What are the potential safety impacts of lane width changes?

Changes to the lane widths used within a roadway cross section can potentially impact safety. For example, narrower lanes may lead to an increase in certain crash types, such as sideswipes. At the same time, narrower lanes may lead to reductions in vehicle speeds and crash severity. Please note, however, that the research discussed below, which focused on the potential safety impacts of lane width changes, is general in nature and not specific to four- to three-lane conversions.

LANE WIDTH CHANGES

The lane width provided to vehicle traffic is a central component of roadway design. It can, for example, have an effect on driver perceptions of a safe speed along that roadway. The choice of a lane width is partially guided by the available right-of-way and the competing demands for its use. These uses can include, but are not limited to, curbs and gutters or shoulders, parking lanes, bicycle lanes, and sidewalks. To accommodate these uses, narrower lane widths may sometimes be incorporated into a roadway cross section design. Items to keep in mind when considering changes to lane widths include the following:

- As lanes narrow, the potential for crashes may increase.
- Conversely, as lanes widen, speeds may increase as drivers feel more comfortable with more room to maneuver.
- Available right-of-way (if lane widening is being considered) and other competing design needs that must be served (e.g., parking, pedestrians) also impact the selection of lane widths.

In addition to these considerations, designers should follow current national and state/local guidance related to the selection of lane widths. The American Association of State Highway and Transportation Officials (AASHTO) *A Policy on Geometric Design of Highways and Streets* (i.e., the Green Book), for example, includes guidance on the use of 10 to 12 foot lane widths with a caution that the narrower, 10 foot width should be used only where truck and bus volumes are relatively low and speeds are less than 35 mph (AASHTO 2018). It also states that, in urban areas, lane width changes must be considered in light of not only the vehicle volumes that are being served but also pedestrian, bicycle, and transit needs.

In Iowa, the Iowa DOT *Design Manual* includes sections related to roadway design criteria, including design criteria worksheets with preferred and acceptable geometrics and typical roadway cross sections (Iowa DOT 2019). The typical roadway cross sections in that document generally have lane widths of 11 to 12 feet in urban areas (including some with a 14 foot two-way left-turn lane [TWLTL]) and 12 feet in rural areas (Iowa DOT 2019). The manual indicates that a normal TWLTL is 14 feet wide but notes that 10 to 12 foot widths can be considered in restricted right-of-way locations (Iowa DOT 2019). The Iowa Statewide Urban Design and Specifications (SUDAS) *Design Manual*, on the other hand, includes discussions of geometric design elements related to lane widths and presents geometric design tables with preferred (e.g., 10.5 to 12 feet) and acceptable lane widths for various functional classes of roadway (SUDAS 2024). In addition, because four- to three-lane conversions are sometimes considered within multimodal street situations, the reader is also referred to the section of the SUDAS *Design Manual* on Complete Streets, which includes information on geometric elements in this context (SUDAS 2024).

Iowa LTAP

Three-lane roadway in a residential area

CHANGES IN CRASHES

Depending on the changes made to lane widths, increases or decreases in crashes should be expected. Improved mobility for pedestrians and bicyclists or lower speeds along a corridor, however, may also result from narrowing lane widths, and this could be considered a positive outcome even considering the potential for an increase in lower severity crashes.

To better understand the tradeoffs of changes to lane widths, it is helpful consider the results of past evaluations.

Work in Nebraska (Wood et al. 2015) examined a number of urban lane width changes and their impact on midblock crashes along arterials and collectors (i.e., roadways with speed limits ranging from 25 to 50 mph). This research found that reducing 12 foot lanes to 10 feet increased crashes by 28 percent, while reductions to 9 feet reduced crashes by 43 percent. For 11 foot lanes, reductions to 10 feet increased crashes by 27 percent, while reductions to 9 feet reduced crashes by 47 percent. Reducing 10 foot lanes to 9 feet similarly reduced crashes by 57 percent. The reduction in crashes when lanes were reduced to 9 feet was thought to be the result of drivers being more cautious.

However, Sando and Moses (2011) evaluated five-lane cross sections with TWLTLs in Florida and found increases in crashes. In this case, restriping outside lanes from 14 feet to 13 feet and inside lanes from 12 feet to 11 feet increased total crashes by 4 percent. This increase was less than that observed for sites with 12 to 12.5 foot outside and 11 foot inside lane widths.

Another urban lane width evaluation in Florida (Park and Abdel-Aty 2016) found that when lane widths were increased up to 12 feet, crashes decreased. When lane widths were increased to between 12 and 13 feet, crashes increased, and then crashes decreased once again when lane widths were increased to over 13 feet. Similarly, work in New Jersey (Ozbay et al. 2009) on urban collectors found that increasing lane widths from 10 or 11 feet to 12 feet produced crash reductions between 18 and 23 percent, respectively.

Finally, a significant amount of lane width research along rural two-lane roadways has been completed. In a summary of past findings, Harkey et al. (2008) found that, relative to a base condition of 12 foot lanes, crashes increased 5 to 50 percent for 9 foot lanes, 2 to 30 percent for 10 foot lanes, and 1 to 5 percent for 11 foot lanes (with all increases varying by average daily traffic). These results are similar to the guidance provided in the AASHTO *Highway Safety Manual*, which indicates that narrowing lane widths from 12 feet to 9 to 11 feet increases the frequency of run-off-the-road, head-on, and sideswipe crashes (AASHTO 2014).

Research in Florida (Raihan et al. 2019) on urban two-lane roadway segments also found that narrow lanes (i.e., less than 12 feet in width) increased the probability of bicycle crashes by 72 percent.

It is important to recognize that 9 foot lanes are considered too narrow for most heavy vehicles or buses. The AASHTO Green Book stresses that this lane width should be used with caution.

SUMMARY

The cross-section design information in Iowa for lane width generally varies by whether a roadway is within an urban or rural area, vehicle speeds, and the type of roadway, lane users, or vehicle flow (e.g., trucks, buses). This information may also include, in the context of a four- to three-lane conversion, the applicability of a Complete Streets approach.

The research on the safety impacts of lane widths has produced varying results but is most robust for rural two-lane roadways. In fact, the AASHTO *Highway Safety Manual* shows that the difference in predicted crashes for 12 foot and 11 foot wide lanes along rural two-lane roadways is relatively small. Predicted crashes increase, however, when rural two-lane roadways with 12 foot wide lanes are compared to those with 10 foot and 9 foot wide lanes. While the research shows a different trend in urban areas when lanes are reduced to 9 feet, the use of this lane width is not often practical or recommended because it does not adequately serve the truck and/or bus traffic that the roadway lane may need to serve.

Summary of the effects of lane narrowing on crashes

		Narrow Lanes From		
		12 feet	**11 feet**	**10 feet**
Narrow Lanes To	11 feet	1%–5% increase (rural)	N/A	N/A
	10 feet	28% increase (urban)* 2%–30% increase (rural)	27% increase (urban)*	N/A
	9 feet	43% decrease (urban)** 5%–50% increase (rural)	47% decrease (urban)**	57% increase (rural)

Information summarized from Harkey et al. (2008) for rural roadways and Wood et al. (2015) for urban streets. The differences presented in this table are the result of the study approaches employed as well as confounding variables.

* Wood et al. (2015) note that this result is likely because the narrow lane width is less forgiving to driving mistakes, but the lanes themselves are not narrow enough to encourage more cautious driving.

** Wood et al. (2015) note that the decrease in crashes for 9 foot lane widths is likely related to the segments used in the study, which consisted of minor arterials and collectors with low speed limits, slower operating speeds and larger headways, and little or no heavy vehicle traffic.

References available in: Knapp, K., and D. Veneziano. 2024. *Roadway Cross Section Reconfiguration: Responses to 14 Commonly Asked Questions*. Iowa Local Technical Assistance Program, Institute for Transportation, Ames, IA. https://intrans.iastate.edu/uploads/2024/10/roadway_cross_section_reconfiguration_w_cvr.pdf.