

SIGNALIZED INTERSECTION SAFETY STRATEGIES



Improve Drainage in Intersection and on Approaches

WHERE TO USE

Signalized intersections with a high frequency of crashes that are related to poor drainage. Such crashes involve vehicles that hydroplane and, hence, are not able to stop when required.



Photos by: unknown (l), Dan Burden (r)

DETAILS

One of the most important principles of good highway design is drainage. Drainage problems on approaches to, within, and between intersections can contribute to crashes. However, within an intersection, the potential for vehicles on cross streets to crash contributes to the likelihood for severe crashes, specifically angle crashes. Concentrated storm water must be intercepted at all intersection locations before it reaches the highway. Over-the-curb flow and surface water must be removed without interrupting traffic flow or causing a problem for vehicle occupants, pedestrians, or bicyclists.

Where greater volumes of truck traffic cause rutting in asphalt pavement, especially in the summer when the pavement is hot, consideration should be given to replacing the asphalt with a concrete pavement. Though this is more expensive than a flexible pavement, less rutting will occur, and repair of pavement damage due to trucks will be needed less frequently.

KEY TO SUCCESS

A key to success for this strategy is involving hydrologic and hydraulic specialists during the initial phases to ensure that proper considerations are given to drainage aspects.

Notification of proposed projects should be communicated to other agencies and the public. Any permits and regulations needed by the project should be identified as soon as possible so there are no delays due to legal processes. The success of this strategy will be significantly aided when provision is made for regular condition surveys of existing structures and hydraulic performance to evaluate the functionality of the improvements.



ISSUES

Problems related to drainage design include: lateral encroachments on a channel; pavement cross slopes; disruption of water supplies, irrigation facilities, or storm drainage systems; encroachments into environmentally sensitive areas; and failure to plan for right-of-way.

Increased maintenance costs and responsibilities due to change in material costs or drainage systems, regardless of how minor, may present problems in implementing drainage improvements. The legal implications that may be overlooked or not investigated thoroughly pose a serious potential problem. Overlooking a needed permit or regulation can delay a project for months.

TIME FRAME ●●○○

Many small projects that could include drainage improvements, such as spot safety improvements, single bridge replacements, and similar work, are often planned and constructed within several months. Longer-term improvements sometimes require as much time to complete as construction of an entirely new section of highway.

COSTS ●●○○○

While minor drainage improvements can be low cost, the costs involved in designing and implementing a drainage system are not incidental or minor on most roads. Careful attention should be given to adequate drainage and protection of the highway from floods in all phases of location and design.

Drainage is usually more challenging and costly for urban projects than for rural projects due to more rapid runoff rates and larger volumes of runoff, increases in cost due to potential flood damage to adjacent property, greater restrictions because of urban developments, lack of natural areas of water bodies to receive flood water, and higher volumes of traffic or pedestrians.

EFFECTIVENESS

TRIED: Improved drainage can help improve safety, increase traffic capacity, and increase pavement load capacity. However, there exists no adequate documentation of the effect on crash experience. It can be expected that improved drainage would reduce crashes related to hydroplaning.

COMPATIBILITY

This strategy can be used in conjunction with the other strategies for improving safety at signalized intersections.

SUPPLEMENTAL INFORMATION

Policy guidance on drainage design/techniques is discussed in AASHTO's *A Policy on Geometric Design of Highways and Streets* and *Highway Drainage Guidelines* and other policy manuals. Highway agencies should consider these policies if they are not covered in their own guidelines.

For more details on this and other countermeasures: <http://safety.transportation.org>

For more information contact:

FHWA Office of Safety Design
E71, 1200 New Jersey Avenue SE
Washington, D.C. 20590
(202) 366-9064
<http://safety.fhwa.dot.gov>

FHWA Resource Center - Safety and Design Team
19900 Governor's Drive, Suite 301
Olympia Fields, IL 60461
(708) 283-3545
<http://www.fhwa.dot.gov/resourcecenter>

