



Waukee
THE KEY TO GOOD LIVING

Waukee Street Design Guide



Prepared for:

The City of Waukeee

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Prepared by:



Table of Contents

Introduction	1
Street Design Criteria Table.....	1
Major Arterial Streets	2
Definition	2
Typical Cross Section	2
Minor Arterial Streets.....	3
Definition	3
Typical Cross Section	3
Major Collector Streets.....	5
Definition	5
Typical Cross Section	5
Traffic Calming Designs	7
Minor Collector Streets	8
Definition	8
Typical Cross Section	8
Traffic Calming Designs	8
Local Streets	9
Definition	9
Typical Cross Section	9
Traffic Calming Designs	9
Traffic Calming Measures	10
Choker.....	10
Corner Extension/Bulb-Out	10

Median Island.....	11
Speed Table / Raised Crosswalk.....	11
On-Street Parking.....	11
Roundabout.....	12
Mini Roundabout.....	12
Access Spacing Criteria.....	15
Intersection Selection Guidance	16
Intersection Type Recommendation Table	16
Right Turn Lane Guidance.....	17
Traffic Impact Studies	17
Sources	18

Introduction

This reference guide provides a working definition and description of the different levels of street classifications with a corresponding example for Waukeee. Graphic representations are included to provide a visual guide to the typical cross-section of the indicated street designations.

Each street type has a number of traffic calming strategies identified that are appropriate for the identified classification. Additional information on each type of traffic calming measure, including whether each measure may be applied retroactively to existing streets or should be part of a street redesign or initial construction, may be found in the “Traffic Calming Measures” section of this guide.

Finally, this guide includes certain design criteria, access spacing guidelines for the identified categories of street and a reference chart for design options when considering new intersections. These design recommendations have been developed with input from City of Waukeee Public Works, Development and Emergency Response staff and are based on criteria found in the Iowa Statewide Urban Design and Specifications Manual (SUDAS).

Street Design Criteria Table

The table below presents a number of design criteria depending on the classification and nature of the identified streets. The values listed in the table should be used as a starting point for roadway planning and design purposes and may be modified per specific situations. Refer to the currently adopted SUDAS and City of Waukeee Standard Specifications for additional roadway design criteria and guidance.

Design Elements	Local	Cul-de-sac	Collector		Arterial	
			Minor	Major	Minor	Major
General						
Lane Width (single lane) (ft)	11	11	11	12	12	12
Two-Way Left-Turn Lanes (TWLTL) (ft)	N/A	N/A	12	14	14	N/A
Object setback (ft)	1.5	1.5	1.5	3.0	3.0	3.0
Urban (2-lane undivided roadway)						
Roadway width with parking (one-side) (ft)	29	26	31	N/A	N/A	N/A
Roadway width without parking (ft)	26	26	26	29	31	N/A
Boulevard (2 or 4-lane divided roadway)						
Roadway width without parking (one side) (ft)	N/A	N/A	N/A	18 ¹	26 ²	41 ³
Raised median with left-turn lane (ft)	N/A	N/A	N/A	20	20	30

¹ Based on one lane each direction
² Based on two lanes each direction
³ Based on three lanes each direction

Major Arterial Streets

Definition

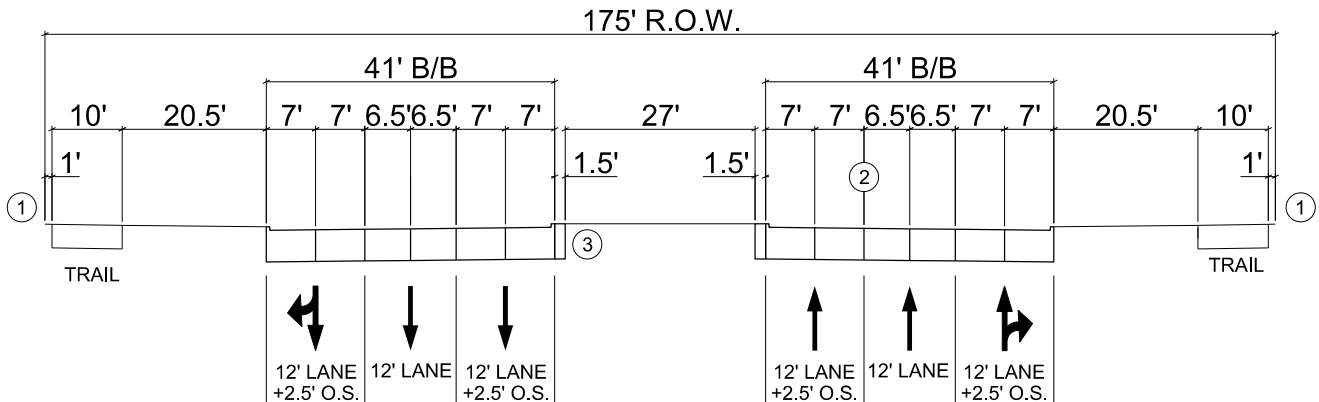
Major arterial streets serve major centers of activity in urbanized areas and should be used for the highest traffic volume corridors to carry most of the trips entering and leaving the area as well as trips that bypass the city center. Additionally, arterial streets should handle significant intra-area travel such as between central business districts and outlining residential areas, between major inner-city communities and between major suburban centers.

Private property access from major arterials is deliberately limited to reduce constraints on road capacity and user mobility. Access should generally be restricted to Interstate freeways, other major arterial streets and selected minor arterial streets. Arterial spacing varies, but may be spaced one mile apart in highly developed areas to five miles apart in developed urban/rural fringes.ⁱ Signalized intersection spacing should be at least every ¼ mile.

General arterial speed limits in Waukee are 45 MPH, with limited opportunities for pedestrian and bicycle crossings. Any crossings should be part of a larger bicycle/pedestrian system and designed to provide safe crossing opportunities without compromising arterial mobility.ⁱⁱ

Major arterial streets in Waukee include Hickman Rd/Highway 6 and Grand Prairie Parkway/Alice's Road.

Typical Cross Section



- 1. PUBLIC UTILITY EASEMENTS
- 2. JOINT LINES (TYP.)
- 3. FULL DEPTH PAVEMENT

MAJOR ARTERIAL BOULEVARD SECTION

Minor Arterial Streets

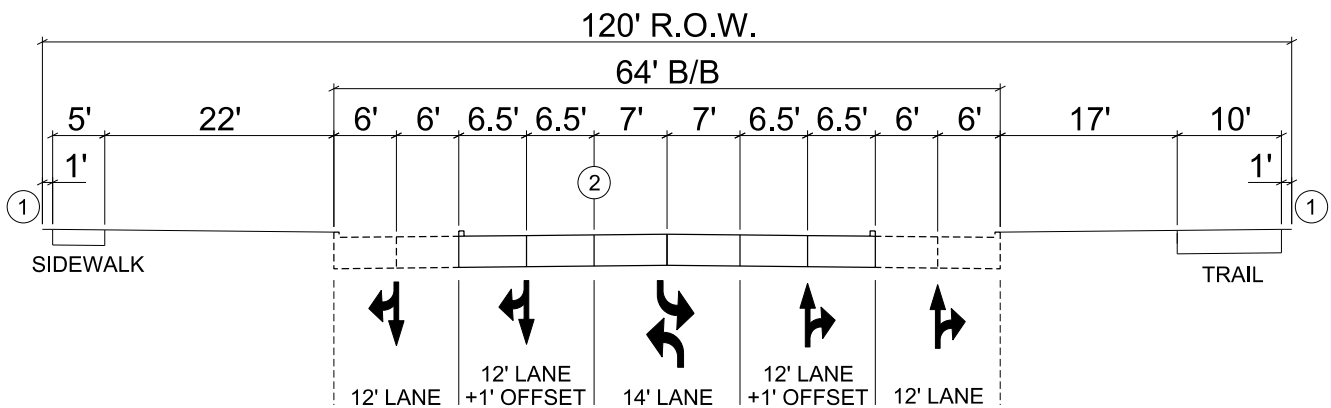
Definition

Minor arterial streets connect with and augment the major arterial streets system by increasing access to private land, neighborhoods and streets of a lower classification level while maintaining some limits on access points. The spacing of minor arterials may vary from 1/8 to 1/2 mile spacing in urban areas and up to 2 - 3 mile spacing on suburban fringes.ⁱⁱⁱ Signalized access should be spaced at least every 1/4 mile.

General arterial speed limits in Waukeee are currently posted at 35 MPH, with limited opportunities for pedestrian and bicycle crossings. Crossing opportunities should be adequately spaced and designed to allow for safe opportunities for bicycling and pedestrian users.^{iv}

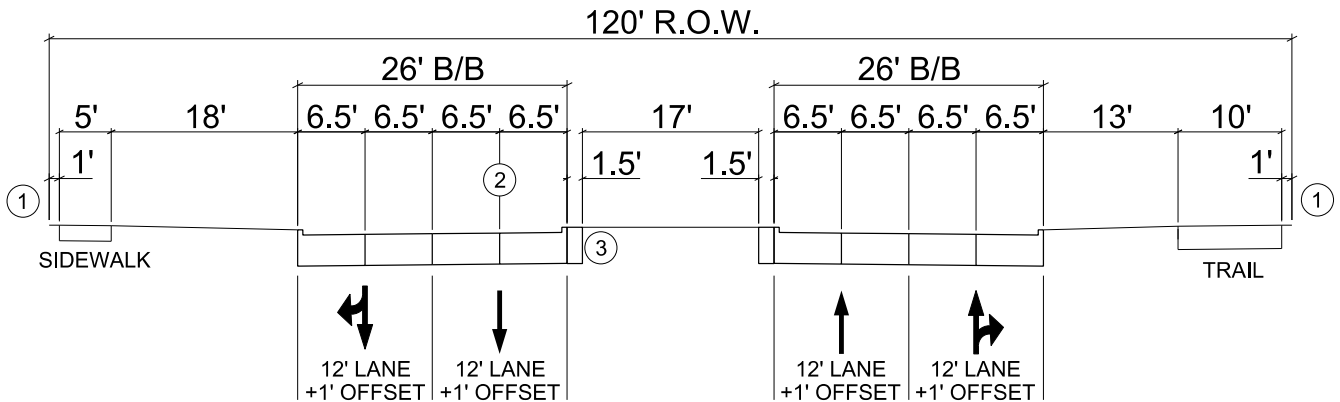
Waukeee examples of minor arterial streets include University Avenue, Westown Parkway and SE LA Grant Parkway.

Typical Cross Section



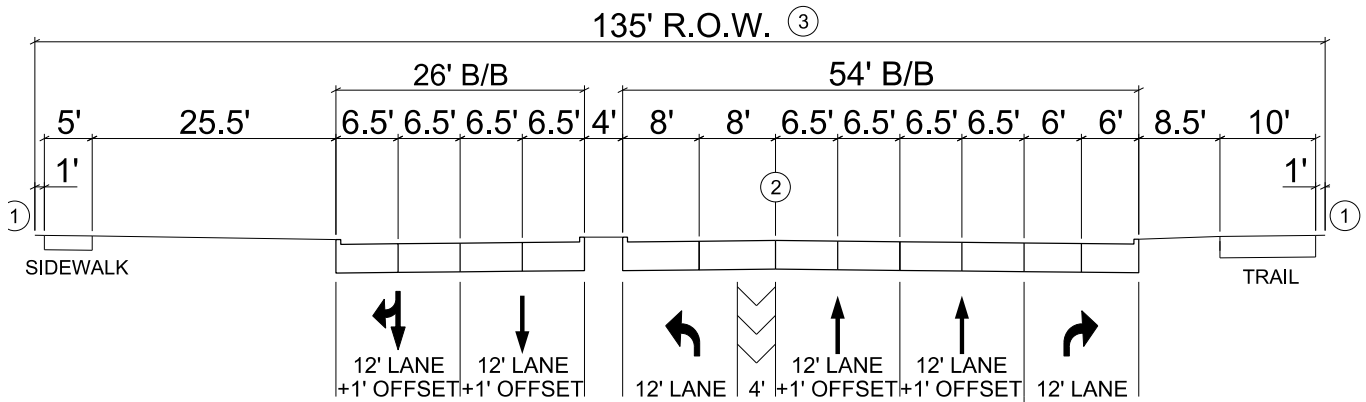
- 1. PUBLIC UTILITY EASEMENTS
- 2. JOINT LINES (TYP.)

MINOR ARTERIAL 3-LANE / 5-LANE (OR RIGHT TURN LANES)



- 1. PUBLIC UTILITY EASEMENTS
- 2. JOINT LINES (TYP.)
- 3. FULL DEPTH PAVEMENT

MINOR ARTERIAL BOULEVARD SECTION



- 1. PUBLIC UTILITY EASEMENTS
- 2. JOINT LINES (TYP.)
- 3. R.O.W. = 145' TO ACCOMMODATE DUAL LEFT TURN LANES
- 4. LEFT TURN LANE POSITION WOULD BE DETERMINED ON CASE BY CASE BASIS

MINOR ARTERIAL BOULEVARD SECTION (AT INTERSECTIONS)

Major Collector Streets

Definition

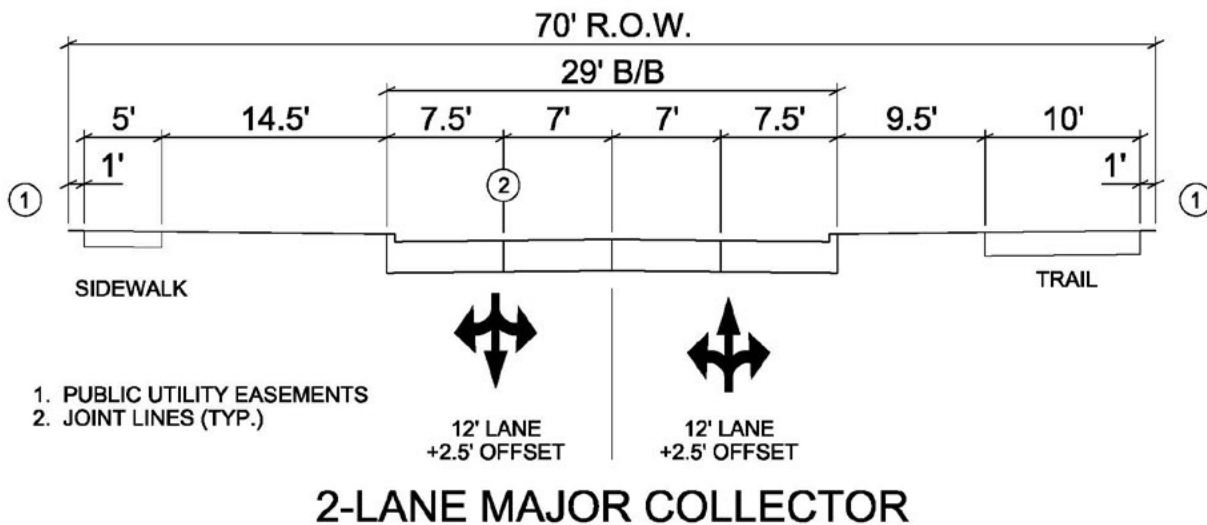
The collector street system provides both land access and traffic circulation within residential neighborhoods, commercial and industrial areas. Unlike arterial systems, collector streets penetrate residential neighborhoods, channeling trips to and from the arterial network. A major collector street connects arterial streets with minor collectors while also collecting traffic from local streets, residential and commercial areas. **Through movement is prioritized over direct land access on major collectors.**

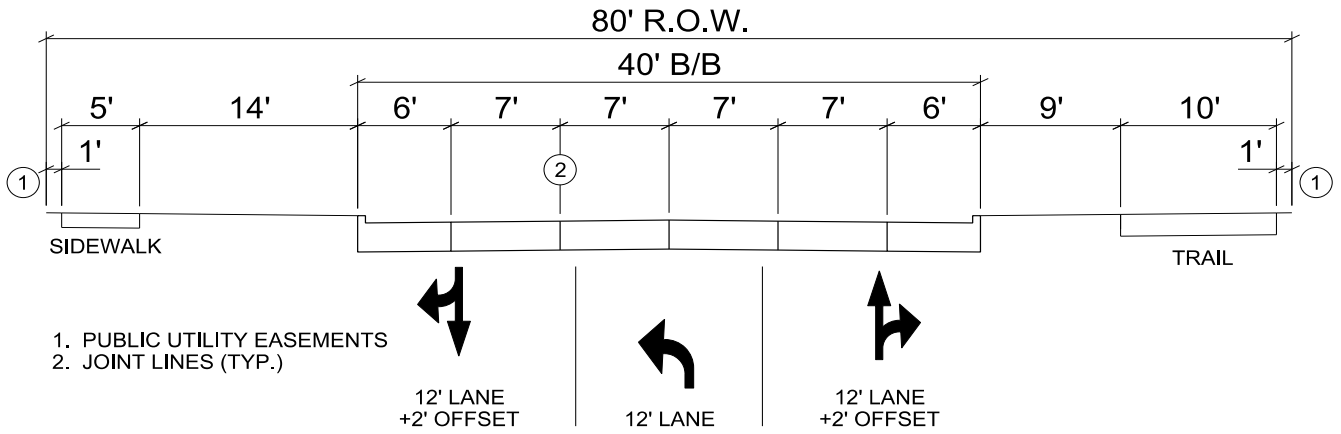
A major collector has control of access to abutting properties with a majority of access at local street connections.

Speed limits on major collector streets in Waukeee range between 25 – 35 MPH. Future considerations may include standardizing speed limits to be 30 MPH across the community. Crossing opportunities for pedestrians and bicyclists should be regular, adequately spaced and designed to allow for safe opportunities for bicycling and pedestrian users, especially on roads that are currently posted at 25 MPH.

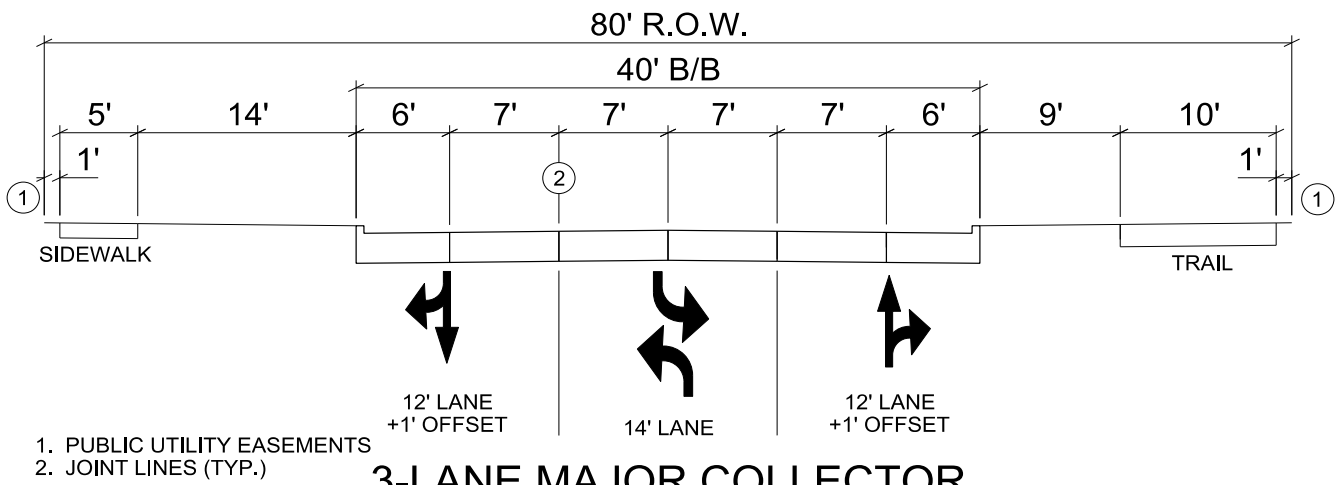
Waukeee examples of a major collector include NE Dartmoor Drive and SE Brick Drive.

Typical Cross Section

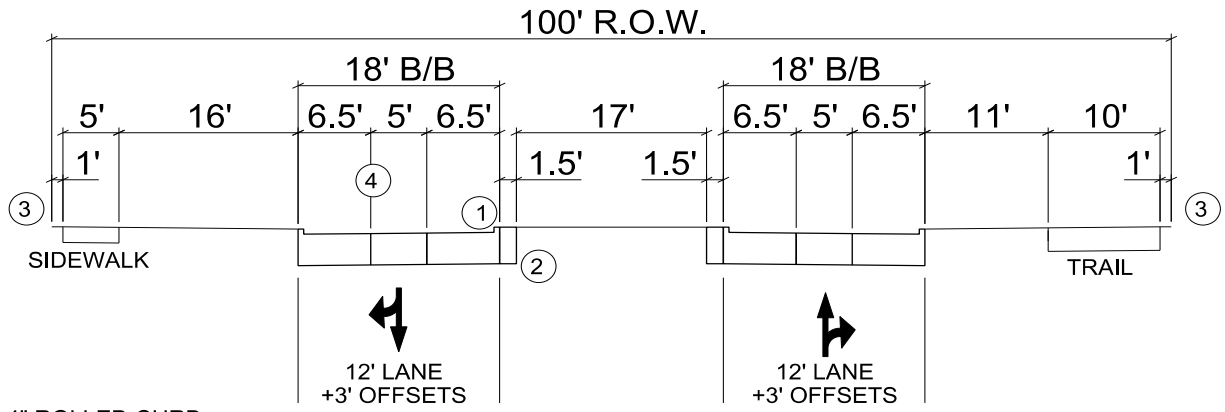




**2-LANE MAJOR COLLECTOR
LEFT TURN LANE AT INTERSECTIONS**



3-LANE MAJOR COLLECTOR



- 1. 4" ROLLED CURB
- 2. FULL DEPTH PAVEMENT
- 3. PUBLIC UTILITY EASEMENTS
- 4. JOINT LINES (TYP.)

MAJOR COLLECTOR BOULEVARD SECTION

Traffic Calming Designs

Traffic calming devices are used to encourage motorists to adhere to posted speed limits and create a safer roadway environment for all users, motorists, cyclists and pedestrians. A number of traffic calming measures are available to collector streets given lower travel speeds of motorists and the emphasis placed on neighborhood penetration. Additional information on each of the following traffic calming measures may be found in the "Traffic Calming" section of this report, but listed below are measures appropriate for Major Collector streets include:

Choker
Corner Extension

Median Islands
Mini Roundabouts

Roundabouts
Speed Table / Raised Crosswalk

Minor Collector Streets

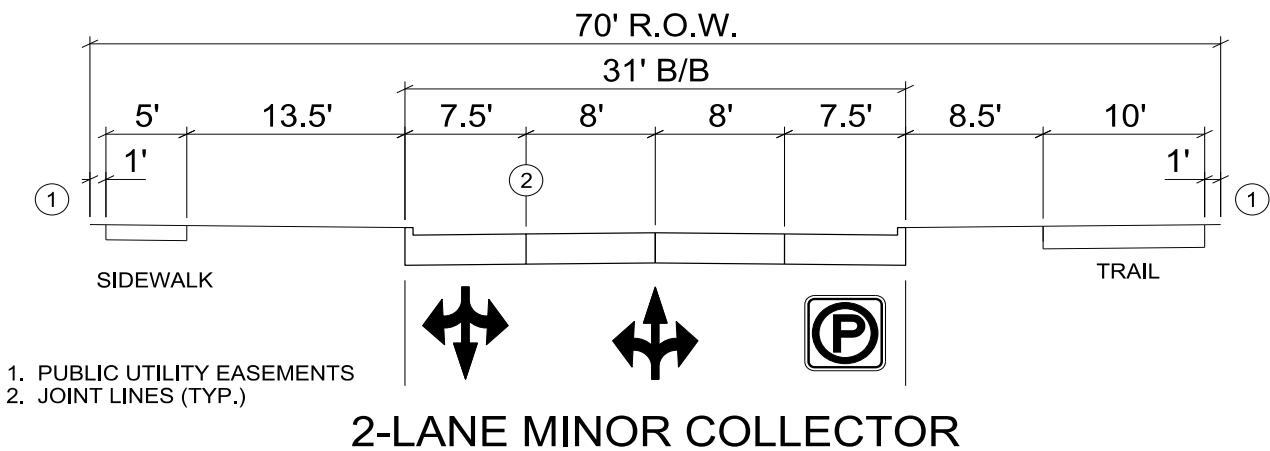
Definition

A minor collector provides movement between major collectors, residential, commercial and local streets while providing access to abutting properties. **Through movement of traffic and direct land access are weighed evenly when considering allowing access points to minor collector streets.** Signalized access should be spaced at least every ¼ mile.

Speed limits on minor collector in Waukee are 25 MPH and should provide regular opportunities for pedestrian and bicycle crossings. Crossing opportunities should be adequately spaced and designed to allow for safe opportunities for bicycling and pedestrian users.

Waukee examples of Minor Collector streets include SE Florence Drive, SE Pleasant View Drive and NE Boston Parkway.†

Typical Cross Section



Traffic Calming Designs

Traffic calming devices are used to encourage motorists to adhere to posted speed limits and create a safer roadway environment for all users, motorists, cyclists and pedestrians. A number of traffic calming measures are available to collector streets given lower travel speeds of motorists and the emphasis placed on neighborhood penetration. Additional information on each of the following traffic calming measures may be found in the “Traffic Calming” section of this report, but listed below are measures appropriate for Minor Collector streets include:

Choker

Corner Extension

Mini Roundabouts

Median Islands

On-Street Parking

Roundabouts

Speed Tables / Raised Crosswalks

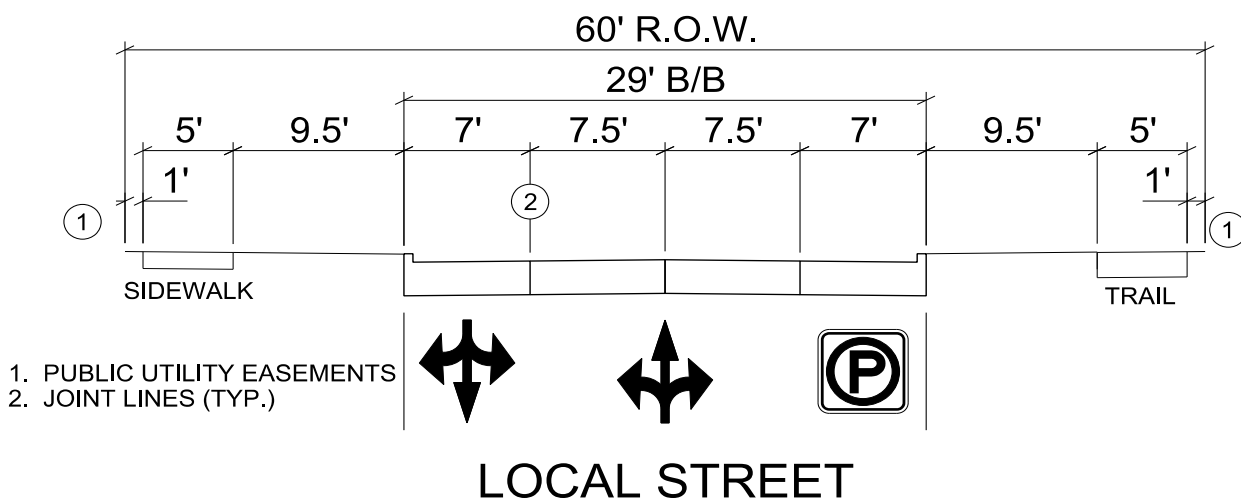
Local Streets

Definition

Local streets allow direct access to abutting land and provide connections to higher order street systems. They provide the lowest level of mobility and should deliberately discourage major through traffic movements. Examples of local streets in Waukeee include the majority of residential streets throughout the community.

Local streets in Waukeee have a maximum speed limit of 25 MPH and allow for pedestrian and bicycle accommodations on, along, or crossing local roads at any needed location.

Typical Cross Section



Traffic Calming Designs

Traffic calming devices are used to encourage motorists to adhere to posted speed limits and create a safer roadway environment for all users, motorists, cyclists and pedestrians. Traffic calming devices on local streets may also discourage “cut-through” traffic that is more appropriate for collector streets.

A number of traffic calming measures are available to local streets given lower travel speeds of motorists and the emphasis placed on neighborhood access. Additional information on each of the following traffic calming measures may be found in the “Traffic Calming” section of this report, but listed below are measures appropriate for local streets include:

Choker

Corner Extension

Mini Roundabouts

Median Islands

On-Street Parking

Roundabouts

Speed Tables / Raised

Crosswalks

Traffic Calming Measures

Traffic calming devices are used to encourage motorists to adhere to posted speed limits and create a safer roadway environment for all users, motorists, cyclists and pedestrians. Traffic calming measures are a combination of road features and interventions that reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for non-motorized street users. By increasing pedestrian and cyclist safety, traffic calming measures may even encourage additional pedestrian and bicycling activity on and along roadways. Traffic calming measures can be retroactively applied to existing streets or may be integrated into original construction or reconstruction design guidelines and may be implemented at an intersection, street, neighborhood, or area-wide level.

When applied to Waukee, the following type of traffic calming measures may be considered:

Choker

A Choker is a lateral horizontal extension of the parkway into the street that, through the narrowing of the roadway, encourages lower motorist speed through the pinch point. When located mid-block, this feature is known as a “choker,” whereas an intersection placement renames this feature as a “corner extension.” This feature should be placed near streetlights, should be at least 20 feet long, can be used on one-way and two-way streets and can coexist with on-street parking facilities. If used in conjunction with a mid-block crossing, a choker will reduce crossing distance for pedestrians and cyclists. Typical costs (2020 dollars) for this feature can be between **\$12,000 to \$15,000** depending on length and width of barriers.

Emergency response concerns include retaining sufficient street width for ease of use for emergency vehicles.

Chokers may modify **existing streets** or be integrated into the design of **new or reconstructed streets** and are appropriate for Major Collectors, Minor Collectors and Local streets.

Corner Extension/Bulb-Out

A Corner Extension is a choker placed at an intersection rather than at a mid-block location. Typical costs (2020 dollars) for this feature can be between **\$12,000 to \$15,000** depending on length and width of barriers.

Emergency response concerns include retaining sufficient width for ease of emergency vehicles and that a shortened curb radii may require large turning vehicles to cross centerlines.

Similar to Chokers, Corner Extensions and Bulb-Outs may modify **existing streets** or be integrated into the design of **new or reconstructed streets** and are appropriate for Major Collectors, Minor Collectors and Local streets.

Median Island

A Median Island is a raised island located along the street centerline to narrow travel lanes mid-block or at intersections. Raised islands may also serve as pedestrian refuge islands at crossing points for marked crosswalks or shared-use trails. Typical costs (2020 dollars) for this feature range between **\$12,000 to \$15,000**.

Median Islands are appropriate along primary emergency vehicle streets that provide access to hospitals/emergency medical services as long as sufficient width is retained for ease of use by emergency vehicles.

Median Islands may modify **existing streets** or be integrated into the design of **new or reconstructed streets** and are appropriate for Major Collectors, Minor Collectors and Local streets.

Speed Table / Raised Crosswalk

A Speed Table is a long, raised (three to four inches) speed hump with a flat section in the middle with ramps on the end that may be placed mid-block or at intersection and may feature crosswalks. Speed Tables work well in conjunction with curb extensions, textured crosswalks and curb radius reductions. Speed Tables are appropriate for one- or two-way streets, are best placed on roads with posted limits of 35 MPH or less and are not appropriate for roads with 85th percentile speeds of 45 MPH or more. Typical costs (2020 dollars) for this feature range between **\$20,000 to \$25,000** for concrete tables.

Speed Tables are typically preferred by fire departments over Speed Humps, but may not be appropriate for placement on primary emergency vehicle routes. The typical delay experienced by fire trucks is three seconds per Speed Table.

Speed Tables may modify **existing streets** or be integrated into the design of **new or reconstructed streets** and are appropriate for Major Collectors, Minor Collectors and Local streets.

On-Street Parking

On-Street Parking requires the allocation of paved space to parking spaces, reducing the amount of available travel lanes and introducing side friction to traffic flow. The parking spaces can be oriented parallel or angled to the curb-line, but parallel is preferred for maximum speed reductions. On-Street Parking may be combined with other traffic calming measures like chicanes and chokers, but should be avoided near roundabouts and should not be placed adjacent to median islands. In addition to the costs for associated traffic calming elements installed with on-street parking, there are typically no additional costs above the addition of appropriate signage.

There are no emergency response concerns for the installment of On-Street Parking, but care should be exercised when placing On-Street parking near hydrants or other emergency features.

On-Street Parking may modify **existing streets** or be integrated into the design of **new or reconstructed streets** and are appropriate for Minor Collectors and Local streets.

Roundabout

A Roundabout is a raised island placed in an unsignalized intersection forcing traffic to circulate to continue through the intersection or access the intersecting road. Motorists are required to yield to vehicles already within the Roundabout. The Roundabout will force drivers to reduce their speeds to comfortably maneuver, but will also require additional physical separation measures for pedestrian and bicycle facilities for safe access and street crossings.^{vi} Construction costs for roundabouts vary due to intersection context, but are typically **in excess of \$250,000**.

Emergency response vehicles may traverse the Roundabout Apron when navigating the Roundabout intersection.

Roundabouts are only appropriate for **new or reconstructed intersections** and are appropriate for Minor Arterials, Major Collectors, Minor Collectors and Local streets.

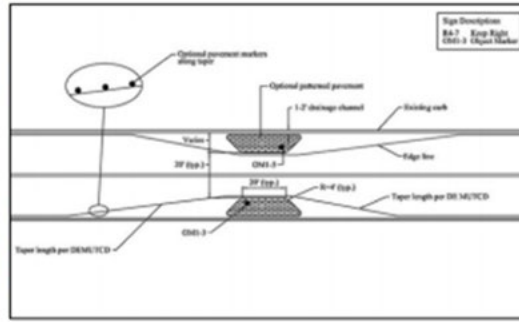
Mini Roundabout

A Mini Roundabout is a raised island placed in an unsignalized intersections of local and/or collector streets. A Mini Roundabout should only have one lane of each intersection entering the roundabout and should not be used on intersections with a high volume of trucks or buses turning left. Typical costs (2020 dollars) for this feature range between **\$50,000 and \$300,000** depending on the size, treatment of splitter islands, and amount of intersection reconstruction required.

Emergency response vehicles can maneuver the Mini Roundabout in the same manner as a personal automobile or by driving over the center island at slow speeds.

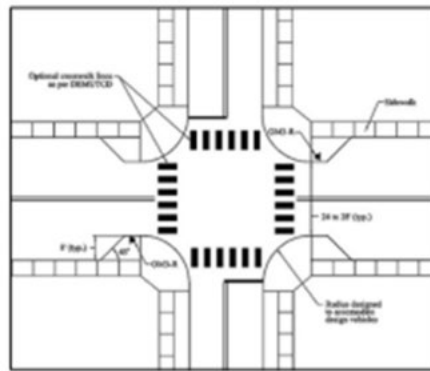
Mini Roundabouts may modify **existing intersections** or be integrated into the design of **new or reconstructed intersections** and are appropriate for Major Collectors, Minor Collectors and Local streets.

For additional information on the design and function of roundabouts and mini roundabouts, refer to the FHWA roundabouts website at <https://safety.fhwa.dot.gov/intersection/innovative/roundabouts/>.



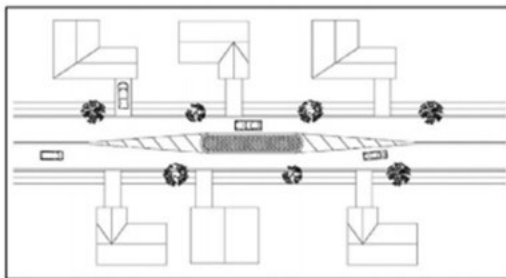
Choker

- Reduces Lane Width
- Retrofit / New
- Major Collectors, Minor Collectors, Local
- \$12,000 to \$15,000



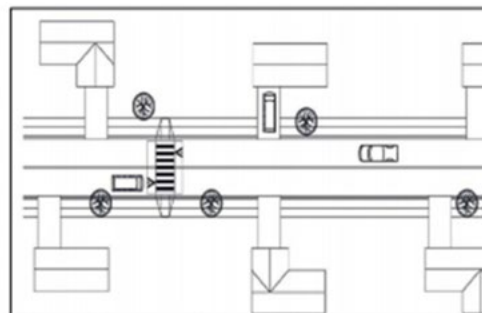
Corner Extension/Bulb-Out

- Reduces Lane Width
- Retrofit / New
- Major Collectors, Minor Collectors, Local
- \$12,000 to \$15,000



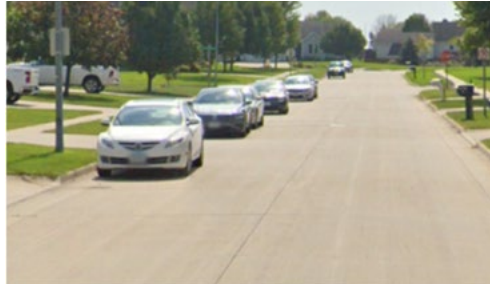
Median Island

- Lane Shift / Reduces Lane Width
- Retrofit / New
- Major Collectors, Minor Collectors, Local
- \$12,000 to \$15,000



Speed Table/Raised Crosswalk

- Vertical Deflection
- Retrofit / New
- Major Collectors, Minor Collectors, Local
- \$20,000 to \$25,000



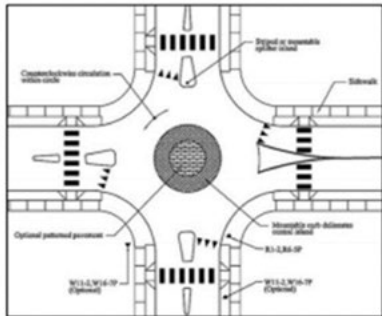
On-Street Parking

- Reduces Lane Width
- Retrofit / New
- Minor Collectors, Local



Roundabout

- Speed Reduction / Traffic Control
- New
- Minor Arterials, Major Collectors, Minor Collectors, Local
- \$250,000+



Mini Roundabout

- Speed Reduction / Traffic Control
- Retrofit / New
- Major Collectors, Minor Collectors, Local
- \$50,000 to \$300,000

Access Spacing Criteria

The efficiency and safety of a street or highway depends largely upon the amount and character of interruptions to the movement of traffic. Access priority should be ranked to preserve the core functionality of the system; to provide for a supporting street and circulation system; to preserve the functional areas of planned intersections and interchanges; and to limit the number of conflict points along the corridor. If found to be in conflict, a lower ranked consideration should not be allowed to infringe upon that of a more highly ranked community priority.

The following general priorities should guide access requests to preserve the safety and efficiency of the subject roadway:

- Safety to the traveling public including considerations of vehicle safe stopping distance and the reduction of conflict areas;
- Preservation of the traffic-carrying capacity of the roadway and intersection functional areas;
- The impact upon the economy of the area; and,
- Balance the safety of the public with public road access by property owners

The number of access points per mile has a direct relation to the number of expected crashes and should be controlled in the interest of public safety and roadway efficiency. Refer to the current SUDAS guidance for more details on access management.

Beyond limiting the number of access points and interaction opportunities, the placement of access points are important considerations. The following spacing table provides guidance on access placement that minimizes conflict frequency and considers necessary stopping distance for a number of roadway categories:

Street (Posted Speed)	Centerline to Centerline Full Access Spacing (Feet)	Centerline to ROW Line of Street Corner Clearance Spacing (Feet)
Local (25 MPH)		
Residential	50	75
Commercial	75	100
Minor Collector (25 MPH)		
Residential	50	75
Commercial	100	150
Major Collector (30 MPH)	300 (150 ¹)	300 (250 ¹)
Minor Arterial (35 MPH)	600 (300 ¹)	600 (425 ² , 300 ³)
Major Arterial (45 MPH)	1,320 (600 ¹)	1,320 (600 ^{2,3})
¹ Right-In-Right-Out allowed at this spacing ² For Right-In-Right-Out located upstream of intersection ³ For Right-In-Right-Out located downstream of intersection		

Intersection Selection Guidance

When two or more roads intersect, there is potential for conflict between vehicles and between various modes of travel. A priority in the design of at-grade intersections is to reduce the potential severity of conflicts and at the same time, assure the convenience and ease of all users in making the necessary maneuvers.

Intersection Type Recommendation Table

The following table is meant only as a general guide for potential intersection treatments. The appropriate intersection type for each location should be influenced by:

- Functional class of intersecting streets
- Traffic volumes, patterns and speeds
- Design level of traffic
- All modes to be accommodated
- Number of intersecting legs
- Availability of right of way
- Topography
- Desired type of operation
- Access requirements

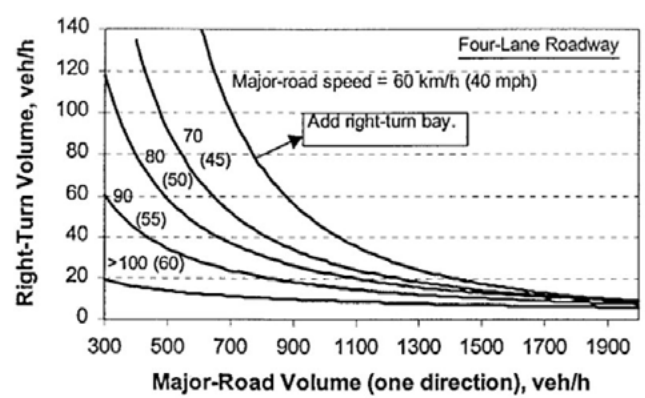
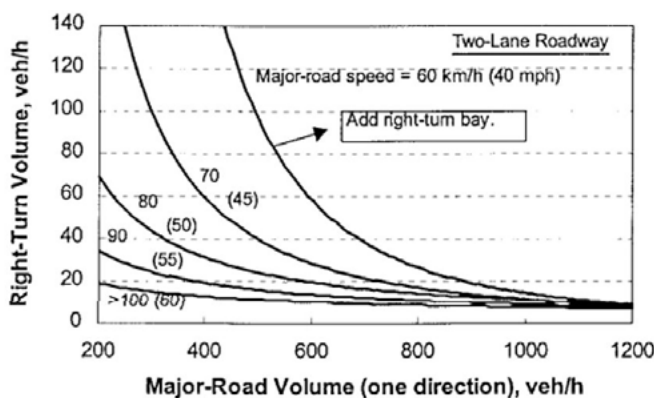
Type of Intersecting Street	Local	Minor Collector	Major Collector	Minor Arterial	Major Arterial
Local	Uncontrolled	Stop Control Mini-roundabout	Stop Control Additional Turn Lanes Roundabout	Right-in-Right-Out	Right-in-Right-Out
Minor Collector	Stop Control Mini-roundabout	Stop Control Mini-roundabout	Stop Control Additional Turn Lanes Roundabout	Additional Turn Lanes Roundabout Signalized	Right-in-Right-Out
Major Collector	Stop Control Additional Turn Lanes Roundabout	Stop Control Additional Turn Lanes Roundabout	Additional Turn Lanes Roundabout Signalized	Additional Turn Lanes Roundabout Signalized	Additional Turn Lanes Signalized
Minor Arterial	Right-in-Right-Out	Additional Turn Lanes Roundabout Signalized	Additional Turn Lanes Roundabout Signalized	Additional Turn Lanes Roundabout Signalized	Additional Turn Lanes Signalized
Major Arterial	Right-in-Right-Out	Right-in-Right-Out	Additional Turn Lanes Signalized	Additional Turn Lanes Signalized	Additional Turn Lanes Signalized

Right Turn Lane Guidance

Dedicated right turn lanes can provide increased efficiency and safety at major driveways located on the **arterial and major collector roadway networks** by separating vehicles that are slowing to complete a right turn from the vehicles travelling through the intersection. Drawbacks to the addition of right turn lanes include additional crosswalk length across the arterial street (if a crosswalk is provided) and potential sight distance concerns for motorists exiting a side street or driveway when a significant volume of right turning vehicles are present.

Dedicated right turn lanes should be considered on arterial and major collector streets when significant traffic generators have direct access to the arterial roadway network. NCHRP Report 457 provides widely accepted guidance to determine when a dedicated right turn lane should be considered. The variables to consider include the volume of right turning traffic as well as the total volume of traffic in the direction of the right turning vehicles.

Offset right turn lanes (providing a buffer space between the turn lane and the adjacent through lane) should be considered for side-street stop controlled intersections where there are significant volumes of both entering and exiting traffic occurring at the same time.



Traffic Impact Studies

City staff will determine if a traffic impact study should be completed on a case by case basis and will work with the site developer on the specific scope of work to be included in the study. If a traffic impact study is required by the Iowa DOT due to proposed access changes on Hickman Road (US 6), the Iowa DOT Guidelines for Traffic Impact Analysis will need to be followed.

Sources

- i. <https://intrans.iastate.edu/app/uploads/sites/15/2018/09/5B-1.pdf>
- ii. Waukee Comprehensive Plan 7-80.
- iii. <https://intrans.iastate.edu/app/uploads/sites/15/2018/09/5B-1.pdf>
- iv. Waukee Comprehensive Plan 7-80.
- v. <https://intrans.iastate.edu/app/uploads/sites/15/2018/09/5B-1.pdf>
- vi. <http://library.ite.org/pub/2c675061-fb27-c4e8-0d89-e5cc99a3ca7b>