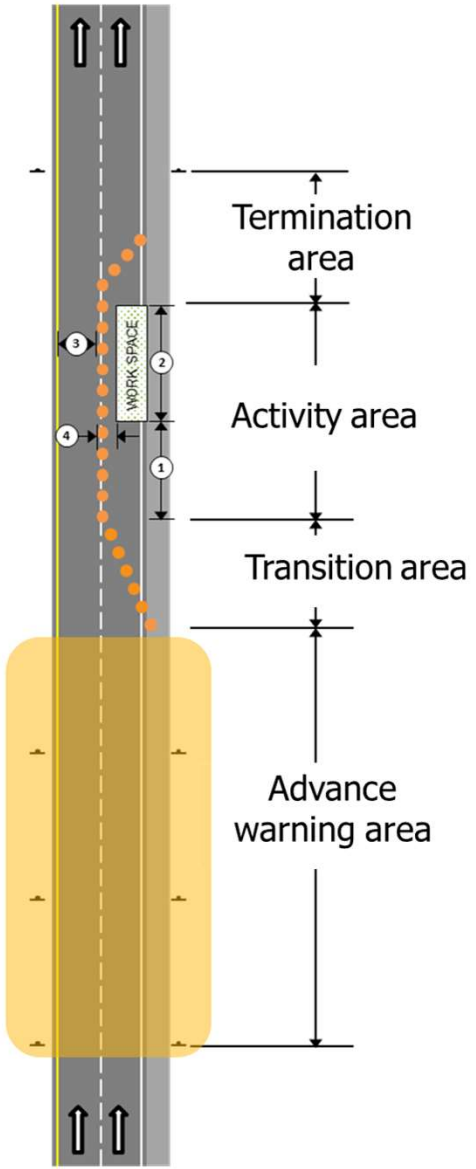
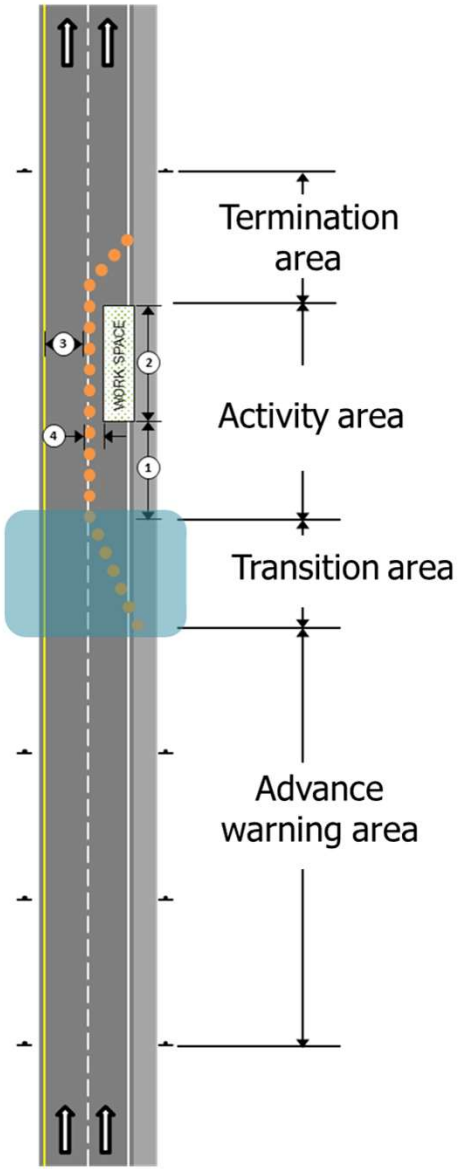
Large truck considerations – advance warning area

- Provide enough advance notice of unexpected changes in roadway alignment
- Highly retroreflective signs
- End-of-queue warning



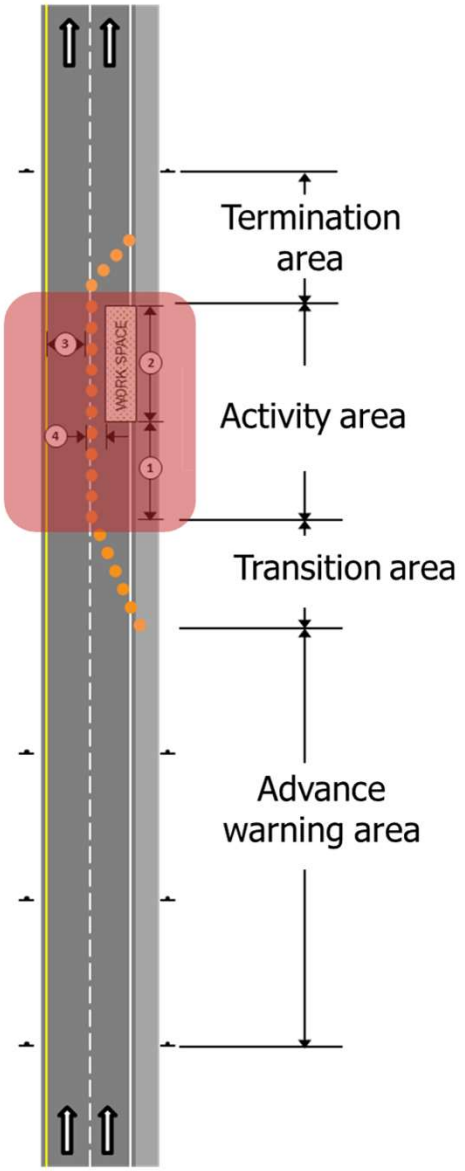
Large truck considerations – transition area

- Enough distance needed for safe lane shifts
  - Low volumes
  - High volumes
  - Freeway operations
- Impacts of grade changes for safe lane shifting



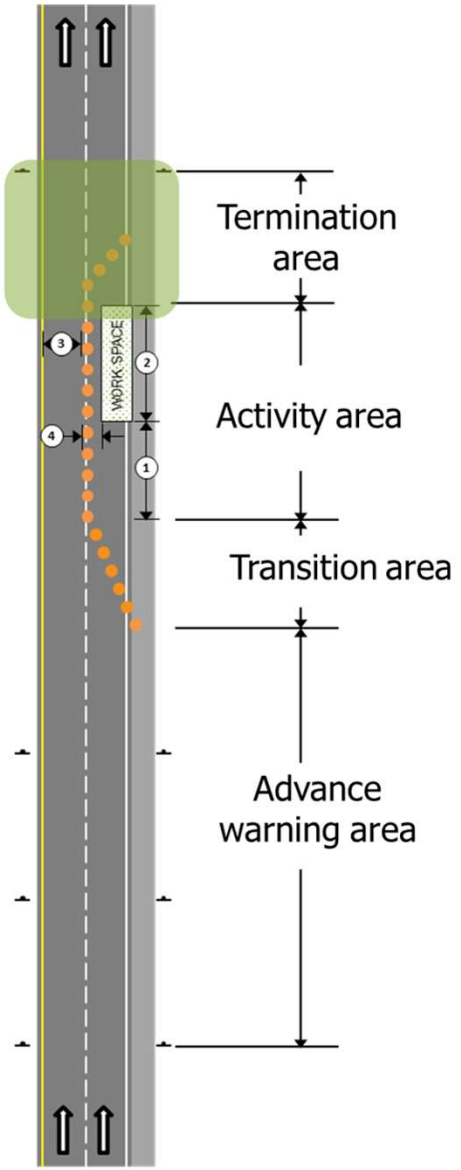
Large truck considerations – activity area

- Sufficient lane width – minimum 3.3m
- Protection barriers able to contain a large truck
- Adequate sight lines for trucks entering work zone
- Lower operating speeds



Large truck considerations – termination area

- Use caution when transitioning large trucks back into normal lanes
- Enough sight distance
- Avoid differential speeds



Other considerations for trucks

- Truck-only lanes through work zone
- Restrict certain movements if needed
- Diversion of large trucks/DG trucks
- Incident response plan for DG incidents
- Provide enough vertical clearance
- Communications and outreach – coordination with industry on special permit vehicle movements is important

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