Designing Streets for All Users

(A Complete Streets Reference Guide for Iowa Communities)

Compiled by Bradley J. Grefe for CTRE
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Foreword

Good street design can enhance the livability of a community and positively affect the quality of life for those living in the area, thereby increasing the value of the experience of those using the street. Creating safer streets is helpful in attracting new residents while also benefiting those who already live in the neighborhood. This document aims to stimulate community leaders and decision makers to critically assess many important questions when considering the design of their streets, including the following:

- Who will be using this street and is this street (will this street be) safe for all users?
- How well are pedestrian facilities integrated within the existing infrastructure (if they are necessary)?
- Most importantly, would more pedestrians feel comfortable using this street if it were safer and more inviting for them?

Therefore, the overarching themes of this document promote

- including all current and potential street users in the design of new streets and the improvement of established roadways in urban areas and rural developments,
- properly constructing streets at the outset, rather than retrofitting the street later to accommodate for pedestrian and/or transit use,
- embedding complete streets ideas within local policies (i.e. city codes and subdivision requirements), and
- establishing or returning a positive sense of place to Iowa’s neighborhoods—starting with better, safer, and more inviting streets.
Structure of this Document

No single section plan can be successfully applied to all streets. Each street has a different purpose, a distinctive surrounding land-use pattern, and its own set of users. There are, however, many characteristics that can enhance the quality of a street or road—whether urban or rural.

Copious amounts of literature exist in various forms (books, pamphlets, Internet sites, etc.) that offer insight on how to design a good street. The following is a collection of design concepts for all users that are practical and suitable for communities in the state of Iowa. This document focuses on the design elements included in complete streets policies. Further, it emphasizes the necessity to incorporate these design elements on a context-sensitive, case-by-case basis.

The document is divided into four sections. The first section begins by defining Iowa’s types of roads and streets, describing the purpose of a street, and how the purpose differs among each road type. The second section provides many design elements that, if implemented correctly, can be included within a street plan to make the street effective for all users. The third section presents a series of seven 50-foot sample sections of roadways fitted with those design elements. The fourth section of this guide presents a list of references that offer more details for the examples and methods mentioned. This gives decision makers a list of resources to use in conducting further research and helps them choose what will work best in their locality.
Section I: Roads and Streets in Iowa

The Federal Highway Administration (FHWA) has a functional classification hierarchy for roads and streets. The FHWA groups roads according to their functional system (location) and then by subsystem (level of traffic mobility versus land access). The three functional systems include rural, urbanized, and small urban areas. The subsystems include arterial, collector, and local streets (Figure 1). As illustrated in Figure 2, the hierarchy of mobility ranges from automobile-oriented on the arterials to pedestrian-friendly on the local streets. Higher levels of mobility suggest increased amounts of automobile movement, whereas more land access indicates more direct access to surrounding land and an elevated rate of multi-modal activity.

Figure 1. Schematic of an urban roadway network

Figure 2. Levels of mobility on different road types
**Arterials** have little, if any, need for pedestrian inclusion in their design. They function as limited access, high-speed, high-volume thoroughfares intended primarily for automobile mobility. Examples of primary arterials are interstates, freeways, and rural highway bypasses. Minor arterials, such as rural highways and major urban streets, are characterized as having slightly less limited access and reduced speeds, while carrying nearly as much volume as a principal arterial. Often located in transition areas, arterials may be extensions of or connections to other road or street types.

**Collectors** often have a moderate need for pedestrian elements in their design. In urban settings they have moderate to high speeds and capacities for automobile traffic, and often serve as bus routes. County roads are collectors in rural areas. Many of these roads are popular bicycle routes, so it may be advantageous to consider this when designing the shoulder of a road. The need to include pedestrians or bicyclists in street design largely depends on surrounding land use. When designing collectors that run through business districts or major commercial areas, decision makers should carefully consider pedestrians, bicyclists, and transit riders as potential street users.
Locals are any roads or streets that do not fall within either of the other two categories. Local streets offer direct access to the adjacent land functions. They are lower-mobility routes for automobiles—generally shorter (some dead-end) and lower-speed—and they include more conflict points (i.e. intersections, driveways, and crosswalks). These roads should be the most pedestrian friendly of all.

Iowa Code 306.3.8 states:

"Road" or "street" means the entire width between property lines through private property or the designated width through public property of every way or place of whatever nature if any part of such way or place is open to the use of the public, as a matter of right, for purposes of vehicular traffic.

By definition, then, the only user of a street would be a motorist. This misconception can lead to automobile-exclusive street design. It should be clear, though, that the automobile is not the only occupant of most streets. Without a doubt, high-speed thoroughfares such as interstates have their rights-of-way oriented solely for auto travel. But on most other roads, pedestrians interact with vehicles in some way. It is important, then, that a street or road be properly equipped to handle such interaction.

The next few subsections describe Iowa’s roadways in the context of their FHWA functional classification, further identifying their necessary levels of pedestrian-inclusive design. Table 1 exhibits the mileage of Iowa’s network of public roads divided into rural (and small urban) and urban routes.

<table>
<thead>
<tr>
<th>Road or Street Type</th>
<th>Rural Miles</th>
<th>Urban Miles</th>
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<tr>
<td>Interstate</td>
<td>628</td>
<td>153</td>
</tr>
<tr>
<td>Principal Arterial</td>
<td>3,462</td>
<td>804</td>
</tr>
<tr>
<td>Minor Arterial</td>
<td>3,925</td>
<td>1,506</td>
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<tr>
<td>Major Collector</td>
<td>14,271</td>
<td>1,064</td>
</tr>
<tr>
<td>Minor Collector</td>
<td>16,187</td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td>64,383</td>
<td>7,588</td>
</tr>
<tr>
<td><strong>Total Mileage</strong></td>
<td><strong>102,856</strong></td>
<td><strong>11,115</strong></td>
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Source: Federal Highway Administration
Rural Roads

Iowa has nearly 114,000 miles of roadways. A large portion of these miles are rural in nature. In 2005, almost 103,000 miles of Iowa’s roads were classified as rural. This classification may be deceptive, however, as the majority of Iowa’s towns have populations less than 5,000. These communities account for the large amount of rural roadway miles. Included within this classification are city streets in small cities and towns, as well as roads in rural developments. Pedestrian needs should be considered in the design of these local streets.

Some rural collectors offer higher levels of service for automobiles, but their design should also consider pedestrians in some instances. County roads are major rural collectors, and gravel roads are minor rural collectors. Iowa’s paved county roads are very attractive for use by bicyclists during the warmer months.

The arterials, state and national highways, and interstates are primarily used by automobiles; only in very rare circumstances would it be advantageous to have any pedestrian-inclusive component on these roadways. Sometimes these roads bisect small towns, creating main street districts.
Urbanized Streets

Urbanized areas, as defined by the U.S. Census Bureau, are those areas with a population greater than 50,000 people. Because the majority of Iowa’s streets and roads are rural, urban mileage only accounts for 11,000 of the 114,000 miles in the state. These miles, however, have the greatest need for pedestrian design elements on their rights-of-way.

As with the rural category, the interstates and arterials are dominated by automobile travel, and there should be reservations about including pedestrians in their design. The collectors, to a certain extent, should be looked at with the most scrutiny. Some collectors may have as much traffic as an arterial with a slower speed, which can lead to conflicts between motorists and pedestrians.

Local streets carry an obvious need to include people on foot or bicycle in addition to those in vehicles. Additionally, the FHWA has developed a policy statement (Accommodating Bicycle and Pedestrian Travel: A Recommended Approach) in hopes that public agencies will begin integrating bicycle and pedestrian facilities on their roads and streets.
Small Urban Streets

Small urban areas are those with a population of over 5,000 but not lying within an urbanized area as defined above. These small urban areas have characteristics of both rural and urbanized areas. Often located in areas surrounded by rural lands, country roadways intersect and pass through these cities, creating “connecting links,” which are simply urban extensions of rural roads. A connecting link may serve as a city’s main street (e.g., US Highway 30 through Carroll, Denison, etc.). It is important in this situation to include entities that will make a safe interaction between people and vehicles. The streets in small urban areas function much the same as those in urbanized areas, but on a smaller scale.

Complete Streets

A complete street is designed to be safe and accessible for all users—motorists, pedestrians, cyclists, transit riders, wheelchair users, etc. Complete streets policies are directed toward transportation planners and engineers in an effort to raise awareness and include additional pedestrian elements in the design of roads, instead of solely designing them for automobile travel. Complete streets improve safety and can help ease traffic clutter. Additionally, they offer an alternative for those with limited vehicle access, such as children, the elderly, and less-advantaged people. By encouraging walking, complete streets can improve the physical health of those in their communities. With more people on the sidewalks, the social health of a neighborhood may stand to gain from complete streets policies as well.
Section II: Elements of Complete Streets

Although there is no “set” of design elements present in every complete street, there are several items to consider when designing either new construction or improving a roadway to make it a complete street. The following provides insight into the elements that can help make a great street.
Rights-of-Way

The principal portions of a street are its rights-of-way. There are three main sections that may appear in the paved portion of a street: automobile lanes, sidewalks, and bicycle lanes.

Wide streets with little landscaping create a false sense of security for motorists and breed higher speeds of travel. For arterial roads and interstates, this is fine. But for a street cutting through a residential or commercial district, wide lanes may be detrimental to the walkability of the area. Narrower lanes coupled with some of the other elements discussed later in this document can help slow vehicles down. When correctly implemented and maintained, the pedestrian may feel comfortable using the street while traffic is still able to flow freely.

The most basic means of keeping both pedestrians and motorists comfortable when using a street is incorporating a sidewalk adjacent to the street. The type and location of a road or street will determine how the walk is constructed. On most roads it is best to have a separation between the sidewalk and automobile lanes. Commonly this separation is a narrow strip of grass (usually around four to eight feet), but it may exist in business districts as on-street parking spaces. Sometimes, however, a curb may be the only separation between automobiles and pedestrians.
In Iowa, it is the right of a person to ride a bicycle in the paved right-of-way on all roads and streets unless otherwise prohibited (Iowa Code 321.234). Many Iowans choose to exercise this right—some for fitness or recreation, others as an alternative mode of transportation. For those who like to use bicycles, nothing is more inviting than a designated bike lane (Chapter 9 of the Manual for Uniform Transportation Control Devices explains traffic controls for bicycle facilities). Bicycle lanes allow cyclists to travel on the paved right-of-way without interfering with the movement of motorized vehicles. A wider paved shoulder on a rural route can provide plenty of space for both a vehicle and a bicycle, without the expense of installing an additional designated bike lane. Before a road is designed or improved upon, the designer should investigate the rates of bicycle use. This creates safe rights-of-way and avoids the need to retrofit them to accommodate bikes later.

Other methods may be used without altering or adding to established roadways. For instance, on wide streets, where it may be too expensive to install sidewalks or where the policy may face political opposition, narrowing the driving lanes and striping one or both sides of the road may create a designated pedestrian lane for walkers and bikers. Especially on four- and six-lane collectors with large amounts of pedestrian activity, initiating a “road diet” can relieve many problems including safety and efficiency while allowing for multi-modal use. The road diet concept cuts the number of through lanes in half while leaving a two-way left-turn lane in the center (often leaving room on the edge of a road for bike lanes). Studies have shown a reduction in vehicular crashes and an accompanying overall speed reduction as well. Where appropriate, these are cost-effective alternatives that offer improved pedestrian service while maintaining or improving automobile levels of service.
Transit

Streets in urban communities may be subject to use by a public transit agency. Buses are Iowa’s primary mode of public transit. Although Iowa communities probably are not in any position for designated transit lanes, it is important to consider any potential transit service when designing a street. This can drastically reduce future costs of retrofitting the street to accommodate transit use.

The most common locations for transit stops are on collector streets, though some local streets may be served as well. Many of the streets that already serve as transit routes have adequate transit facilities, although some could be better. It is important to have entities such as shelters and turn-ins for high-boarding stops, especially on high-volume roads. Having concrete pads with benches and sidewalk connections is also important to improve the quality of a moderate-use transit stop. Incorporating trees, lighting, benches, and art can help make a stop attractive and inviting. Low-use stops require the least degree of design because of their high cost of maintenance in relation to the more frequently used stops. Overall, it is important to understand the current and potential context of the stop in its design phase.

Scale and Connectivity

Some conflicts between street and user arise from a lack of connectivity. Scale is the underlying culprit in such issues. A street may be properly fitted with sidewalks or bike lanes, but if the scale is too large a pedestrian may refuse to use it while drivers may misuse it. Particularly, very long blocks are a problem. Motorists tend to drive faster on streets with lengthy, uninterrupted sight lines. Long distances between blocks may overwhelm a pedestrian, creating discomfort and ultimately diminishing the pedestrian usage of the street.

A similar situation occurs in cul-de-sac developments. Often cul-de-sac streets are long and disconnected. A potential walker may opt to
drive to a relatively close location if they are forced to walk to the end of the street and back up the other side when a cut-through path is not available. Consider this when designing streets within new developments. The remaining elements can also assist with scale issues.

### On-Street Parking

Because any trip made in an automobile must start and end with a pedestrian movement, parking is where the rubber and the foot meet the road simultaneously. Parking is a major issue in many communities. The basic concerns with on-street parking are location, quantity of stalls and mode separation. Parking lots and structures are often preferred in auto-oriented developments such as business parks and shopping centers. In main-street commercial districts or in residential areas; however, on-street parking may be more advantageous. There are generally two methods of on-street parking used in Iowa—parallel and diagonal. Each may have an advantage over the other depending on its site and situation. Both can serve as a spatial barrier between the automobile lanes and the pedestrian path. Public input may be valuable when deciding which type of parking to install. Additionally, installing parking meters in commercial areas is a good way to recover any costs of improvement.

Parallel parking is most common in residential areas. It has the distinct advantage of offering additional parking for the residents without occupying a large portion of the automobile right-of-way. It can also help keep traffic speed in check, which is especially important in neighborhoods with a high number of children and other pedestrianism. Additional parked vehicles force drivers to raise their level of awareness while operating their motor vehicle. Parallel parking in a residential area can be alternated daily from one side of the street to the other to keep people...
from permanently parking a vehicle in the street. This also ensures equity so that home owners do not have to worry about having vehicles always parked in front of their property.

Parallel parking on a commercial street provides for three-fold mode separation. If an arterial or collector road from a rural area becomes a main street, parallel parking can provide separation of pedestrian and automobile traffic while also offering space for a designated bicycle lane. This way, users of each of the three modes can feel comfortable and confident in their respective activity. The same applies to a wide street that is not wide enough to accommodate two-sided angled parking.

Diagonal parking in a commercial area may be preferred over parallel parking when the street is very wide or when an increased number of parking stalls is desired. Diagonal parking can offer more store-front spaces which may be beneficial when access to additional parking areas is limited. An emerging trend in diagonal parking is a back-in angled parking. Backing into a diagonal parking spot allows a vehicle to enter and exit the stall easier and more safely because of increased sight lines and curbside access to the trunk and doors. Des Moines and Dubuque are among Iowa communities that are instituting back-in angle parking.
Lighting and Visibility

Making the division between automobile- and pedestrian-traveled portions of a street clear is important to the street’s overall safety. There are several things that can be added to a street that increase the visibility of pedestrians and pedestrian paths. Adequate lighting along the street is very important to seeing pedestrians in the hours of darkness. Proper lighting at intersections and other conflict points should reduce the risk of an accident at night.

A common and fairly inexpensive method of alerting drivers that they may encounter pedestrians is the installation of warning signs for crosswalks, increased pedestrian activity, etc. Coupling a set of flashing lights with the warning signs, especially in high-frequency pedestrian crossings (i.e. school zones) is a great way to gain a driver’s attention.

Other components may be directly integrated on the pavement. Curb cut-outs or extensions (i.e. bulb-outs) are essential in allowing a smooth transition between the street and the sidewalk—which is
especially convenient for those who may be in wheelchairs. A curb cut-out helps tip-off the driver to watch out for people and an extension actually narrows the lane enticing a motorist to drive slower. A raised median may offer a mid-street refuge to a walker crossing a busy or wide street. Count down signals on stop light poles may also be beneficial in allowing pedestrians to know how much time they have left to cross a street safely.

Pavement markings are another commonly used technique to alert drivers of pedestrians—the most widely utilized being painted crosswalks. A more complete description of pavement markings exists in Section 3B.17 of the MUTCD. Common painting methods are curb-to-curb parallel white lines while another involves a series of white rectangular bars. The paint used usually includes small retroreflective beads that allow the crossings to stand out at night when headlights shine on them.

A more attractive, though more expensive method of marking a crosswalk includes the use of different materials in construction. Typically, brick pavers may be integrated within the crosswalks of cultural districts to add to the aesthetic quality of the area while improving the safety of an intersection. Other textured or specially painted pavement can provide additional safety and help give an identity to an area.
Mid-block crosswalks may be useful in areas such as downtowns or main street districts which may have a combination of longer blocks and higher levels of pedestrian and vehicular activity.

Street Trees

Trees have the ability to improve both the quality of the space and safety of a street. The most apparent benefit of including trees is the visual impact they have on a street. Adding trees of the appropriate type and in the correct locations can help make a street more inviting to use. For example, trees provide shelter for a pedestrian from the summer sun, precipitation, and wind. This creates a better environment for a walker.

Properly spaced trees can reduce the scale of the street. This, in turn, may elevate the pedestrian’s level of comfort by adding a clearly visible line of separation between vehicles and the walking path. Correctly spaced trees can slow traffic as well. People subconsciously drive more slowly when a street “feels” smaller. Even very wide streets can appear narrow in a driver’s frame of reference when they pass trees and similar objects (i.e. light poles) at regular intervals.
Beyond aesthetics and safety, trees have added environmental benefits. They can help clean up harmful gasses in the air released by automobiles. Trees also control erosion and absorb stormwater run-off. With proper installation and maintenance, trees add beauty and sustainability to a street without negatively affecting the automobile traffic on the street.

*The City of Seattle, Washington,* developed a set of street tree planting procedures for its citizens—showing people how to get permission to plant a tree, what kind of trees are best suitable for their area, and how to plant and care for their trees. *Ames* has a similar set of regulations available on its city website. It may be in the interest of Iowa communities to develop similar guidelines promoting the planting of trees in their neighborhoods.

### Stopping Places and Points of Interest

The remaining elements of good street design are of a finer detail, including adding interest and identity to a place. This includes art, benches, bicycle racks, clocks, planting strips, and trash cans. These may be found at stopping places or other points of interest such as intersections, shop entryways, or on the sides of buildings. Though not absolutely necessary, they certainly do create a nicer atmosphere for everyone when they are present. Art can exist in almost any form: as a mural on a wall, a sculpture on the street corner, a pattern paved in the sidewalk, a decorative street sign, or within any of the other elements mentioned previously.
Benches allow a pedestrian place to stop and rest, a place to wait for a transit bus, or a place to sit and watch people. Some benches may have canopies for shade from the sun or may be connected to a table in a downtown area for informal meetings or lunches.

Bike racks enhance the multi-modal function of a street. Clocks, while not the most important part of design, still create an identifiable characteristic to a location and allow passersby a glimpse at the time.

Planters or planting strips also help enhance the attractiveness of a street while attaching an identity to the street and its surrounding area. For instance, planting a specific type of flower or shrub (or even a tree) may help a visitor understand he or she is entering a special neighborhood.

Perhaps one of the most overlooked extras for a street is the trash can. Nothing can help keep a street clean more than having an adequate number of trash cans available in pedestrian areas. People are much less likely to toss their waste in the street if they are aware that a garbage can is near.
Section IV. Sample Cross Sections

The following are a set of seven sample cross sections of streets designed with all users in mind. Each section includes a 50-foot plan view with a corresponding cut-away view of the street. The overall width dimensions are positioned across the bottom.

Section 1. A two-lane collector street with optional bicycle lanes, offset sidewalks, and street trees.

Section 2. A two-lane collector street with optional bicycle lanes, offset sidewalks, median, and street trees.

Section 3a. A four-lane collector street; potential candidate for a “road diet” conversion.

Section 3b. An example of the conversion of a four-lane to two-way with left-turn lane (“road diet”).

Section 4. A street running through a commercial district with on-street angled parking and optional bike lanes.

Section 5. A street running through a commercial district with on-street parallel parking and optional bike lanes.

Section 6. A street running through a residential area with two-sided on-street parking and offset sidewalks.

Section 7. A street running through a residential area with one-sided alternating parking and offset sidewalks.
4-Lane Collector Before “Road Diet”

2-Lane Collector After “Road Diet”
Commercial Street with Angled Parking

Commercial Street with Parallel Parking
Residential Street with 2-Side Parallel Parking

Residential Street with Alternating Parking
Section IV. Implications & References

Implications

Several major cities across the United States have already bought into the Complete Streets ideology, including Chicago, Illinois, in 2006. Iowa City, Cascade, and Johnson County in Iowa have each adopted complete streets initiatives. Senator Tom Harkin (D-Iowa) has expressed his intention to sponsor a federal complete streets program in Congress as part of a comprehensive wellness initiative. While it may be true that roads and streets are not the solitary solution for creating great communities, they are the foundation. When accompanied by well-conceived (and implemented) land use and zoning policies, well-designed roads and streets can be invaluable in developing or enhancing great communities.

References

The following books, publications, and Internet sites were quite useful in developing this guide. Much more detailed and specific information and successful case studies in other states may be found in them. This guide is a collection of the best design elements that are applicable to the state of Iowa; however, other things found within the websites or publications could work in Iowa given proper planning and execution. Though it may seem as if much of the information presented in this guide is common sense, it often goes overlooked. Careful consideration is therefore essential to designing good, safe, and complete streets for all users.
Books & Publications


Reference Websites

FHWA Functional Classification System:
  http://www.fhwa.dot.gov/planning/fcsec2_1.htm
  http://ntl.bts.gov/lib/12000/12200/12274/ch03.htm

Iowa Map of FHWA Functional Classification System:
  http://www.sysplan.dot.state.ia.us/fedfunc_class.html

Iowa Code 306.3 Definitions Throughout Code:
  http://www.legis.state.ia.us/IACODE/2003/306/3.html

Accommodating Bicycle and Pedestrian Travel:
  http://www.fhwa.dot.gov/environment/bikeped/design.htm#top

Iowa DOT Office of Systems Planning: Federal Functional Classification Map:
  http://www.sysplan.dot.state.ia.us/fedfunc_class.html
Iowa Code 321.234 Bicycles:
http://www.legis.state.ia.us/IACODE/2003/321/234.html

MUTCD Chapter 9 – Traffic Control for Bicycle Facilities:

Road Diets:
http://www.dot.state.ia.us/crashanalysis/pdfs/trb_roaddiet_papersubmission_08012005.pdf

Des Moines Back-in Angled Parking Demonstration:

MUTCD Chapter 3 – Pavement Markings:

Integrated Paving Concepts:
http://www.integratedpaving.com/

Seattle Tree Planting Guide:
www.seattle.gov/transportation/treeplanting.htm

Ames Tree Planting Guide:
http://www.city.ames.ia.us/electricweb/tree%20planting.htm

Chicago Complete Streets Policy:
Iowa City Complete Streets Policy:  
http://www.iowabicyclecoalition.org/resources/iowacitycs.htm

Cascade Complete Streets Policy:  
http://www.iowabicyclecoalition.org/cascade%20complete%20streets.pdf

Tom Harkin Comprehensive Wellness Initiative:  
http://harkin.senate.gov/pr/p.cfm?i=222816

**Government & Organization Websites**

Complete Streets Coalition  
www.completestreets.org

Context Sensitive Solutions (CSS)  
www.contextsensitivesolutions.org

Federal Highway Administration (US Department of Transportation)  
www.fhwa.dot.gov

Great Streets!  
www.greatstreets.org

Institute of Transportation Engineers  
www.ite.org

The Thunderhead Alliance  
www.thunderheadalliance.org