

| Accident Pattern | Probable Cause | Safety Enhancement |
|------------------|--|---|
| Run-off-roadway | Slippery Pavement | Improve skid resistance; provide adequate drainage; groove existing pavement |
| | Roadway Design Inadequate for Traffic Conditions | Widen lanes/shoulders; relocate islands; provide proper super-elevation; install/improve traffic barriers; improve alignment/grade; flatten slopes/ditches; provide escape ramp |
| | Poor Delineation | Improve/install pavement markings; install roadside delineators; install advance warning lights |
| | Poor Visibility | Improve roadway lighting; increase sign size |
| | Inadequate Shoulder | Upgrade roadway shoulders |
| | Improper Channelization | Improve channelization |
| Overturn | Roadside Features | Flatten slopes and ditches; relocate drainage facilities; extend culverts; provide traversable culvert end treatments; install/improve traffic barriers |
| | Inadequate shoulder | Widen lane/shoulder; upgrade shoulder surface; remove curbing obstructions; revise cross slope |
| | Pavement Feature | Eliminate edge dropoff; improve superelevation/crown |

ACCIDENT ANALYSIS

Figure 55-8E

| Accident Pattern | Probable Cause | Safety Enhancement |
|------------------|----------------------------|---|
| Bridges | Alignment | Realign bridge/roadway; install advance warning signs; improve delineation/markings |
| | Narrow Roadway | Widen structure; improve delineation/markings; install signing/signals |
| | Visibility | Remove obstruction; install advance warning signs; improve delineation and markings |
| | Vertical Clearance | Rebuild structure/adjust roadway grade; install advance warning signs; improve delineation and markings; provide height restrictor/warning device |
| | Slippery Surface (Wet/Icy) | Resurface deck; improve skid resistance; provide adequate drainage; provide special signing |
| | Rough Surface | Resurface deck; rehabilitate joints; regrade approaches |
| | Inadequate Barrier | Upgrade bridge rail system; upgrade approach rail/terminals; upgrade bridge - approach rail connections; remove hazardous curb; improve delineation and marking |
| Parked Vehicles | Inadequate Road Design | Widen lanes/shoulders |

ACCIDENT ANALYSIS

Figure 55-8E (Continued)

| Accident Pattern | Probable Cause | Safety Enhancement |
|----------------------|---|---|
| Fixed Object | Obstructions In or Too Close to Roadway | Remove/relocate obstacles; install breakaway features to light poles, signposts, etc.; protect objects with guardrail; install crash cushions; delineation/reflectorize safety hardware |
| | Inadequate Lighting | Improve roadway lighting |
| | Inadequate Pavement | Install reflectorized pavement marking lines/raised markers |
| | Inadequate Signs, Delineators and Guardrail | Install reflectorized paint and/or reflectors on the obstruction; add special signing; upgrade barrier system |
| | Inadequate Road Design | Improve alignment/grade; provide proper superelevation; install warning signs/delineators; provide wider lanes |
| | Slippery Surface | Improve skid resistance; provide adequate drainage; groove existing pavement |
| Sideswipe or Head-On | Inadequate Road Design | Provide wider lanes; improve alignment/grade; provide passing lanes; provide roadside delineators; sign and mark unsafe passing areas |
| | Inadequate Shoulder | Improve shoulders |
| | Excessive Vehicle Speed | Install median devices |
| | Inadequate Pavement Markings | Install/improve centerlines, lane lines and edgelines; install reflectorized markers |
| | Inadequate Channelization | Install acceleration and deceleration lanes; improve/install channelization; provide turning bays |
| | Inadequate signing | Provide advance direction and warning signs; add illuminated name signs |

ACCIDENT ANALYSIS

Figure 55-8E (Continued)

| Accident Pattern | Probable Cause | Safety Enhancement |
|---|--------------------------------------|--|
| Intersection (Signalized/ Unsignalized) Left- Turn, Head-On, Right Angle, Rear End | Large Volume of Left/ Right Turns | Widen road; channelize intersection; install stop signs; provide signal; increase curb radii |
| | Restricted Sight Distance | Remove sight obstructions; provide adequate channelization; provide left/ right turn lanes; install warning signs; install stop signs; install signal; install advance markings to supplement signs; install stop bars |
| | Slippery Surface | Improve skid resistance; provide adequate drainage; groove pavement |
| | Large Numbers of Turning Vehicles | Create left- or right-turn lanes; curb radii; install signal |
| | Inadequate Lighting | Improve roadway lighting |
| | Lack of Adequate Gaps | Provide signal; provide stop signs |
| | Crossing Pedestrians | Install/improve signing or marking of pedestrian crosswalks; install signal |
| | Large Total Intersection Volume | Install signal; add traffic lane |
| | Excessive Speed on Approaches | Install rumble strips; improve warning devices |
| | Inadequate Advance Warning Signs | Install advance warning signs |
| | Inadequate Traffic Control Devices | Upgrade traffic control devices |
| | Poor Visibility of Signals | Install/improve advance warning devices; install overhead signals; install 305-mm signal lenses; install visors/back plates; relocate signals; remove sight obstructions; add illuminated/reflectorized name signs |
| | Unwarranted Signals | Remove signals |
| Inadequate Signal Timing | Upgrade signal system timing/phasing | |

ACCIDENT ANALYSIS

Figure 55-8E (Continued)

| Accident Pattern | Probable Cause | Safety Enhancement |
|------------------|--|---|
| Access Related | Left-Turning Vehicles | Install median devices; install two-way left-turn lanes |
| | Improperly Located Driveway | Move driveway to side street; install curbing to define driveway location; consolidate adjacent driveways |
| | Right-Turning Vehicles | Provide right-turn lanes; increase the width of driveways; widen through lanes; increase curb radii |
| | Large Volume of Through Traffic | Move driveway to side street; construct a local service road |
| | Large Volume of Driveway Traffic | Signalize driveway; provide acceleration and deceleration lanes; channelize driveway |
| | Restricted Sight | Remove obstructions |
| | Inadequate Lighting | Improve street lighting |
| Nighttime | Poor Visibility or Lighting | Install/improve streetlighting; install/improve delineation/markings; install/improve warning signs |
| | Poor Sign Quality | Upgrade signing; provide illuminated reflectorized signs |
| | Inadequate Channelization or Delineation | Install pavement markings; improve channelization/delineation |

ACCIDENT ANALYSIS

Figure 55-8E (Continued)

| Accident Pattern | Probable Cause | Safety Enhancement |
|------------------------|------------------------------------|---|
| Pedestrian/ Bicycle | Limited Sight Distance | Remove sight obstructions; install/ improve pedestrian crossing signs and markings |
| | Inadequate Protection | Add pedestrian refuge islands |
| | Inadequate Signals/Signs | Install/upgrade signals/signs |
| | Mid-block Crossings | Install warning signs/markings |
| | Inadequate Pavement Markings | Supplement markings with signing; upgrade pavement markings |
| | Lack of Crossing Opportunity | Install traffic/pedestrian signals; install pedestrian crosswalk and signs |
| | Inadequate Lighting | Improve lighting |
| | Excessive Vehicle Speed | Install proper warning signs |
| | Pedestrian/Bicycles on Roadway | Install sidewalks; install bike lanes/path; eliminate roadside obstructions; install curb ramps |
| | Long Distance to Nearest Crosswalk | Install pedestrian crosswalk; install pedestrian actuated signals |
| Wet Pavement | Slippery Pavement | Improve skid resistance; groove existing pavement |
| | Inadequate Drainage | Provide adequate drainage |
| | Inadequate Pavement Markings | Install raised/reflectorized pavement markings |

ACCIDENT ANALYSIS

Figure 55-8E (Continued)

| Accident Pattern | Probable Cause | Safety Enhancement |
|--------------------|------------------------------|--|
| Railroad Crossings | Restricted Sight Distance | Remove sight obstructions; reduce grade; install active warning devices; install advance warning signs |
| | Poor Visibility | Improve roadway lighting; increase size of signs |
| | Inadequate Pavement Markings | Install advance markings to supplement signs; install stop bars; install/improve pavement markings |
| | Rough Crossing Surface | Improve crossing surface |
| | Sharp Crossing Angle | Rebuild crossing with proper angle |

ACCIDENT ANALYSIS

Figure 55-8E (Continued)