

“COMPLETE STREETS” ROAD DESIGN AUDITS FOR BICYCLES AND PEDESTRIANS

By

Ed Barsotti, Executive Director
Stephen Hunt, Project Assistant
Christopher Trigg, Project Assistant
League of Illinois Bicyclists
2550 Cheshire Dr., Aurora, IL 60504
630-978-0583, ed@bikelib.org

INTRODUCTION

“Complete Streets” are designed to enable safe access for all users. Pedestrians, bicyclists, motorists and transit riders are able to safely move along and across a complete street. Across the country, road-building agencies are formally adopting complete streets policies, to provide safer conditions for those who bicycle or walk either by choice – or by economic (or other) *necessity*.

The League of Illinois Bicyclists (LIB), a statewide non-profit bicycle advocacy organization, has started a Complete Streets Audit program of road-building agencies. LIB has developed a new scoring methodology rating a road design on how well it accommodates bicyclists and pedestrians – taking into account what is needed for that road’s particular context. A quiet farm roadway or residential cul-de-sac may not need anything extra for bikes or peds, but a major suburban arterial would. A high score indicates that non-motorized users have been appropriately accommodated for whatever the specific situation may be.

Overall accommodation and design details are rated for: pedestrian travel *along* the road, bicycle travel *along* the road, crossings of the road, and other context-sensitive factors. The methodology uses tools such as the Federal Highway Administration’s sidewalk installation recommendations¹, Bicycle Level of Service^{2,3}, and LIB’s Sidepath Suitability Score^{4,5} to provide design guidance on topics ranging from bike accommodation type to right-in-right-out entrances.

The League plans to conduct Complete Street Audits of roadway projects in the state’s urban areas, where both federal and state policies recognize there being the most existing and latent need. The goals of the program are to:

- Introduce the scoring methodology as a planning tool that can be used by agencies in a project’s early stages and in the selection of accommodation type
- Work cooperatively with agencies on design details that make a big difference
- Give credit to agencies that build safer roads for pedestrians and bicyclists
- Urge other agencies to adopt Complete Streets policies and to view bike/ped accommodation as a necessary part of a project, not as an optional amenity

METHODOLOGY

The Complete Streets Audit scoring methodology is based on a 100-point scale, with the following gradations: A = 80-100, B = 60-79, C = 40-59, D = 20-39, F = 0-19. Sum the results from the sections below, including pedestrian accommodations along the road, bicycle accommodations along the road, road crossings, and other context-sensitive factors.

PEDESTRIAN ACCOMMODATIONS ALONG THE ROAD

A maximum of 40 points are possible for sidewalks *along* the road being audited. “Sidepaths”, bike trails parallel to but off the road, are considered as sidewalks here.

The Federal Highway Administration (FHWA) has provided recommendations¹ for **sidewalk installation**, based on road classification, land use and density. These recommendations, which include suggested “required” and “preferred” conditions, are used in this section of the methodology, with the following weighting:

- 30 points if the maximum FHWA recommendation is met
- 22 points if only the “required” level is met when a “preferred” level is present
- 14 points if sidewalks are only on one side, when FHWA lists two sides as required
- 5 points if right-of-way has been preserved with flattened ground work, for future sidewalks

Deduct between 25% (minimum) and 100% of the above for incomplete sidewalks, depending on severity and/or frequency of the gaps.

Add up to 10 points for favorable **sidewalk design and maintenance details** *along* the road being audited, including:

- Sufficient sidewalk buffer strip width and/or ped-friendly features such as trees
- Placement of crossings and stop bars at intersections – closer to the road is better for visibility and for more realistic car stopping location and stopline adherence
- Right-turn island and/or median refuge islands at wider, busier intersections – breaking up the crossing into segments and isolating turning motions with which to contend
- Pedestrian signals and conveniently-located push-button activation
- Sufficiently visible crosswalks at signalized intersections, including continental, ladder or zebra-style where appropriate (Figure 1)
- Maintained crosswalks, as appropriate, at street intersections
- Visual delineation (e.g., painted or color-contrasted crosswalks) at crossings of commercial entrances – in recent years, this feature is regularly omitted

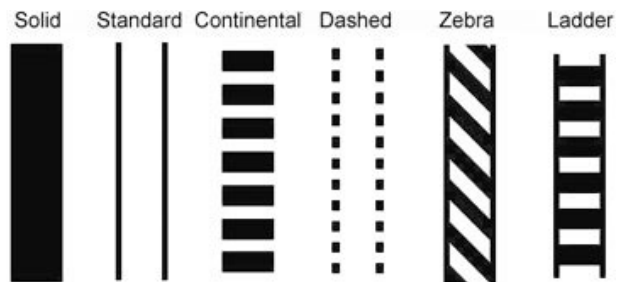


Figure 1 – Crosswalk styles.

- Use of right-in-right-out islands as a refuge island – allowing crossings/crosswalks and stoplines to be closer to the road (see Figure 2)



*Figure 2 – Left: poor crossing and stop bar placement.
Right: good use of a right-in-right-out island*

- American with Disabilities Act (ADA) ramp compliance at crossings
- Links to adjacent land uses – are roadside destinations accessible from the sidewalk?
- Other proactive design factors
- Deduction for poor sidewalk condition

BICYCLE ACCOMMODATIONS ALONG THE ROAD

A maximum of 35 points are possible for bicycle accommodation *along* the road being audited. The methodology compares a baseline score for the road with any dedicated on-road and/or off-road bikeway facility that may be present. The highest scoring accommodation is considered as the overall bicycle accommodation score.

Many minor roads may be fine for bicyclists “as is”. For other roads, extra space may be warranted. Both off-road and on-road bikeway options are available, each appropriate in a range of cases. Scoring for four bikeway options below varies with the situation to reflect their ranges of suitability.

First, consider the road without any of these bikeway options. This will be its **minimum bike accommodation score**. Determine its Bicycle Level of Service² (BLOS), a measure of adult bicyclist comfort level as a function of roadway geometry and traffic conditions. Using an on-line BLOS calculator³, enter the number of lanes, lane width, daily traffic volume count (ADT), speed limit, and on-road parking occupancy percentage. Consider the pavement width *without any bike lane or shoulder stripes* (paved shoulder/bike lane/parking width = 0), even if such striping exists on the road. If the resulting BLOS is a “B” or “C”, calculate $15 * (3.5 - \text{BLOS})$. Use 30 points for a BLOS of “A” and 0 points for a BLOS of “D” or worse. Then, add up to 5 points for any bicycle-related pavement markings and/or signage that may exist (Figure 3).



Figure 3 – Pavement Markings and Signage: “Sharrows” – indicates proper bike position in the presence of on-road parking; on-road traffic signal actuation for bicycles; Bike Route signage with wayfinding; Share the Road signage.

Next, consider any specific bikeway or other accommodation that may be part of the road design. If any of the four types below exist, find its score:

1) **Bike Lanes** (Figure 4) provide dedicated space for bikes. Each 5-6 foot bike lane should be one-way, on each side of two-way roads. Urban arterials (usually low to medium speed) and collectors are the most appropriate places for bike lanes. Results include higher bike usage and lower crash rates – even among car-car crashes.

Award 30 points for bike lanes designed per AASHTO⁶ guidelines. Deduct up to 15 points if the lanes are poorly maintained or swept, or if they do not meet guidelines. Add up to 5 points for relevant pavement markings, such as those for signal actuation, proper striping at intersections⁶, and lane positioning to avoid parked cars’ doors.



Figure 4 – Bike Lanes.

2) **Paved Shoulders** provide space for bicycles, improve safety for cars, and reduce road maintenance needs. IDOT’s bicycle policy⁷ specifies 4-foot shoulders for daily ADT traffic count between 1000 and 2999, 4-6 feet over 3000 ADT – with 6-foot shoulders for 55 mph roads or 45 mph roads with high truck traffic. Bicycles can not ride on shoulder rumble strips. However, designs with periodic longitudinal breaks and at least four feet of (swept) space clear of rumble strips can be bike-friendly.

Award 30 points if paved shoulders on both sides of the road meet IDOT’s bicycle policy. Award 15 points for paved shoulders of 3 or more feet but not meeting these standards. Deduct up to 50% if the shoulders are poorly maintained or full of debris. Deduct up to 100% for rumble strips, depending on their bicycle-friendliness. Add up to 5 points for bike-related pavement markings and/or signage, as shown in Figure 3.

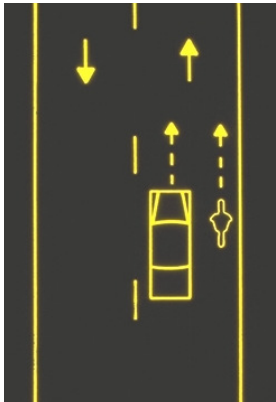


Figure 5 – Wide outside curb lanes.

3) **Wide Outside Curb Lanes** (Figure 5) allow cars to pass bikes within the same lane, with at least three feet clearance. These serve experienced cyclists on lower speed urban roads, but are less adequate for other users and on other roads.

Award 10 points for an outside curb lane width of 13 feet, 15 points for 14 feet, and 20 points for 15 feet or more. Deduct 25% of this for every 5 mph speed limit increment over 30 mph. Deduct another 1% for every 1000 in its daily traffic count (ADT). As an example, 14-foot lanes on a 30 mph road with 3000 ADT score 12 points, while the minimum of 0 points is given for the same road with 45 mph or 15000 ADT. Add up to 5 points for bike-related pavement markings and/or signage, as shown in Figure 3.

4) **Sidepaths** are bike trails adjacent to but off the road (Figure 6), basically widened sidewalks. Because of conflicts at intersections (illustrated in Figure 7), sidepaths are more appropriate along roads where there are fewer crossings. This commonly occurs on higher-speed and (often) busier roads with more access control. Despite advice from AASHTO, many towns use sidepaths in less appropriate places with numerous crossings. This often is *less* safe than riding on-road – a surprising result to many.



Figure 6 – Sidepath.

Start with 30 points for a sidepath – or a sidewalk, which is also considered here for its utility as a place to bike. Deduct 3 points for each foot of width under 8 feet, as this creates pedestrian conflicts. Deduct 4 points for every Sidepath Suitability Score^{4,5} (SSS) over 6 points. The SSS is used to gauge appropriateness and design factors of the sidepath (or sidewalk).

Deduct 50-100% of what remains, for gaps of varying severity. If there are no gaps, deduct up to 50% if the sidepath (or sidewalk) is poorly maintained and swept. Also, factor in the sidepath in the sidewalk design and maintenance detail score above.

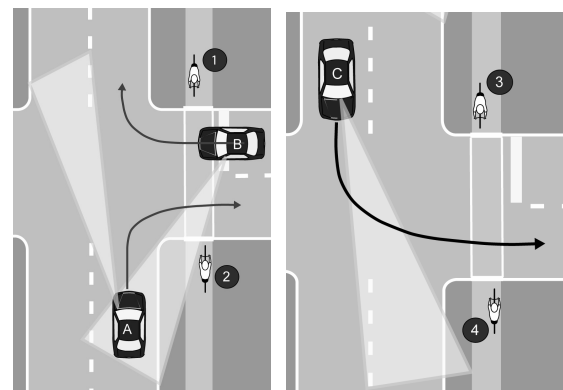


Figure 7 – Sidepath crossing problems. Sidepath users, especially contra-flow cyclists 1 and 3, are often not seen. On-road cyclists are within turning motorists' viewing areas.

Select the highest score among these four bikeway accommodation types above, or 0 if none of them exist. The result becomes the **bikeway facility accommodation score**.

The higher of (1) the minimum bike accommodation score (the baseline) and (2) the bikeway facility accommodation score becomes the **overall bike accommodation score**, to be added to the total.

ROAD CROSSING ACCOMMODATIONS

The pedestrian section considered travel *along* the rated road, including crossings of side streets, entrances, and driveways intersecting the road. But, how easy is it for bicyclists and pedestrians to *cross* the road being rated? As a road gets busier and wider, it can become more difficult, especially when certain design features are absent.

Score up to 15 **road crossing** points for well-designed crossings suitable for the particular road. Considerations may include factors mentioned earlier and more:

- Right-turn and/or median refuge islands at wider, busier intersections
- Median refuge islands, high-visibility crosswalks, warning signage, and other features at significant non-motorized mid-block crossings
- At signalized intersections, pedestrian signals with conveniently-placed actuation and highly visible crosswalks
- If appropriate, raised crosswalk crossings and bulb-outs that shorten crossing distance
- Signal actuation for on-road cyclists – either MUTCD-approved Bicycle Detector Pavement Markings on-road (preferred), or accessible off-road placement
- ADA ramp compliance at crossings
- Access to the off-road sidepath trail or sidewalk from road entrances on the other side (Figure 8)
- Other proactive design factors



Figure 8 – Access to far-side sidepath or sidewalk at T-intersection.

OTHER CONTEXT-SENSITIVE FACTORS

Certain roads have factors making adequate bike and pedestrian accommodation even more important. Access to destinations, adjacent land use, and availability of alternative routes all affect the *latent* demand of non-motorized use. Some of the following factors are adapted from IDOT's bicycle policy⁷ in its design manual.

Start with 10 **other factors** points. Deduct points for *not meeting* any special context of the road's corridor, such as:

- Does this road provide the only access to significant destinations such as a park, recreational area, school, transit, shopping/commercial area, or employment center?
- Does the road provide unique access across a natural or man-made barrier (e.g., bridges over rivers or expressways)?

- Are there alternative, *nearby, useable* routes that also provide access to the destinations along the road being rated?
- Is the road in an area where many more non-motorized users would be expected, based on density, land uses, parking availability, economics, and other reasons?
- Does the road impact an independent trail or connectivity to a trail?

CONCLUSION

The goal of the Complete Streets Audit scoring methodology was to rate the effectiveness of bicycle and pedestrian accommodation in road designs, in a way that adapted to the particular situation. What is needed to walk or bike safely along or across a street varies dramatically over the wide range of roadways. Clearly, a “one-size-fits-all” bikeway or pedestrian accommodation approach does not work.

Early testing and use of the methodology has shown that it meets this goal adequately. Larger road projects and residential streets have been examined with the result much more dependent on proactive design principles than on traffic counts or the like. This allows measuring of the road-building agency’s policies, not the road classification. Initial audits have ranged from an “F” through a high “B”, the latter being a few details away from an “A”. This correlated strongly to how the relevant agencies’ policies view the meeting of non-motorized users’ safety needs: an optional amenity or diversion – or an integral part of a road project.

REFERENCES

- ¹ “Priorities and Guidelines for Providing Places for Pedestrians to Walk Along Streets and Highways (Table 4-2, Guidelines for New Sidewalk Installation)”. Federal Highway Administration (1999). www.fhwa.dot.gov/environment/sidewalk2/sidewalks204.htm
- ² Landis, Bruce, et al. "Real-Time Human Perceptions: Toward a Bicycle Level of Service". Transportation Research Record 1578 (1997).
- ³ Bicycle Level of Service calculator. League of Illinois Bicyclists. www.bikelib.org/roads/blos/losform.htm
- ⁴ Barsotti, Ed and Kilgore, Gin. “The Road Network is the Bicycle Network: Bicycle Suitability Measures for Roadways and Sidepaths”. Transport Chicago Conference (2001).
- ⁵ Sidepath Suitability calculator. League of Illinois Bicyclists. www.bikelib.org/roads/blos/sidepathform.htm
- ⁶ Guide for the Development of Bicycle Facilities. AASHTO (1999).
- ⁷ Bureau of Design and Environment Manual (Chapter 17). Illinois Department of Transportation. www.dot.state.il.us/desenv/BDE%20Manual/BDE/pdf/chap17.pdf

Photo credits: www.bicyclinginfo.org, Dan Burden, Chicagoland Bicycle Federation.