Design Guidelines for Motorcycle Safety

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Since 1997, motorcycle fatalities have more than doubled in the United States. This has brought motorcycle safety to road designers' attention. Motorcycle safety is a concern to all road users. This article describes road construction and design standards to increase motorcycle safety.

Safety factors for motorcyclists are:

- Visibility & sight distance,
- Road geometry,
- Workzones,
- Pavement maintenance,
- Skid resistant surfaces,
- Guardrails,
- Parking availability & design, and
- Assessments in motorcycle safety.

Visibility & Sight Distance

Sight distance is the length of roadway that a driver can see ahead. Stopping sight distance (SSD) is the minimum sight distance required to stop a vehicle on wet pavement after seeing an object, without hitting it. Engineers use SSD to determine the minimum length of vertical curves and minimum radii of horizontal curves. SSD is set by American Association of Highway Transportation Officials (AASHTO). It is meant for cars but not for other vehicles, including motorcycles. Whenever possible, use a more generous SSD.

Road Geometry

The leading cause of motorcycle accidents on curves with other vehicles is that the driver of the other vehicle does not see them. In accident reports, drivers say they were unable to see the motorcycle before it's too late.

Use traffic signs and pavement markings with clear and consistent messages to warn drivers of unexpected road geometry. When possible, design roads with little curve, as one half of motorcycle fatalities are related to road curves.

Workzones

Workzones are dangerous for motorcyclists. Post specific warnings for motorcycles. Place warning signs for grooved pavement, bumps in the road, edge drop-offs, and other hazards.

Use steel construction plates of an adequate size and with a skid resistant surface. Plates can be slippery when wet. Recess plates to avoid creating an edge trap. Edge traps prevent a motorcycle's front wheel from moving side-to-side. Even a small edge trap may result in an accident.

Use weighted workzone devices to prevent them from being blown into the travel lane. Many signs, cones, and barrels have a heavy rubber ring on the bottom. Use a second weighted ring in dangerous locations. Check workzones regularly to ensure correct placement of safety devices.

Pavement Maintenance

When using pavement maintenance treatments, post warning signs.

Seal coating is the application of liquid asphalt over pavement. Gravel is spread over liquid asphalt. Motorcycles can easily lose traction on this loose material.

Milling machines produce a coarse surface with longitudinal grooves. The course material may cause a motorcycle to lose traction. Grooves can create an edge trap.

Edge traps often occur during paving opera-

tions. Current highway standards permit pavement edges of up to 1.5 inches without tapering.

Potholes are an issue. Post warning signs and repair as soon as viable. To prevent potholes, install an effective drainage system and crackseal.

Cracksealing is an effective pavement treatment however, it becomes slick during warm weather. Like any surface treatment, use only when appropriate.

Accumulated sand becomes a hazard. Winter sand often accumulates at stop signs and intersections. Sweep as soon as possible.

Skid-Resistant Surfaces

Skid-resistant surfaces allow vehicles to stop or turn. Examine pavement for skid resistance during road maintenance. Older pavements often have poor skid resistance. Grind, overlay, or apply a surface treatment to increase skid resistance.

Guardrails

Guardrails are safety device for cars and trucks but unsafe for motorcycles. Almost half of all motorcycle guardrail collisions result in fatalities. Helmet usage is not a solution as over 2/3 of fatally injured riders wore helmets. Guardrails prevent vehicles from going over embankments. Install guardrails when the embankment is steeper than 3 to 1. Place guardrail as far from traveled way as practical. Apply retroreflective material to guardrails to increase visibility at night.

Parking Availability & Design

On street parking reduces a driver's ability to see pedestrians. Place parking areas more than 20 feet away from unsignalized crosswalks and more than 30 feet away from a signalized intersections. Install "no parking zone" signs in restricted areas.

Assess Motorcycle Safety

It is the duty of a highway departments to reduce traffic accidents and save lives. Use road safety audits to assess safety. Obtain motorcycle crash data. Use crash reports to decide which areas need improvements. Make a list of improvement needs, prioritize the list, and take action.

References:

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US Customary				
Design speed (mph)	Brake reaction distance (ft)	Braking distance on level (ft)	Stopping sight distance	
			Calculated (ft)	Design (ft)
15	55.1	21.6	76.7	80
20	73.5	38.4	111.9	115
25	91.9	60.0	151.9	155
30	110.3	86.4	196.7	200
35	128.6	117.6	246.2	250
40	147.0	153.6	300.6	305
45	165.4	194.4	359.8	360
50	183.8	240.0	423.8	425
55	202.1	290.3	492.4	495
60	220.5	345.5	566.0	570
65	238.9	405.5	644.4	645
70	257.3	470.3	727.6	730
75	275.6	539.9	815.5	820
80	294.0	614.3	908.3	910

Stopping Sight Distance