

Crash Analysis Studio

Session 3: Richmond, Virginia

Held on March 24, 2023

Session Participants:

- **Jennifer Griffin**, Architect; Founding Principal of J Griffin Design, LLC; Urban Designer for various projects across the US, Central America, & Europe
- **Brantley Tyndall**, Director of Bike Walk RVA at Sports Backers; President of the Virginia Bicycling Federation
- **Jordyn Taylor**, Coordinator for Policy and Administration at the Partnership for Smarter Growth
- **Tara FitzPatrick**, Safe Routes to School Coordinator at Greater Richmond Fit4Kids
- **Edward Erfurt**, Director of Community Action at Strong Towns
- **Rachel Quednau** (moderator), Program Director at Strong Towns

Summary of Crash Event

- The crash occurred at approximately 9:00am (EST) on Friday January 27, 2023.
 - News coverage indicates that the collision happened at the intersection of West Main and Laurel Street in Richmond, Virginia; this area is part of the Virginia Commonwealth University (VCU) campus.
 - Since the crash is classified as an active investigation, a police report establishing the facts of this collision is currently unavailable.
- A motorist struck Mahrokh Khan as she was walking through the intersection. Khan was hit in the far right lane of traffic on West Main Street, which is a one-way street at this location.
 - News coverage does not specify if Khan was on the east or west side of the intersection.
 - If she was on the east side, Khan would have been in a right-turn only lane when she was struck.
 - If she was on the west side, Khan would have been in one of two thru-traffic lanes.
- The posted speed limit in this area is 25 miles per hour (mph). A speed study measured the 85th percentile speed at 32 mph with 7 out of 10 drivers exceeding the posted speed limit.
- Media coverage did not state whether or not impairment tests were administered. Media sources indicate that the driver stayed on the scene after the crash. No charges have been filed.

Primary Contributing Factors

Session participants identified the following primary factors that contributed to this crash:

- 1. The design of West Main Street facilitates high automobile speeds. High speeds are unsafe in complex urban areas, particularly next to a major university with a high volume of pedestrian crossings.**
 - a. The posted speed limit is 25 mph, but the design of West Main Street suggests a much higher design speed.
 - i. West Main Street has one direction of travel as part of a couplet system. This style of design is meant to increase automobile mobility (measured in speed of traffic and peak volume of traffic).
 - ii. In addition to one, on-street parking lane, there are two through lanes (9.5 feet and 9 feet, 11 inches in width) and one right-turn lane of 12.5 feet in width. The number of lanes, and the presence of a dedicated right turn lane, is designed to enhance automobile mobility (measured in speed of traffic and peak volume of traffic).
 - b. A speed study indicated that drivers do indeed feel comfortable operating at higher speeds than what is safe for a major university campus.
 - i. This speed study measured the 85th percentile speed at 32 mph, 7 mph over the posted speed limit.
 - ii. This speed study indicated that 7 out of 10 drivers exceed the posted speed limit.
 - iii. This speed study measured 94% of drivers operating at speeds shown to be lethal to pedestrians (20 mph or greater).
 - c. Virginia Commonwealth University is a public institution that has over 28,000 students enrolled. Thousands of students live on the block south of West Main Street and cross the street on foot each day to attend class. The high volume of students crossing on foot is incompatible with the design speed, and the actualized speeds, of traffic on West Main Street.

- 2. The right-turn-only lane on West Main Street signals to drivers that the turning area is dedicated to their use, reducing their overall awareness and anticipation of the presence of pedestrians.**
 - a. West Main Street has a dedicated right turn lane at the approach to Laurel Street. Such a turn lane is designed to increase traffic flow (both speed of traffic and volume of traffic) by separating the turning traffic from traffic flowing through the intersection.
 - b. The dedicated right turn lane is 12.5 feet wide, a lane dimension commonly used on highways and not appropriate for local streets.
 - c. A wide, dedicated lane gives drivers the impression that their flow up to and through the intersection is frictionless, that potential conflicts have been removed from their path of travel. This is obviously a false impression.

- d. The false impression is further solidified by the presence of the traffic signal, where a green light signals to the driver that intersecting traffic flow is halted and it is their turn to proceed.
- e. The false impression is further solidified by the absence of any restriction on right turning movements during a red light. This signals to drivers that, despite the restriction to continue on West Main Street, they are free to seek an opportunity to make a turning movement onto North Laurel Street.

3. The NE corner curb radius at the intersection of West Main Street and North Laurel Street is too large for safe pedestrian crossing.

- a. As drivers enter the intersection in the dedicated right turn lane, their awareness and anticipation is further dulled by the wide curb radius, which requires minimal deceleration to navigate.
- b. The curb radius at the NE corner of the intersection is excessively large, a degree of curvature inappropriate for an urban street. It is particularly excessive for an intersection with the high number of pedestrian crossings of this location.
- c. The wide curb radius increases the total crossing distance on West Main Street to approximately 42 feet. People crossing on foot are exposed to the automobile traffic stream for much longer than they need to be, increasing the likelihood of conflict.

4. The intersection at West Main Street and Laurel Street is designed in a way that creates confusion for drivers and pedestrians.

- a. At the NE corner of the intersection, there is an electric pole that obscures the driver's view of a pedestrian waiting to cross West Main Street or crossing North Laurel Street.
- b. The crosswalk on West Main Street is pushed west towards the middle of the intersection instead of being in a logical place for pedestrians to cross.
- c. Despite recent renovations, not all curb ramps at this location align with the crosswalk; the intersection does not meet ADA Standards for Accessible Design.
- d. There is a bus stop in the right turn lane approaching the intersection. Drivers seeking to turn right often navigate around the bus, which further obscures their vision of the intersection.
- e. The mixed direction of automobile travel is disorienting for pedestrians, leading to errors in determining expected driver behavior. This is particularly problematic given the speed in which automobiles enter the intersection.
- f. Each corner of the intersection has a radically different design, creating levels of confusion inconsistent with the speed of traffic and frequency of pedestrian crossings.
 - i. The NW corner has two ADA ramps -- one in each direction -- and a bump out.
 - ii. The NE corner has just one ramp. The ramp is further up North Laurel Street, not a natural place for someone seeking to cross West Main Street.

- iii. The SE corner has one corner ramp that doesn't align with either crosswalk.
- iv. The SW corner has two, properly-placed ramps with a tight curb radius.
- g. East of Laurel Street on West Main Street, there is a confusing partial lane where the concrete bump out is stopped short of extending through the full lane.

Related Contributing Factors

Session participants identified the following related factors that contributed to this crash:

5. The overall design of West Main Street and the adjacent street network is incompatible with the context of the area.

- a. Virginia Commonwealth University is a public institution that has over 28,000 students enrolled. The state of Virginia has made significant investments in educating people at this university.
- b. The University campus, including related housing, dining, office, and park space, occupy numerous square blocks in the core of the city of Richmond. Each day, tens of thousands of students, faculty, and other staff walk, bike, and navigate the space in and around the University while outside of an automobile.
- c. With West Main Street and its traffic couplet to the south in West Cary Street, the state of Virginia has made a significant investment in automobile mobility through the core of the city of Richmond.
- d. These two state investments -- operating a major university and moving high volumes of traffic at speed -- are incompatible with each other. Thousands of people crossing streets on foot is incompatible with a street network that prioritizes high-speed traffic movements.

6. With the amount of high-capacity freeway available within a short distance of West Main Street, a parallel system of high-capacity urban streets is redundant and unnecessary.

- a. Virginia Highway 195 is a major, eight-lane divided highway that is located 3 blocks south, just 1,000 feet, of the intersection where the crash occurred.
- b. Virginia Highway 33 is a four lane highway with a dedicated transit lane that is located 8 blocks north and east of the intersection where the crash occurred.
- c. Interstate 64/95 is a major interstate that is located approximately 1,600 feet north of Virginia Highway 33.
- d. All three of these high-capacity freeways are generally parallel to the West Main Street / West Cary Street couplet. They provide redundant high-speed connections between the core of Richmond.
- e. Given these three major transportation corridors in close proximity to Virginia Commonwealth University, there is no compelling reason why West Main Street and West Cary Street need to provide a fourth high-speed corridor running in the same direction, particularly given overall safety concerns.

Recommendations

There are multiple ways to address these factors and minimize the likelihood of future crashes, fatalities, and traumatic injuries. To address the factors identified in this analysis, the following practices are recommended for adoption.

Immediate:

1. Remove the dedicated right turn lane on West Main Street beginning 500 feet east of the intersection with Laurel Street with the use of orange cones and barrels.
 - a. Note: This was already done as part of the recent street reconstruction project.
2. Within the cones and barrels used to remove the dedicated right turn lane, provide a dedicated bus stop along West Main Street. Space the bus stop from the intersection to allow for adequate visibility for approaching vehicles.
3. Use orange cones, orange barrels, and/or delineator sticks that wrap around the intersection to extend and tighten the curb radius and provide extra pedestrian refuge space on the NE corner of the intersection.
4. To reduce visual clutter, remove the parking guidance sign on the light pole on the NE corner of the intersection.
5. Prohibit a right turn on red for the two turning movements where it is currently allowed. Place the signs prohibiting the movement on the mast arms next to the signal lights.
6. Expand the “all stop” interval for the intersection’s traffic signals to ensure all traffic is stopped before pedestrians begin to cross.
7. Reduce the speed limit of West Main Street to 20 mph through the Virginia Commonwealth University campus, from Belvidere Street to Harrison Street.
8. Station crossing guards at the intersection during peak hours for student crossings.

Near Term (within the next 12 months):

9. Turn the dedicated right turn lane on West Main Street into a parking lane, mirroring the south side of the street. Within the parking area, provide a dedicated bus stop with adequate spacing to safely exit and reenter the traffic stream.
10. Use bollards similar to the ones already installed in the park to make permanent the expanded pedestrian refuge area and tightened curb radius on the NE corner of the intersection.
11. Conduct a speed study to validate that the 85th percentile travel speed entering the intersection is 20 mph or less.
 - a. If it is not, use cones, barrels, and other temporary measures to test alternative design approaches. Iterate until the necessary reduction in travel speed is consistently achieved.
 - b. Once the safe design is identified, initiate a project to make it a permanent change.

Long Term and Systematic:

12. Remove the couplet between West Main Street and West Cary Street, turning both back into two-way streets.

13. Complete a redesign of the intersection that:
 - a. Fixes the bump out in the NW corner extending it to the travel lane of West Main Street and providing an additional bump out onto Laurel Street.
 - b. Provides bump outs in both directions in the SW corner.
14. Consider mechanisms for changing West Main Street from a state highway to a locally managed urban street.

Concluding Statement

The series of design flaws present along West Main Street and at the crash location are problematic and - unfortunately - commonplace. Design emphasis that prioritizes automobile speed over the safety of motorists, cyclists, and pedestrians is typical within cities such as Richmond and throughout much of North America.

By evaluating the many factors that contribute to a crash, we believe that decision-makers, the public, and designers can move beyond the current approach, which seeks only to assign blame to involved parties, to a model that helps change the way these spaces are designed, constructed, and cared for.