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[Home](#) / [Public Roads](#)

IN THIS SECTION



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[Table of Contents](#)

Rumble Strips for the Safety of New York City’s Cyclists

by Edward Wang

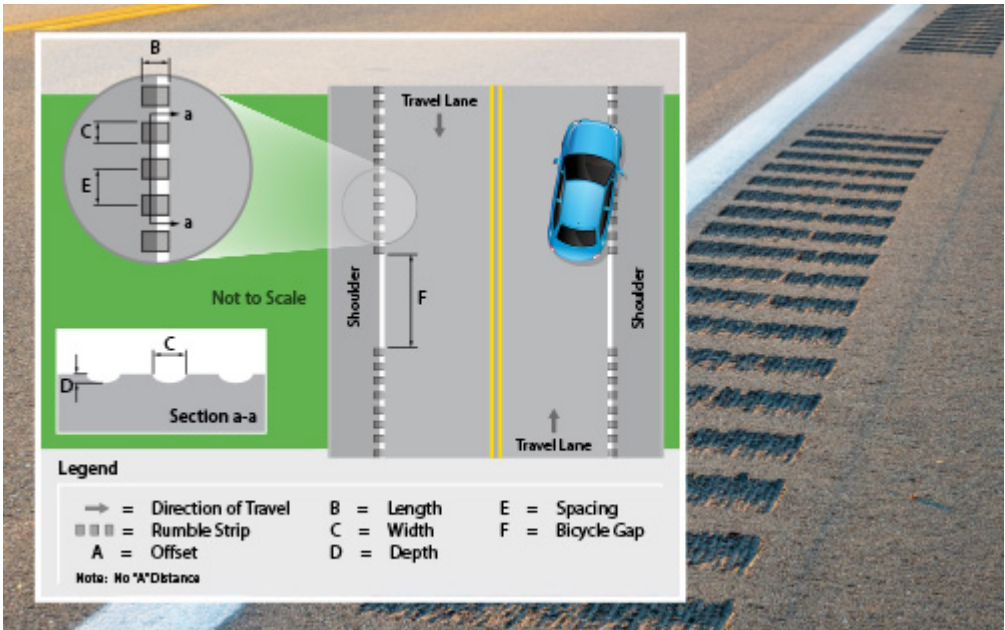


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Cycling in a busy place like New York City can be challenging and dangerous.

Cycling is an efficient form of transportation that improves a person’s health and their surrounding environment, helping to reduce air and noise pollution over time. However, cycling comes with its risks, especially in urban areas, where there is a higher chance of vehicle-cyclist accidents, not to mention cyclists coming in contact with parked vehicles and other obstructions blocking the bike lane. Take New York City (NYC), for example; despite being the largest city in the United States, NYC has more than 1,525 miles (2,454.21 km) of bike lanes as of 2022, 644 of which are protected (either by street parking spaces or rigid posts). Although NYC is relatively biker-friendly, with more than 30 percent of adult New Yorkers riding a bike, accidents still occur. According to 2022 data from the New York City Department of Transportation (NYC DOT), there were 5,621 vehicle-cyclist crashes, 4,676 cyclist injuries, and 15 cyclist fatalities. To help increase the safety of current NYC cyclists and promote ridership in busy city areas, implementing edge line rumble strips for unprotected bike lanes is a strong, viable solution.

Rumble strips, tiny grooves, or bumps on the road alert drivers when drifting out of their current lane, producing a vibrating sensation and rumbling noise. They can help minimize the number of bicycle accidents due to distracted driving or on narrower streets when drivers may not be aware they are crossing into the bike lane. In addition, rumble strips can discourage drivers from intentionally blocking the bike lane to park or stall their vehicles. According to the Federal Highway Administration, there are multiple kinds of rumble strips, including centerline rumble strips, shoulder rumble strips, and edge line rumble strips. While centerline rumble strips are placed in the middle of the roadway, shoulder rumble strips are placed outside the shoulder; edge line rumble strips are a specific type of shoulder rumble strip. Since edge line rumble strips can be directly installed on the edge of the bike lane, they can also be painted with a bright, reflective coating for nighttime driving when visibility is limited.



Source: FHWA. Photo: © MarekPhotoDesign.com / AdobeStock.com.

Edge line rumble strips can be directly placed on the shoulder (or bicycle lane) to alert drivers when they are drifting out of their lane.

Compared to typical milled rumble strips that have a depth of 0.5 inches (1.27 cm), a width of 5 to 7 inches (12.7 to 17.78 cm) (compared parallel to the flow of traffic), a length of 12 to 16 inches (30.48 to 40.64 cm) (compared perpendicular to the flow of traffic), and a 12-inch (30.48 cm) spacing between each other, edge line rumble strips must also account for the cyclist’s ability to maneuver across the rumble strips safely. FHWA suggests narrowing the rumble strip on narrower roads to give more shoulder space to cyclists and adding occasional “bicycle gaps” to allow cyclists to leave the bike lane in case of an emergency. Therefore, a solution for cycling safety is using bicycle-friendly rumble strips with a modified depth of three-eighths of an inch (.95 cm), a width of 4.5 inches (11.43 cm), a length of 5.5 inches (13.97 cm), and a spacing of 8 inches (20.32 cm) between each rumble strip. In addition, having a bicycle gap every 50-75 meters (164.04-246.06 ft; placed strategically and determined on a case-by-case basis) could further improve safety for riders.



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Signage is critical to the safety of cyclists on city streets.

The cost of installing rumble strips depends on the rumble strip’s dimensions, spacing, and the pavement material. The price of installing milled rumble strips ranges from \$500 to \$6,000 per mile. In NYC, most roads are made of asphalt, which is less rigid and durable than concrete and cheaper to mill because asphalt produces two to three times less wear on the mill head. Altogether, it is estimated that installing rumble strips would cost around \$2,000 per mile, on the lower end. Since rumble strips would have to be placed on both sides of the road next to the bike lanes, the cost would be \$4,000 per mile. For the 881 miles (1,417.83 km) of unprotected bike lanes in NYC, the cost would be \$3,524,000. However, this estimate does not consider bike lanes on one-way streets—meaning the actual price for implementation may be lower.

Using data from the NYC DOT, the average number of motor vehicle-bicycle accidents in NYC for the past five years is 5,773, and the average number of injuries from these accidents is 4,677. Including lost wages and medical bills, around \$77,308 is lost for every severe bicycle accident. In total, that would amount to a cost of \$361,569,516 for bicycle-related injuries annually. However, the NYC DOT data does not specify the severity of their injuries. The total expenses lost to bicycle injuries would have to be lower. Comparing the cost of installing edge line rumble strips to the amount of money lost from cyclist injuries, the benefit-to-cost ratio of this proposal would range from 26.67:1 to 47.19:1.

In summary, although biking in NYC can help reduce traffic congestion and air pollution while improving physical health, there are also risks. Being one of the most densely populated cities, NYC harbors heavy traffic congestion; drivers may ignore bike lanes and signs for cyclist safety or fail to yield to cyclists. Every year, it is inevitable that a few thousand people will be injured in a cyclist-vehicle accident. To improve ridership safety and make NYC “greener,” installing edge line rumble strips with a white reflective coating on the sides of unprotected bike lanes may save lives. The implementation of edge-line rumble strips will alert drivers and cyclists when drifting out of their intended travel lane and discourage cars from intentionally blocking the bike lane to park or stall. This proposal seeks to build on existing bicycle-friendly infrastructure in NYC and create a safer environment for cyclists and drivers.

Edward Wang is a student at Tenaflly High School in Tenaflly, NJ. Edward will graduate in June 2026.



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Roadway pavement markings can protect cyclists but could benefit from rumble strips to enhance safety.

Mathematical Reasoning

- Average number of bicycle accidents annually involving motor vehicles for the past five years (2018–2022), according to data from the NYC DOT.
2018: 5,502 accidents
2019: 5,846 accidents
2020: 6,343 accidents
2021: 5,553 accidents
2022: 5,621 accidents
- Average of motor vehicle and bicycle accidents for the past five years:
 $5502+5846+6343+5553+5621 / 5 = 5,773$ accidents annually
- Average number of bicycle accidents annually with injuries involving motor vehicles for the past five years (2018–2022), according to data from the NYC DOT.
2018: 4,304 injuries
2019: 4,611 injuries
2020: 5,175 injuries
2021: 4,618 injuries
2022: 4,676 injuries
 $4304+4611+5175+4618+4676 / 5 = 4,676.8 \approx 4,677$ injuries annually

Benefit-to-cost Ratio of the Proposal

- According to data from the NYC DOT, milled shoulder and edge line rumble strips reduced accidents by 26 to 46 percent on two-lane roads.
- Including lost wages and medical bills, around \$77,308 is lost for every severe bicycle accident.
- Low-range calculation:
Out of the 4,677 bicycle accidents with injuries in NYC, 1,216 could be prevented by installing edge line rumble strips to currently unprotected bike lanes.
Benefits (money saved): (1,216 accidents) (\$77,308/accident)
Cost (edge line rumble strips): \$3,524,000
Benefit-to-cost ratio:
(1216 accidents) (\$77,308/accident) / \$3,524,000 = 26.67:1
- High-range calculation:
Out of the 4,677 bicycle accidents with injuries in NYC, 2,151 could be prevented by installing edge line rumble strips to currently unprotected bike lanes.
Benefits (money saved): (2,151 accidents) (\$77,308/accident)
Cost (edge line rumble strips): \$3,524,000
Benefit-to-cost ratio:
(2151 accidents) (\$77,308/accident) / \$3,524,000 = 47.19:1

Resources:

- “Cycling in the City”
<https://www.nyc.gov/html/dot/html/bicyclists/cyclinginthecity.shtml>
- “Bicycle Crash Data Report 2022”
<https://www.nyc.gov/html/dot/downloads/pdf/bicycle-crash-data-report-2022.pdf>
- “Long-awaited NYC Congestion Pricing Finally Has A Start Date”
<https://www.nbcnewyork.com/traffic/transit-traffic/congestion-pricing-nyc-start-date/5357389/>
- “Rumble Strips and Rumble Stripes: T 5040.39, Revision 1”
https://safety.fhwa.dot.gov/roadway_dept/pavement/rumble_strips/t504039/
- “Rumble Strips and Rumble Stripes: T 5040.40, Revision 1”
https://safety.fhwa.dot.gov/roadway_dept/pavement/rumble_strips/t504040/
- “Rumble Strips and Rumble Stripes: Design and Construction”
https://safety.fhwa.dot.gov/roadway_dept/pavement/rumble_strips/design-and-construction.cfm
- “Rumble Strip and Rumble Stripes: Frequently Asked Questions”
https://safety.fhwa.dot.gov/roadway_dept/pavement/rumble_strips/faqs.cfm
- “Rumble Strips: Frequently Asked Questions”
<https://highways.dot.gov/safety/rwd/keep-vehicles-road/rumble-strips/frequently-asked-questions#faq-bicyclesandmotorcycles>
- “Bicycle Crash Data”
<https://www.nyc.gov/html/dot/html/bicyclists/bikestats.shtml#crashdata>
- “The Cost of Bicycle Accidents: Why Bike Safety Pays Off”
<https://www.jdsupra.com/legalnews/the-cost-of-bicycle-accidents-why-bike-3371913/>

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