

CITY OF GOLDEN CROSSWALK MANUAL



City of
Golden
PUBLIC WORKS DEPARTMENT

Approved by: _____ Date: _____

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Introduction & Purpose

Historically, the design of transportation facilities has included a bias towards the efficient movement of automobiles. Increasingly society is moving away from the auto centric model to one that strives for a more balanced approach that provides safe and adequate facilities for multiple modes of transportation. Walkability within a community is enhanced by the ability to readily cross major vehicle roadways. These crossings lead to a more connected and livable city. This document is intended to provide information and guidance to both the citizens and the staff of the City of Golden in the determination of whether a marked crosswalk should be installed and which specific features should be included. It shall serve as a guideline for the efficacious installation of crosswalks in an effort to enhance the safety of pedestrians within the City and thereby increase the walkability and livability of our community. The formation of this manual was a joint effort of the Mobility and Transportation Advisory Board, Citizen input (via public comment) and City staff. It is intended to be a guide that best fits the needs and unique transportation system of the City of Golden.

If you have any questions or concerns, or if you would like to request a location be evaluated for potential crosswalk installation, please call 303 384 8115.

Appropriate Use of Crosswalks

While the presence of a crosswalk can often times make pedestrians feel safer, it has been shown that in some conditions the presence of a crosswalk can in reality make pedestrians less safe. This manual aims to provide the correct balance in determining when to install a crosswalk and what treatment techniques to utilize under specific conditions. This manual aims to provide a thorough guide for use in determining crosswalk installation, however every location is unique and therefore nothing within this manual is intended to supersede or overrule sound engineering judgement in the design or installation of a crosswalk or the choice to not install a marked crosswalk. The ultimate decision to install a crosswalk rests with the City Engineer, as outlined in City of Golden Municipal Code.

Colorado Laws for Use of Marked and Unmarked Crosswalks

- When traffic control signals are not in place or not in operation, the driver of a vehicle shall yield the right-of-way, slowing down or stopping if need be to so yield, to a pedestrian crossing the roadway within a crosswalk when the pedestrian is upon the half of the roadway upon which the vehicle is traveling or when the pedestrian is approaching so closely from the opposite half of the roadway as to be in danger.
- No pedestrian shall suddenly leave a curb or other place of safety and ride a bicycle, ride an electrical assisted bicycle, walk, or run into the path of a moving vehicle that is so close as to constitute an immediate hazard.
- Whenever any vehicle is stopped at a marked crosswalk or at any unmarked crosswalk at an intersection to permit a pedestrian to cross the roadway, the driver of any other vehicle approaching from the rear shall not overtake and pass such stopped vehicle.
- Every pedestrian crossing a roadway at any point other than within a marked crosswalk or within an unmarked crosswalk at an intersection shall yield the right-of-way to all vehicles upon the roadway.

Universal Citation: CO Rev Stat § 42-4-802 (2016)



Definitions

- **Average Daily Traffic (ADT)**

The amount of vehicular traffic that crosses an imaginary line across a roadway in a 24-hour period. ADT information typically includes both directions of vehicle travel (if on a two-way street).

- **Controlled crosswalk** is a legal crosswalk across a roadway approach controlled by a stop sign or traffic signal.

- **Crosswalk** shall mean that portion of a roadway included within the prolongation or connection of the lateral lines of sidewalks at intersections, or any portion of a roadway distinctly indicated for pedestrian crossing by lines or other marking on the surface.

- **Crosswalk Lighting**

Street lighting applied at a pedestrian crossing to help approaching motorists see a crossing pedestrian.

- **Curb Extensions**

A roadway edge treatment where a curb line is extended out toward the middle of the roadway to narrow the width of the street. Curb extensions are sometimes call “neck downs” or “side choke islands”, and are often used at the location of a pedestrian crosswalk to minimize the distance and time that a crossing pedestrian must be in the roadway.

- **Gap in Traffic**

A gap in traffic is the space between vehicles approaching the pedestrian crossing. Gaps are typically measured in seconds, not distance, as it is the length of the gap of time in which a pedestrian must be able to cross. A directional gap is the gap between vehicles approaching in a single direction. A directional gap can be measured between vehicles in a single lane, or between vehicles approaching in the same direction but in different lanes on a multi-lane approach. If there is no median refuge at the crossing , a pedestrian will need to find an acceptable gap in traffic approaching from two directions at once. This is much more challenging than finding a gap in each approach direction separately.

- **HAWK Beacon**

A pedestrian hybrid beacon is a relatively new type of crossing treatment used to both warn and control traffic at a pedestrian crossing. It is actuated by a pedestrian push button, and uses a combination of circular yellow and red traffic signal displays to first warn motorists of a pedestrian that is about to cross the street, then require the motorist to stop for the pedestrian crossing, and then release the motorist to proceed once the pedestrian has cleared the crossing. The Beacon is a hybrid between a pedestrian traffic signal and a stop sign. (HAWK High-intensity Activated cross Walk)

- **Lane**

A portion of the roadway surface designated for motor vehicle travel, typically in a single directions, that is delineated by pavement marking stripes. Types of lanes include: “through lanes” for travel along the length of the roadway, often through intersections; “turn lanes” which are typically on intersection approaches and provide space for left or right turning motorists; “bike lanes” which are designated for bicycle travel in the same direction as the automobile travel, are typically narrower than vehicle lanes, and are usually located along the outside edges of the roadway.



- **Manual on Uniform Traffic Control Devices (MUTCD)** is a document issued by the Federal Highway Administration (FHWA) of the United States Department of Transportation (USDOT) to specify the standards by which traffic signs, road surface markings, and signals are designed, installed, and used.
- **Marked Crosswalk**
A pedestrian crossing that is delineated by white crosswalk pavement markings. Marked crosswalks typically also are delineated by a variety of traffic signs. Marked crosswalks would also have curb ramps if there is curb and gutter in an area.
- **Median Refuge**
An area in the middle of a roadway where a crossing pedestrian can take shelter from approaching traffic in either direction. In the context of these guidelines, the median refuge must include a raised median of some width. A median refuge allows a pedestrian to cross each direction of approaching traffic in a separate step. By using the refuge, the pedestrian must only find an acceptable gap in traffic for one approach direction at a time. The walking path within the raised median refuge shall remain flush with adjacent walking path.
- **Midblock crosswalk** is a location not at an intersection, featuring traffic control markings to indicate that it is a legal crosswalk.
- **Minimum Pedestrian Volume Threshold**
The minimum amount of pedestrian crossing traffic (typically in a one hour period) that must be present to “warrant” the installation of a pedestrian crossing treatment.
- **Motorist Compliance Data**
Observations made and recorded at a pedestrian crossing where it is determined if the approaching motorist complied with their legal requirement to yield to a crossing pedestrian who is in or about to enter the crosswalk.
- **Multiple Threat Accidents**
A type of pedestrian accident that occurs on a roadway with two or more lanes in the same direction. A motorist that stops for a crossing pedestrian can obscure the view of the pedestrian from another motorist approaching in the adjacent travel lane. If the second motorist does not slow down it creates the potential for a crossing pedestrian to step out in front of a high speed approach vehicle with potentially dire consequences.
- **Multi-Use Path Crossing**
A location where a sidewalk designated as a multi-use path intersects a roadway, and the path extends on both sides of the roadway.
- **Neckdowns**
See Curb Extensions
- **Pedestrian Traffic Signal**
A conventional traffic signal with circular red, yellow, and green displays for motorists and Walk/Don't Walk signals for pedestrians that is applied at a pedestrian crossing. Typically a pedestrian signal would be applied in a mid-block location since it would be considered a normal intersection related traffic signal if it were to be applied at an intersection.



Definitions

- **Raised Median**
An area in the middle of a roadway, commonly separating vehicles traveling in opposite directions, that is surrounded by curb and gutter and is physically raised above the surrounding pavement where vehicles travel. Raised medians often contain landscaped areas. See also Median Refuge.
- **Rectangular Rapid Flash Beacons (RRFBs)**
RRFBs are small rectangular yellow flashing lights that are deployed with pedestrian crossing warning signs. They are typically actuated by a pedestrian push button and flash for a predetermined amount of time, to allow a pedestrian to cross the roadway, before going dark. RRFBs are warning devices and do not themselves, create a legal requirement for a vehicle to stop when they are flashing.
- **School Crossing**
School Crossing is defined as a crossing location where ten or more student pedestrians per hour are crossing.
- **The American Association of State Highway and Transportation Officials (AASHTO)** is a standards setting body which publishes specifications, test protocols and guidelines which are used in highway design and construction throughout the United States. Despite its name, the association represents not only highways but air, rail, water, and public transportation as well.
- **Uncontrolled crosswalk** is a legal crosswalk across a roadway approach not controlled by a stop sign or traffic signal.
- **Unmarked crosswalk** is a legal crosswalk that does not feature any traffic control markings.



Unmarked Crosswalk.



Site Evaluation Procedures

When a request for a new crosswalk location is received the City of Golden Engineering Division will conduct an Engineering study to determine if the location qualifies for the installation of a Marked Crosswalk. The data collected during this study shall include:

- Posted Speed Limit of roadway being crossed.
- Vehicular Volume Counts Average Daily Traffic (ADT).
- Pedestrian Volume Counts.
- Roadway Geometry (# of lanes, width of lanes, presence of curb extensions, presence of center median, etc.).
- Sight distance measurements.
- 85th percentile speed.
- Presence of pedestrian generators such as regional trails, schools, parks, etc.
- Nighttime lighting levels.
- Any other data determined to be necessary for evaluation by the City of Golden Engineering Division.

Notes:

- ADT measurements should be collected on days that would be typical of the traffic present on the road section. ADT data should not be taken on days with severe weather when the measured ADT would likely be less than the average, or on days when a temporary nearby traffic generator or event would artificially increase the measured ADT.
- Pedestrian Volume measurements should be collected on days that would be typical of the pedestrian traffic present on the road section. Pedestrian data should not be taken on days with severe weather when the measured volume would likely be less than the average, or on days when a nearby temporary generator or event would artificially increase the measured pedestrian count.
- The 85 percentile speeds are gathered only for information. The posted speed limit is the basis for application of the criteria in this manual.



Minimum Vehicular Threshold

The determination to install a marked crosswalk is mainly for the purpose of artificially forcing gaps in vehicular traffic to allow for the safe crossing of the roadway by pedestrians. An Average Daily Traffic (ADT) of 2500 vehicles/day is determined and set forth in this manual as the threshold for the adequate number of gaps to allow for pedestrians to cross a street without an unreasonable delay. Meaning roadways with an ADT less than 2500 vehicles/day shall not be considered for the installation of a marked crosswalk as they have an adequate number of gaps to allow reasonable crossings.

Minimum Pedestrian Threshold

The relationship between the number of pedestrians and driver expectations is a well-established one. Crosswalks with a low frequency of pedestrians often result in poor driver compliance. Therefore, the following shall be the minimum required pedestrians required at a given location to warrant installation of a marked crosswalk.

- 20 pedestrians in any one hour, or
- 18 pedestrians per hour in any two hours, or
- 15 pedestrians per hour in any three hours.

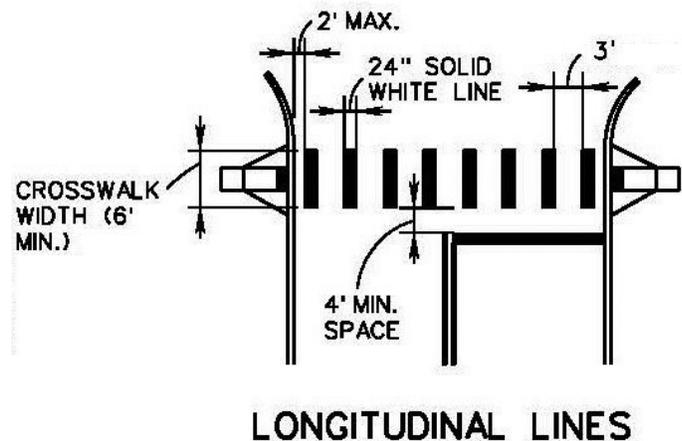
For the purposes of these pedestrian counts young, elderly, or disabled pedestrians shall count as 2x towards the pedestrian total.

Distance To Nearest Marked Crosswalk

Any new proposed locations for a marked crosswalk shall be a minimum of 300' from an existing or simultaneously proposed marked crosswalk. This distance may be reduced by the City Engineer based upon engineering judgement if there is strong evidence to indicate not doing so would cause an unsafe condition as judged by City Engineer.

Pavement Markings

The application of pavement markings within the City of Golden shall conform to the following details. The pattern for the markings shall be continental style with 2' bars of white marked area with 3' unmarked gaps. The bars shall be placed in a manner to avoid wheel paths on the marked white bars to the extent possible.



Crosswalk Signage

Standard Signage



Standard Signage for Marked Crosswalk W11-2

The standard signage for a crosswalk **outside of a school zone** shall be a W11-2 sign. The W11-2 signs shall be placed on either side of the roadway facing oncoming vehicular traffic. Additional signage such as Crosswalk ahead or arrows indicating location may be installed as determined by the City Engineer.



S1-1 sign shall be the standard signage for crosswalks within School Zones

The standard signage for a crosswalk **within a school zone** shall be an S1-1 sign. The S1-1 signs shall be placed on either side of the roadway facing oncoming vehicular traffic. Additional signage such as Crosswalk ahead or arrows indicating location may be installed as determined by the City Engineer.

Enhanced Signage

When indicated as warranted by the Crosswalk Treatment Matrix enhanced signage shall be placed in addition to the standard signage. Additionally the City Engineer may include enhanced signage due to poor driver compliance at a crosswalk.





Example of crosswalk with median refuge.

Median Refuge Islands

Center median islands are a proven safety feature in crosswalks. They allow pedestrians to make a roadway crossing in two smaller and separate crossings and provide the ability to focus on one direction of vehicular traffic at a time. When feasible, center medians shall be included in crosswalk locations that qualify as an enhanced crosswalk location. If included the minimum width of a central median island shall be 6'. The preferred width of central median islands is 10'.

If possible the travel path through the center median island shall be angled towards oncoming vehicular traffic in an effort to provide better visibility to the pedestrians.

The determination of feasibility of the inclusion of a center median island shall reside with the City Engineer.

Curb Extensions

Curb extensions, or side choke islands, increase the safety of crosswalks by reducing the crossing distance. When feasible, curb extensions should be included in crosswalks that qualify for enhanced crosswalk treatments. The City Engineer shall be responsible for the determination of feasibility for inclusion of curb extensions.

Sight Distance Improvements

Removal of sight distance obstructions shall always be considered when installing a crosswalk. Reasonable effort shall be made to remove any sight obstructions within the right of way. If the minimum stopping sight distance set forth in AASHTO's A Policy on Geometric Design of Highways and Streets (also known as the "Green Book") cannot be met, then a crosswalk shall not be installed.



Crosswalk Lighting

Adequate lighting shall be considered an important part of any crosswalk location. City staff shall pursue funding for and installation of street lighting for marked crosswalks, however lack of lighting installation shall not prohibit installation of a marked crosswalk.

Raised Crosswalks

Raised crosswalks may be utilized in the following scenarios:

- Within school zones or along school walking routes.
- At multi-use path crossing or connections to regional trail systems with significant pedestrian volumes.
- In areas with a significant number of elderly, disabled, or otherwise vulnerable pedestrians.
- At marked crosswalks with demonstrated significant speeding issues on adjacent roadway as judged by the City Engineer.

Removal of Crosswalk Treatments

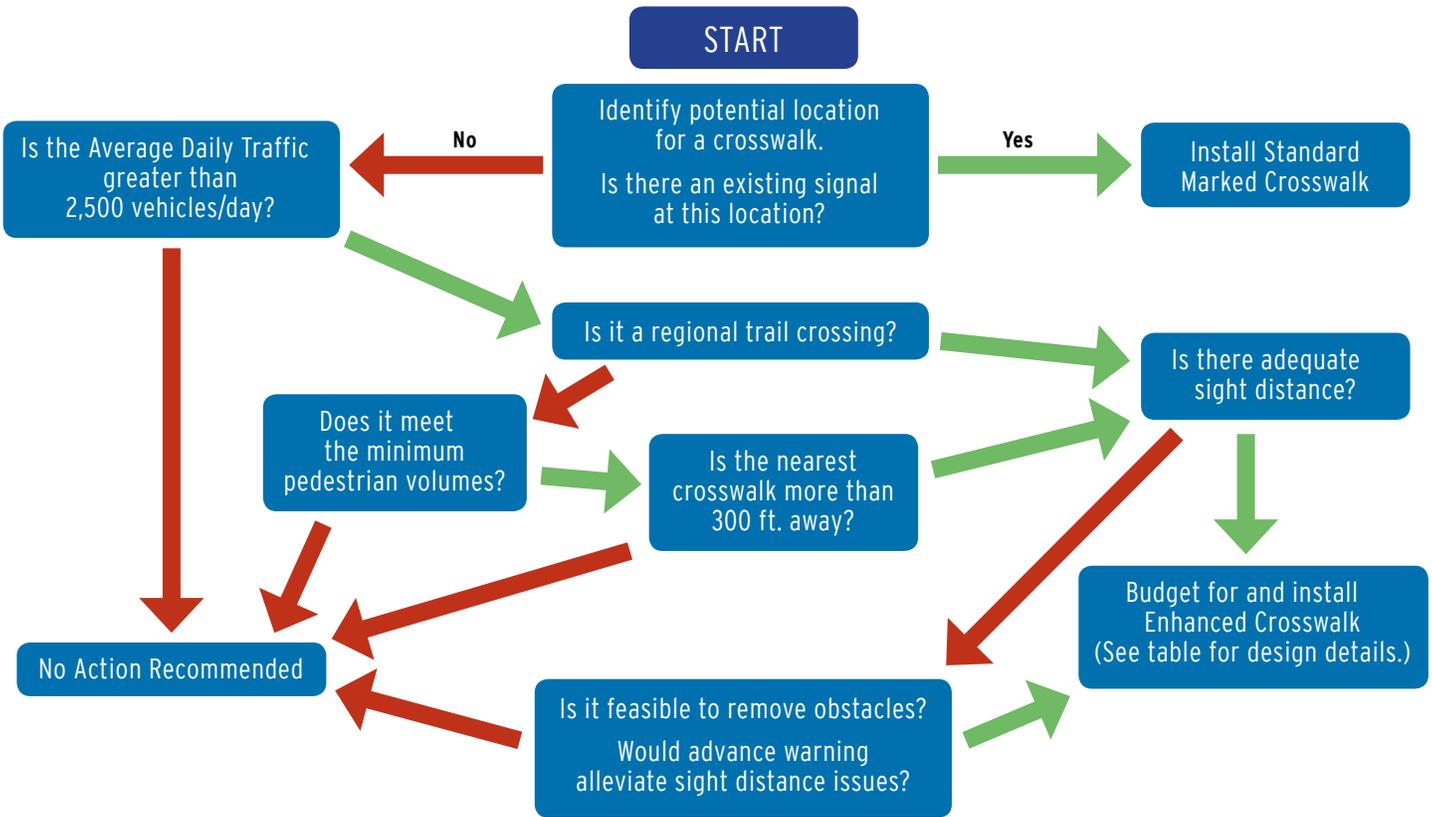
If it is found, after collection of pertinent data, that the average vehicular or pedestrian volumes fall below 50% of the threshold minimums set forth in this manual, the crosswalk **will be considered for removal**.



Standard School Zone Crosswalk.



Crosswalk Site Evaluation Process



CROSSWALK DESIGN BY ROADWAY TYPE*

	VEHICLE ADT > 2,500 - 9,000		VEHICLE ADT > 9,000 - 12,000			VEHICLE ADT > 12,000 - 15,000			VEHICLE ADT > 15,000		
	≤30 MPH	35 MPH	40+ MPH	≤30 MPH	35 MPH	40+ MPH	≤30 MPH	35 MPH	40+ MPH	≤30 MPH	40+ MPH
TWO LANES	●	●	●	●	●	●	●	●	●	●	●
THREE LANES WITH RAISED MEDIAN	●	●	●	●	●	●	●	●	●	●	●
THREE LANES WITHOUT RAISED MEDIAN	●	●	●	●	●	●	●	●	●	●	●
MULTILANE WITH RAISED MEDIAN	●	●	●	●	●	●	●	●	●	●	●
MULTILANE WITHOUT RAISED MEDIAN	●	●	●	●	●	●	●	●	●	●	●

*All crossings must be scoped by an engineer to ensure recommended treatment is appropriate and ADA ramps and illumination are in place.

- Marked Crosswalk
- Marked Crosswalk, island or curb extensions, enhanced signing and striping
- Marked Crosswalk and enhanced/active warning (islands and RRFB's)
- Marked Crosswalk and pedestrian hybrid or full signal

