



Transportation Advisory Committee Meeting Agenda

ASHLAND TRANSPORTATION ADVISORY COMMITTEE

REGULAR MEETING AGENDA

Thursday, December 18, 2025

Note: Anyone wishing to speak at any Transportation Advisory Committee meeting is encouraged to do so. If you wish to speak, please rise and, after you have been recognized by the Chair, give your name and City for the record. You will then be allowed to speak. Please note the public testimony may be limited by the Chair.

I. CALL TO ORDER

1. Call to Order 6:00 PM.
Meeting Held Virtually by Zoom.
Link: <https://zoom.us/j/94350935689>

II. ANNOUNCEMENTS

III. CONSENT AGENDA

1. Approval of November 20, 2025 Minutes

IV. PUBLIC FORUM

V. REPORTS FROM OTHER CITY COMMITTEES

VI. NEW BUSINESS

1. Election of Chair and Vice Chair (6:30-6:45, action required, elect a new chair and vice chair to manage meetings in 2026)

VII. UNFINISHED BUSINESS

1. Working Group TAC Email Review and Responses (6:45-7:00, action required, discuss as necessary)
2. Committee Celebration and Work plan review (7:00-7:15, action required, review Council celebration and work plan meeting)

VIII. INFORMATIONAL ITEMS

1. Oregon State University Transportation Training Slide Deck
2. Bike Rack Installations 3rd St.

IX. AGENDA BUILDING

X. ADJOURNMENT

Next Meeting Date:

If you need special assistance to participate in this meeting, please contact Scott Fleury at scott.fleury@ashlandoregon.gov or 541.488.5587 (TTY phone number 1.800.735.2900). Notification at least three business days before the meeting will enable the City to make reasonable arrangements to ensure accessibility to the meeting in compliance with the Americans with Disabilities Act.





Council Business Meeting

Date: December 18, 2025

Agenda Item	Approval of November 20, 2025 Minutes
Department	Public Works
From	

TIME ESTIMATE

CATEGORY

Staff Direction - provide direction to staff on the body's desired next steps.

SUMMARY

POLICIES, PLANS & GOALS SUPPORTED

BACKGROUND AND ADDITIONAL INFORMATION

FISCAL IMPACTS

SUGGESTED ACTIONS, MOTIONS, AND/OR OPTIONS

REFERENCES & ATTACHMENTS

None





Council Business Meeting

Date: December 18, 2025

Agenda Item	Election of Chair and Vice Chair (6:30-6:45, action required, elect a new chair and vice chair to manage meetings in 2026)
Department	Public Works
From	

TIME ESTIMATE

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REFERENCES & ATTACHMENTS

None



Memo

DATE: December 10, 2025

TO: Transportation Advisory Committee

FROM: Scott Fleury PE, Public Works Director

DEPT: Public Works

RE: Election of Officers – 2026

BACKGROUND:

Ashland Municipal Code 2.10 – Uniform Policies and Operating Procedures for Advisory Committees and Commissions.

The municipal code was updated in December of 2024 to reflect changes to the previous Commission structure and now accounts for advisory committee operations.

AMC 2.10.015 (B)

1. The term for the Chair or Co-Chair of a standing advisory committee shall be one (1) year. A Chair or Co-Chair may serve multiple terms, but no more than two (2) consecutive terms as either Chair or Co-Chair in their respective role.

The code does not specify when/how elections are to occur, but with the change to an annual basis staff recommends December elections to coincide with a Chair/Vice Chair starting a new annual cycle in January.

CONCLUSION:

The Committee should discuss and elect a chair and vice chair to preside over meetings.

CITY OF ASHLAND

20 East Main Street
Ashland, Oregon 97520
ashland.or.us

Tel: 541.488.6002
Fax: 541.488.5311
TTY: 800.735.2900

Memo

CITY OF ASHLAND

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Council Business Meeting

Date: December 18, 2025

Agenda Item	Working Group TAC Email Review and Responses (6:45-7:00, action required, discuss as necessary)
Department	Public Works
From	

TIME ESTIMATE

CATEGORY

Staff Direction - provide direction to staff on the body's desired next steps.

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REFERENCES & ATTACHMENTS

None



Transportation Advisory Committee – Working Group
AGENDA

New Business Review SeeClickFix and email submissions

- 4th and B Street Near Miss
- ADA Space Request
- Crosswalk Request
- Guardrail/Barrier Request-Grandview Drive
- RRFB Request-8th and Main Street
- Streets For Everyone – Winburn Way Recommendations
- Oak Knoll Speeding Concern



Acknowledged by: Ashland, OR

Intersection Vision Clearance Concern ▶

Acknowledged

162 4th St Ashland, Oregon, 97520 • [Show on Map](#)

Issue ID: 20360368

Submitted To: [Ashland, OR - City Service Area](#)

Category: Transportation System Request

Viewed: 20 times

Neighborhood: [Ashland](#)

Reported: on 11/05/2025

REPORTER

[Elizabeth Corson](#)



3 TOTAL

Follow

FOLLOWING

Main

Photos and Videos

Notified

0

Manage in CRM

Flag Issue

DESCRIPTION

I live at the intersection of 4th and B and have witnessed 4 accidents and multiple near misses since June 2025. Cars are parked way too close to the intersection and the visibility is extremely poor while trying to turn or cross B street. We have spoken to several neighbors and local businesses and they have all expressed major concern. We would like to get this fixed before there is a death or serious injury. Either stops signs or 30 ft set back for parked cars would be a simple solution. Thank you. We look forward to hearing from you soon.

also asked...

Q. Please let us know what is blocking the line of sight:

A. Parked vehicle

Q. What is your first name?

A. Elizabeth

Q. What is your last name?

A. Swanson

Q. What is your phone number? (PLEASE NOTE: If there are additional questions or information required to process the request and there is not a contact number available it may result in the request not being resolved.)

A. [REDACTED]

Q. What is your email address?

A. [REDACTED]

Q. Would you prefer us to email or call you if we need to contact you?

A. Email

Share

Share

Post

Share

Online Form Submittal: Transportation Advisory Committee Contact Form

From noreply@civicplus.com <noreply@civicplus.com>

Date Mon 12/8/2025 9:58 AM

To Public Works Information <publicworksinfo@ashland.or.us>; Scott Fleury <scott.fleury@ashland.or.us>

[EXTERNAL SENDER]

Transportation Advisory Committee Contact Form

Name	Mary Ellen Cole
Address	286 Eighth Street
City	Ashland
State	OR
Zip Code	97520
Phone Number	[REDACTED]
Email Address	[REDACTED]
Message to Transportation Advisory Committee	Our 30-year-old son is in a power wheelchair permanently. It has become increasingly difficult to obtain parking in front of our home that will accommodate his rear entry handicap van. For instance, today there has been an out of state vehicle parked for at least five days directly in front of our house. We would like to start the steps for putting a handicap parking spot directly in front of our home. Thank you.
Attachments	<i>Field not completed.</i>

Email not displaying correctly? [View it in your browser.](#)

Online Form Submittal: Transportation Advisory Committee Contact Form

From noreply@civicplus.com <noreply@civicplus.com>

Date Thu 12/4/2025 4:25 PM

To Public Works Information <publicworksinfo@ashland.or.us>; Scott Fleury <scott.fleury@ashland.or.us>

[EXTERNAL SENDER]

Transportation Advisory Committee Contact Form

Name	Alex Censor
Address	185 Oaklawn Ave
City	Ashland
State	OR
Zip Code	97520
Phone Number	[REDACTED]
Email Address	[REDACTED]
Message to Transportation Advisory Committee	Hi! Hi.... For many months have been noticing that on Winburn Way going up through the park, approximately opposite the pickle ball courts, there is a problem with two missing crosswalks and one crosswalk marked where there is essentially no crossing pedestrian traffic: There are two staircases pedestrians frequently use to cross the road for entrance to the Japanese garden. Neither of those have painted crosswalks. On the other hand, going further downhill on Winburn from the upper duck pond there is an aged fading painted cross walk where there is essentially no reason for a pedestrian to be crossing there. Can you confirm my report? Do you agree this should be remedied?
Attachments	<i>Field not completed.</i>

From: noreply@civicplus.com
To: [Public Works Information](#); [Scott Fleury](#)
Subject: Online Form Submittal: Transportation Advisory Committee Contact Form
Date: Tuesday, December 09, 2025 11:50:23 AM

[EXTERNAL SENDER]

Transportation Advisory Committee Contact Form

Name	Kermit Compo
Address	388 Grandview Drive
City	Ashland
State	OR
Zip Code	97520
Phone Number	[REDACTED]
Email Address	[REDACTED]
Message to Transportation Advisory Committee	Called [12/08/2025] regarding the recent overturned car/fire incident at Grandview Drive. Expressed concern for the extensive damage to trees and neighbor's home. Interested in learning more about the criteria and permits required to add an additional barrier on Grandview Drive.
Attachments	<i>Field not completed.</i>

Email not displaying correctly? [View it in your browser.](#)

Ashland, OR

[Change location]

📍 Follow this Place



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Acknowledged by: Ashland, OR

Sign Issue › Acknowledged

895-941 E Main St Ashland, OR, 97520, USA • [Show on Map](#)

Issue ID: 20383309

Submitted To: [Ashland, OR - City Service Area](#)

Category: Transportation System Request

Viewed: 1 time

Neighborhood: [Ashland](#)

Reported via: [mobile application](#)

Reported: on 11/09/2025

REPORTER

[Ashland, OR Neighbor](#)



3 TOTAL

Follow

FOLLOWING

Main

Photos and Videos

Notified

0

Manage in CRM

Flag Issue

DESCRIPTION

please add blinking light to crosswalk in front of Rogue valley roasters. there have been many near misses there.

also asked...

Q. Is there any other information that you think we need to know?

A. No Answer Given

Q. What is your first name?

A. Jennifer

Q. What is your last name?

A. Kert

Q. What is your phone number? (PLEASE NOTE: If there are additional questions or information required to process the request and there is not a contact number available it may result in the request not being resolved.)

A. [REDACTED]

Q. What is your email address?

A. [REDACTED]

Q. Would you prefer us to email or call you if we need to contact you?

A. Email

Share

Share

Post

Share

NEARBY ISSUES



To: Ashland Parks and Recreation Commission & Transportation
Advisory Committee
From: Streets for Everyone
Date: November 26, 2025
RE: Proposed changes to Winburn Way

[Streets for Everyone](#), an Action Team of the Ashland Climate Collaborative, is pleased to have an opportunity to provide input on APRC's proposed changes to Winburn Way. The mission of Streets for Everyone is to make Ashland more livable by promoting walking, biking, and public transportation.

We have reviewed APRC's five options to improve Winburn Way. We believe that by drawing off the best features of each, it is possible to improve Winburn Way in ways that: 1) meet the needs of all Lithia Park users, 2) minimize costs, 3) fulfill APRC's primary objective "to reduce speeds and improve safety for pedestrians and bicyclists," and 4) compliment Lithia Park itself by making it a better, more enjoyable and safe place for everyone.

We recommend that APRC utilize the city's street standards (Development Code 18.4.6.040.F) for "neighborhood streets with parking on one side." This standard is consistent with Winburn Way's:

- 1) 30-foot wide curb-to-curb width, and
- 2) traffic volume of roughly 1,000 motor vehicles per day.

This recommendation also leaves room within the curb-to-curb distance to create a safe pedestrian space (instead of the five- to six-foot wide sidewalks as shown in the road standards table below).

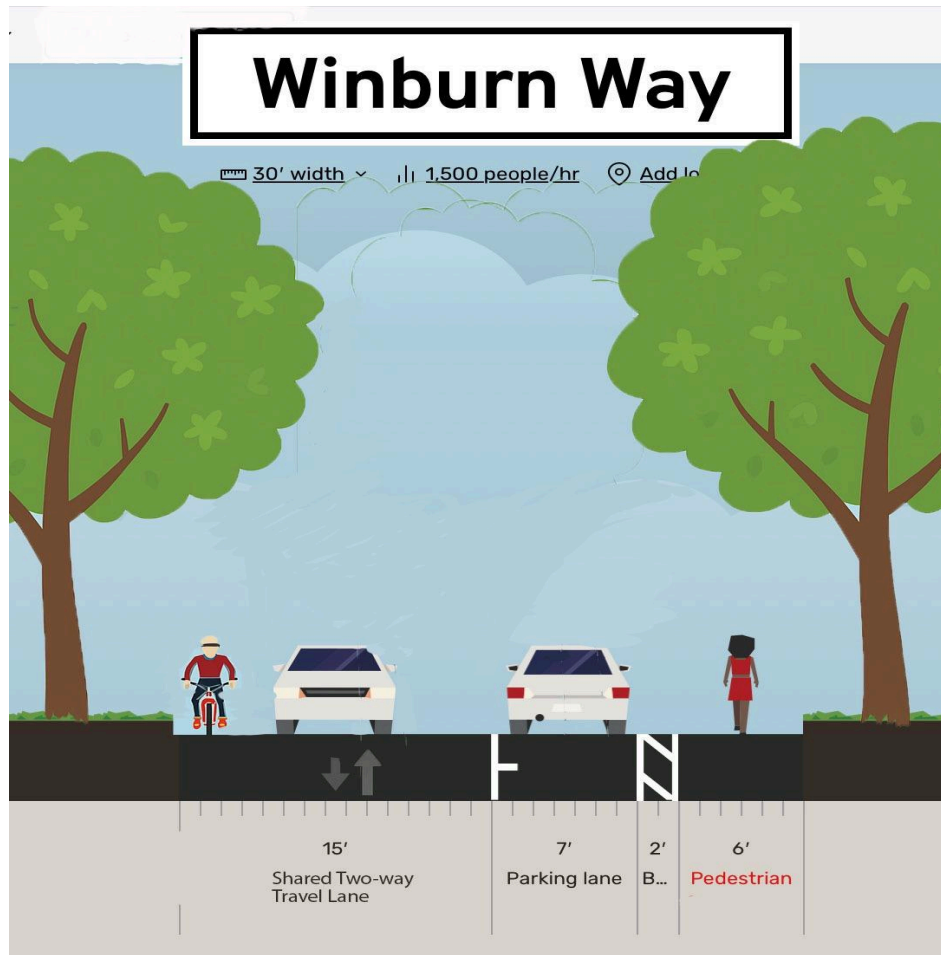
Development Code table 18.4.6.040.F.

TYPE OF STREET	AVERAGE DAILY TRIPS (ADT)	RIGHT-OF-WAY WIDTH	CURB-TO-CURB PAVEMENT WIDTH	WITHIN CURB-TO-CURB AREA				CURB on both sides	PARK-ROW on both sides	SIDE-WALKS on both sides
				MOTOR VEHICLE TRAVEL LANES	MEDIAN AND/OR CENTER TURN LANE	BIKE LANES on both sides	PARKING			
Neighborhood Street	less than 1,500				NA	NA 3				
Parking One Side		47'-51'	22'	15' Queuing			7'	6"	5'-8' ¹	5'-6'
Neighborhood Street										
Parking Both Sides		50'-57'	25'-28'	11'-14' Queuing			7'	6"	5'-8' ¹	5'-6'

Utilizing the Code's dimensions for a neighborhood street with parking on one side allows: 1) a single shared 15-foot travel lane, 2) a seven-foot wide parking lane on one side, and 3) an eight-foot wide paved pedestrian walkway (15'+7'+8'=30').

Converting Winburn Way into a neighborhood street with parking on one side is a perfect fit, given the Commission's objectives expressed during their August 27 Open House, the lack of funding for the construction of sidewalks, the 30' pavement width and low daily traffic volumes on Winburn Way. This design will maintain two-way traffic, provide for motor vehicles, bicycles, and pedestrians and, importantly, have a positive impact on the Lithia Park environment. It will also allow people walking and people using wheelchairs to conveniently access (and move between) important Lithia Park locations (the Butler Bandshell, Butler Perozzi Fountain, Japanese Garden, and Upper Duck Pond).

Included below is Streets for Everyone's recommended cross-section. We believe it integrates the best of the APMC's options.



The parking lane shown above should be reserved for persons with disabilities, and provided at multiple locations (the Butler Bandshell, Japanese Garden, and Upper Duck Pond). These parking spaces will improve access to the park for persons with disabilities, while also serving as a physical protection for pedestrians. The construction of raised crosswalks at these same locations—proposed by APRC at the Open House—would enhance the user experience, improve accessibility, and reduce traffic closer to the 15 mph posted maximum speed limit.

Currently, more than 72 percent of people driving automobiles on this section of Winburn Way exceed the posted speed, according to the city’s speed study conducted between July 30 and August 7. Traffic calming will make Winburn Way more harmonious with the Lithia Park environment while causing little or no inconvenience for auto drivers.

A two-way 15-foot travel lane—which would only exist where handicapped accessible parking is provided—is sufficient to allow vehicles of average width (i.e., less than [six feet](#)) to pass one another safely. There are many streets in Ashland with parking on

one or both sides of the street, where people driving automobiles need to share the travel lane with oncoming traffic. Table 1, below, includes a sampling of streets with an approximate 15-foot shared travel lane.

Table 1. - Streets with an Approximate 15-foot Shared Travel Lane

Street Name	Curb to Curb Width	Parking (one/both sides)	Net Travel Lane Width
Hargadine	18' 6"	One	11' 6"
Hargadine	29' 10"	Both	15' 10"
Pioneer (above OSF)	29' 6"	Both	15' 6"
Orange	21' 9"	One	14' 9"
Vista	19' 10"	One	12' 10"
Morton	28'10"	Both	14' 10"

The proposed design has been proven to be very safe throughout the city. Traffic calming, coupled with the 15 mph speed limit, will change the character of Winburn Way from a "car" street into a multi-functional paved "way" for all.

Thank you for the opportunity to join with you in making Ashland and Lithia Park better for everyone. We'd be happy to discuss our recommendations further. We can be reached at SFE@ashlandclimate.org.

Respectfully submitted,

The Streets for Everyone Action Team

Aaron Michalson, Mike Vergeer, Sharon Dohrmann, Thor Morris, and Gary Shaff

Online Form Submittal: Transportation Advisory Committee Contact Form

From noreply@civicplus.com <noreply@civicplus.com>

Date Fri 12/5/2025 12:01 PM

To Public Works Information <publicworksinfo@ashland.or.us>; Scott Fleury <scott.fleury@ashland.or.us>

[EXTERNAL SENDER]

Transportation Advisory Committee Contact Form

Name	Phil Rodak
Address	659 Oak Knoll Dr
City	Ashland
State	OR
Zip Code	97520
Phone Number	[REDACTED]
Email Address	[REDACTED]

Message to Transportation
Advisory Committee

Good Day, I reside at 659 Oak Knoll Drive. I live at the interior apex of a blind curve going up the hill from Ashland Street. The issue is people speeding on Oak Knoll Drive. This is a blind curve especially exiting from my driveway. People constantly exceed the 25 mph speed limit. Trucks, busses, and automobiles pass by sometimes in excess of 40 mph. Two days ago, for the fifth time, I narrowly avoided getting t-boned. I've rigged my driveway so I can turn around and leave facing out. I come to a complete stop, roll down the windows and listen then proceed with caution, and fear onto the road. The lady yesterday [12/03/2025] took it upon herself to blare her horn because she had to slam on the brakes then give me the finger, obviously feeling that she was in the right. My neighbors share my concern despite the fact that their driveways are a bit more open with a wider view of the road than mine. One lost her pet dog to a speeder who never even stopped. What can we do? Increase police presence? a speed bump or two? more signage? Please, we need some help. Also, there are no sidewalks on this part of Oak Knoll and many people are out walking or walking their animals. It's only a matter of time before someone gets seriously hurt, or worse. Thanks.



Council Business Meeting

Date: December 18, 2025

Agenda Item	Committee Celebration and Work plan review (7:00-7:15, action required, review Council celebration and work plan meeting)
Department	Public Works
From	

TIME ESTIMATE

CATEGORY

Staff Direction - provide direction to staff on the body's desired next steps.

SUMMARY

POLICIES, PLANS & GOALS SUPPORTED

BACKGROUND AND ADDITIONAL INFORMATION

FISCAL IMPACTS

SUGGESTED ACTIONS, MOTIONS, AND/OR OPTIONS

REFERENCES & ATTACHMENTS

None



Memo

DATE: December 10, 2025

TO: Transportation Advisory Committee

FROM: Scott Fleury PE, Public Works Director

DEPT: Public Works

RE: Transportation Committee Workplan Review 2026-2028

BACKGROUND:

Annually the City Council receives updates from Commission/Committees on their formally developed workplan at a meeting in December. This meeting is also meant as a volunteer celebration to recognize the hard work of citizens volunteering on Commission/Committees.

At the November TAC meeting the group discussed the workplan developed by the Chair and overview to be presented to the Council at the December 15th Study Session.

Conclusion:

This item is a review of the Study Session presentation by the Chair and associated Council discussion.

CITY OF ASHLAND

20 East Main Street
Ashland, Oregon 97520
ashland.or.us

Tel: 541.488.6002
Fax: 541.488.5311
TTY: 800.735.2900

Transportation Advisory Committee
Report to Council December 15, 2025

Work Plan Outline 2026-2028

- I. Transportation System Plan Update
- II. Capital Improvement Projects(Protected Bike Lanes/Multimodal Analysis)
 - A. North Mountain Rehab Phase I and Phase II
 - B. B Street Bike Boulevard
 - C. Oak Street Rehabilitation
 - 1. A Street Intersection
 - 2. Van Ness Intersection
 - D. Water Street & RR Trestle
 - E. Van Ness & Helman Intersection
- III. Traffic Safety, Parking, Signage, Striping, etc. – Continuous
 - A.Public Education and Outreach Programs**
(Collaboration with Council, Standing Advisory Committees, Parks Commission and Planning Commission)
 - B. Encroachment Guidelines Review
 - C. Traffic Crash and Near Miss Review (twice annually)
 - D. Bike Parking Project
 - E. E-Bike Safety Project
 - F. Transit Support as needed (RVTD)
- V. Council Directed Projects for Review
 - A. Wayfinding (With Economic Development)
 - B. ODOT Collaboration

Fundamentals of Transportation Engineering - Virtual Workshop

November 4- December 4, 2025

Instructors

David Hurwitz , Ph.D., F.ITE OSU, School of Civil and Construction Engineering	Frank Belleque , P.E. Traffic Markings & Sign Engineer Oregon Department of Transportation
Albert Wang , Ph.D. OSU, School of Civil and Construction Engineering	Marie Kennedy , P.E. State Sign Engineer Oregon Department of Transportation
Sal Hernandez , Ph.D. OSU, School of Civil and Construction Engineering	Chris Primm , P.E. State Traffic Operations Engineer Oregon Department of Transportation
Logan Scott-Deeter , Ph.D., EIT Assistant Engineer, Olsson Engineering	Brian K. Copeland , P.E. DKS Associates
Aaron Myton , P.E. Senior Interchange Engineer Oregon Department of Transportation	Steve Boice , PE, PTOE DKS Associates
Laura Prusakiewicz , P.E. Traffic Speed Zone Engineer Oregon Department of Transportation	Justin King , P.E. State Work Zone Engineer Oregon Department of Transportation
Camilla Dartnell , P.E. Senior Engineer/Planner Kittelson & Associates	Gary R. Obery , P.E., PTOE Active Modes Traffic Engineer Oregon Department of Transportation
Matt Bell Associate Planner Kittelson & Associates	Rodger Gutierrez , P.E. Bike-Ped Design Engineer Oregon Department of Transportation

NOTE These course notes are a compilation of highway operational characteristics and standards along with the professional opinions of the authors. They are not to be construed as a standard, but rather as a guide to appropriate references for identifying, analyzing, and correcting traffic engineering problems.

DOCUMENT PROTECTION

23 U.S.C.

United States Code, 2011 Edition

Title 23 - HIGHWAYS

CHAPTER 4 - HIGHWAY SAFETY

§409. Discovery and admission as evidence of certain reports and surveys

Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or railway-highway crossings, pursuant to sections 130, 144, and 148 of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

AGENDA
Fundamentals of Transportation Engineering
Module 3

Module 3, Day 1 - Tuesday, December 2, 2025

1:00pm	Statistics for Safety Analysis, Crash Studies	Pg. 4	Sal Hernandez
	BREAK		
2:40pm	Work Zone	Pg. 40	Justin King
3:45pm	School Zones	Pg. 67	Gary Obery

An Overview of Safety Analysis and Associated Statistics

Sal Hernandez, Ph.D.
Associate Professor
Oregon State University
December 2, 2025

Learning Objectives

- Develop an understanding of crash data and common approaches to evaluating transportation safety
- Gain insights into how statistical methods contribute to understanding and improving transportation safety outcomes

Agenda

- Review of Basic Statistics
- Introduction to Crash Data
- Safety Analysis Basics
- Overview of Safety Evaluations
- Statistics can Help Save Lives

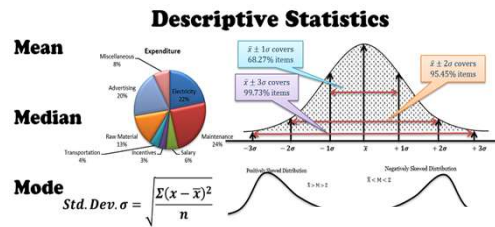
3

Review of Basic Statistics

4

What is Statistics

- Statistics: *The science of collecting, describing, and interpreting data.*
- Two areas of statistics:
 - Descriptive Statistics:
 - Inferential Statistics:



5

Types of Statistics

- Descriptive
 - Provides a quantitative summary or description of information from a sample.
- Inferential
 - Utilizes sample data to draw conclusions about the characteristics of a larger population

6



Analysis of Sample Data

- Measures of Central Tendency:

- Mean (average) = $\bar{X} = \frac{\sum X_i}{N}$
 $\sum X_i$ = sum of sampled events
N = number of events
- Median = middle value, 50% greater & 50% less
- Mode = event with highest frequency

7



Analysis of Sample Data

- Measures of Variability/Spread:

- Range = largest value - smallest value
- Sample variance = $\frac{\sum (X_i - \bar{X})^2}{N}$
- Sample standard deviation = $\sqrt{\frac{\sum (X_i - \bar{X})^2}{N}}$

8

Analysis of Sample Data

- Percentiles:
 - A value that marks the threshold below which a specific percentage of observations lie.
 - **Setting Speed Limits**: The 85th percentile speed is commonly used to set speed limits, as it reflects the speed at which most drivers feel comfortable and safe.
 - Often used as a “benchmark” in speed and safety studies

9

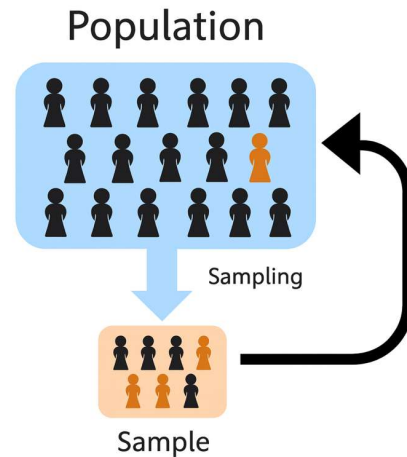
Sample Reliability

- Sample reliability is how well a sample represents the population, giving consistent and accurate results.
 - Increasing the sample size enhances the reliability of the study
 - Sample size is typically constrained by available time, budget, and resources

10

Importance of Choosing a Proper Sample

- The sample should **accurately reflect** the characteristics of the entire population, avoiding bias.
- A **biased sample** occurs when it fails to represent the population, leading to misleading results.



11

Examples of Bias

- Traffic Volume Study Conducted Only During Morning Peak Hours
 - This could overrepresent commuter traffic patterns and underrepresent mid-day or evening traffic behaviors.
- Bicycle Usage Study Conducted During Summer Months
 - This may overestimate bicycle use compared to colder or wetter seasons when biking is less common.
- Pedestrian Crossing Study at a School Zone Conducted During Summer Break
 - This could underestimate the typical pedestrian volume when schools are in session.

12

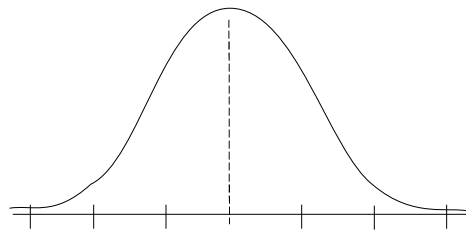
Importance of Statistics

- Provides formalized and repeatable procedures for data analysis.
- Helps estimate the likelihood of making an incorrect decision.
 - Utilizes confidence intervals to quantify uncertainty.
 - Engineering decisions commonly target 90-95% confidence levels.

13

Role of the Normal Distribution in Engineering Statistics

- Widely used in traffic engineering for its versatility and applicability
 - Symmetrical, bell-shaped distribution (as shown)
 - **Key Property:**
 - Mean = Mode = Median

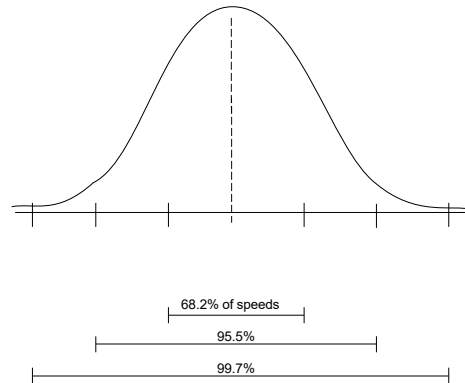


14



Role of the Normal Distribution in Engineering Statistics

- ± 1 (std. deviation) contains 68.2% data area under curve
- ± 2 (std. deviation) contains 95.5% data area under curve
- ± 3 (std. deviation) contains 99.7% data area under curve

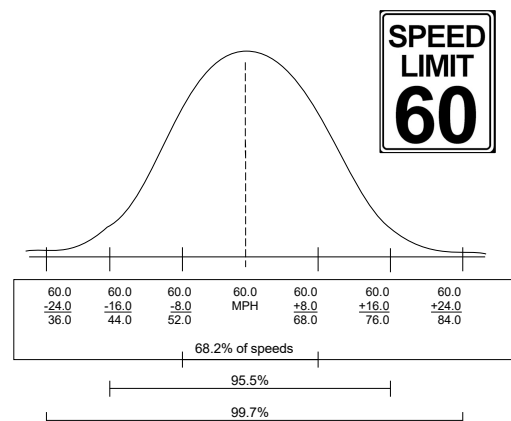


15



Role of the Normal Distribution in Engineering Statistics

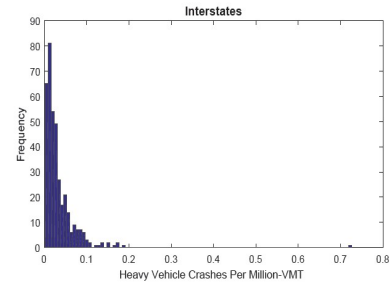
- Example of Speed Data:
 - **Mean Speed:** 60 mph
 - **Standard Deviation:** 8 mph
- We are confident that 95.5% of vehicle speeds will fall between 44 mph and 76 mph.
- Alternatively, if we measure the speed of a single vehicle, there is a 95.5% chance it will be between 44 mph and 76 mph.



16

Inferential Statistics in Safety

- Crash data is typically not normally distributed.
 - Characterized by over-dispersed, non-negative count data.
 - Random samples often show a large proportion of locations with zero crashes (mean < median).
- Commonly analyzed using Negative Binomial or Poisson distributions for better accuracy.



17

Inferential Statistics in Safety

- Critical Crash Rate Comparisons
- Before-and-After Evaluations
- Highway Safety Manual
 - Development of Crash Modification Factors (CMF)
 - Predictive Method

18

Descriptive Statistics in Safety

- Allow us to Summarize crash frequency or proportions.
 - Analyzes by severity, type, traffic control, time, etc.
- Highlights observed crash patterns.
 - Example: "In a study of large truck crashes in the U.S., 35% of fatal crashes occurred on rural roads, and 25% involved rear-end collisions."

19

Importance of Statistics

- Understand how to identify bad statistics, even if you don't apply them directly.
- Be cautious of:
 - Findings from small or non-representative samples.
 - Results that lack full context.
 - Example: "The average large truck crash rate decreased by 5 crashes per year" sounds good, but if the data only includes rural highways and ignores urban areas, it's incomplete.

20

Introduction to Crash Data

21

What qualifies as a crash?

- A collision involving at least one motor vehicle that results in death, injury, or property damage.
 - In most states, this excludes:
 - collisions between non-vehicular travel modes (e.g., bicyclist-pedestrian, or pedestrian-train)
 - Collisions on private property, such as truck yards or loading docks.



22

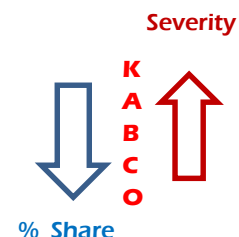
The 3 "Levels" of Crash Data

- Crash Data is comprised of 3 "levels" of data:
 - **Crash Level** – Date, Location, Weather, Lighting, Type, Overall Severity, Contributing Factors, etc.
 - **Vehicle Level** – Movement, Direction, Vehicle Type, Striking Vehicle Indication, Event, etc.
 - **Participant Level** – Age, Gender, Injury Severity, Error, Impairment, etc.

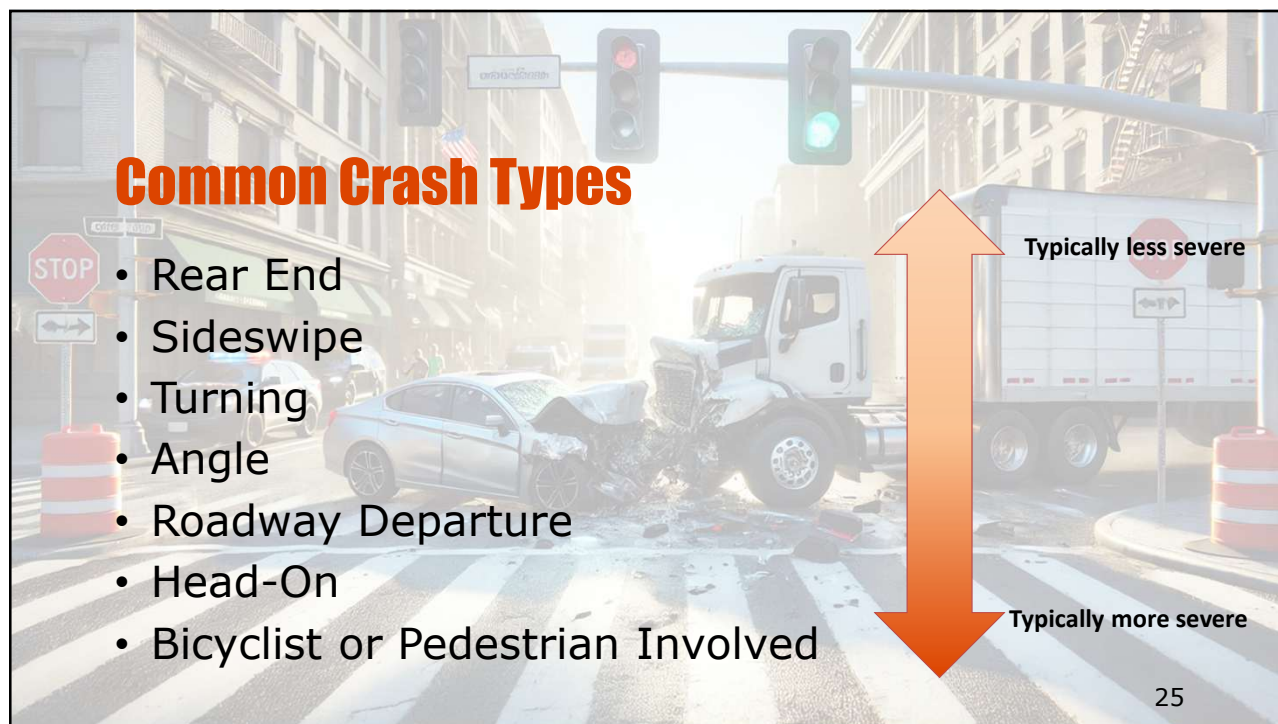
23

Crash Injury Severity

- Overall Crash Severity = Most Severe Injury of any Participant
- KABCO Designation
 - **K**– Fatal
 - **A**– Incapacitating or Severe Injury
 - **B**– Obvious or Visible Injury
 - **C**– Possible Injury
 - **O**– Property Damage Only
 - Under-represented (self-reported at low damage levels)



24



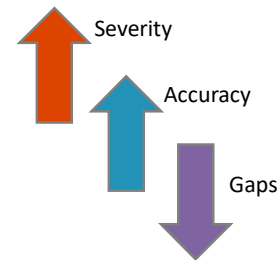
Types of Location Referencing Systems

- **State Highway**
 - Highway numbering system – state highway numbering
 - Milepost
 - Straight-line charts – numbering by standard features, such as, bridges, culverts, etc.
- **County Roads**
 - Number/milepost
 - Intersection/offset
- **City Streets**
 - Street/cross-street (intersections)
 - Distance to nearest intersection (segment)

Location data varies drastically by state - All Oregon and Washington crash data is geolocated!

Challenges with Crash Data

- **Human Error:** Issues with reporting and data entry.
- **Missing or Inaccurate Data:** Gaps in location details or incorrect flag fields.
- **Inconsistencies:** Variation in field formats across datasets.
- **Coded Fields:** Require decoding for meaningful analysis.
- **Outdated Information:** Some datasets are old or delayed
 - Example: Oregon crash data lags by 2 years, though improvements are underway.



27

There is so much more than crash data!

- Surrogate safety metrics
 - Video analytics
 - Near-miss events
 - Connected & Automated Vehicle (CAV) data
 - Hard braking, collision avoidance, etc.
- Predicted safety performance
 - Highway Safety Manual
- Econometric Based Safety Models
 - Discrete outcome

Telematic Data



Figure: HEAVY vehicles that were stopped for more than 5mins at the Santiam Rest Area between Jan and April 2021

28

There is so much more than crash data!

- Trauma/health records (recent efforts conducted with ODOT TPAU)
- Equity and demographics
- Citations (Truck inspection Study)
- Public feedback
- Risk factors
- Artificial intelligence/machine learning
- and the list goes on...

29

If crash data is just one piece of the puzzle, why do we rely on it so much?

- **Funding Dependence:** Crash data is a primary requirement for securing safety funding.
- **Lack of Acceptance for Proactive Approaches:** Innovative datasets and proactive methods are often not considered "sufficient evidence" of safety needs.
- **Historical Bias:** Most funding sources prioritize locations with a documented history of fatal and serious injury crashes.

30



Oregon State University
College of Engineering

Discussion Break

31



Oregon State University
College of Engineering

Safety Analysis Basics

32

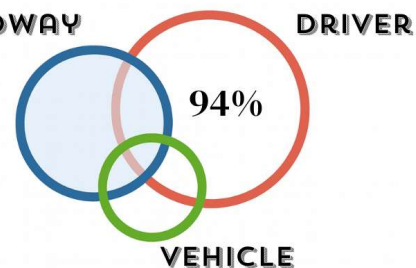
Accident/collision/crash

- “Accident” is an undesirable event occurring by chance, without pattern or predictability.
- A traffic accident/collision/crash: a vehicle collides with another vehicle, pedestrian, bicycle, animal, road debris, or other stationary obstruction, such as a tree or utility pole.
- Traffic accidents may result in property damage, injury, or death.

33

Factors Contributing to Crashes

- According to NHTSA, ~94% of serious crashes are linked to driver decisions/errors.
- **Implication:** Improving roadway and vehicle design is important, but addressing human behavior is critical to reducing crashes.



34

Definitions

- Crash Frequency:
 - The total number of crashes that occur at a specific location within a defined time period (e.g., annually).
- Crash Severity:
 - The highest level of injury sustained by any participant involved in a crash, categorized by severity (e.g., fatal, serious injury, minor injury, or property damage only).

35

Definitions

- Exposure:
 - The volume of vehicles passing through a specific roadway segment or intersection, representing the potential for crashes.
- Additional Considerations:
 - Some studies also incorporate bicycle and pedestrian volumes to account for non-motorized traffic exposure.



36

Definitions

- Crash Rates
 - Crash frequency adjusted for some exposure
 - Intersections
 - Crashes per Year per Million Entering Vehicles (MEV)
 - Roadway Segments
 - Crashes per Year per Million Vehicle Miles Traveled (MVMT)
 - Note that some agencies use Crashes per 100 MVMT instead

37

Definitions

Metric	Definition	Formula	Purpose
Crash Frequency	Total number of crashes over a period	$N = \sum \text{Crashes}$	Identifies absolute safety magnitude
Crash Rate	Crashes per unit of exposure (e.g., per million VMT)	$R = \frac{N \times 10^6}{AADT \times 365 \times L}$	Normalizes by exposure

Note: Very low volumes or very short segments (less than 0.10 miles) can over-inflate crash rates

38

Definitions

- Crash Modification Factor (CMF) or Crash Reduction Factor (CRF)
 - A measure of the expected change in crash frequency from applying a given countermeasure
 - CMF is a decimal value (<1.0 is a decrease in crashes, >1.0 is an increase in crashes)
 - CRF is a percentage (positive is a decrease in crashes, negative is an increase in crashes)

39

Definitions

- Hotspot Analysis:
 - Focuses on locations, such as intersections, curves, or short segments, with a high frequency or severity of crashes to identify specific problem areas.
- Systemic Analysis:
 - Examines underlying risk factors contributing to crashes across an entire network to address broader safety trends and prevent future incidents.

40

Overview of Safety Evaluations

41

The Safe System Approach

Zero is our goal. a safe system is how we get there.

The Safe System Approach recognizes that we can't "engineer" our way to zero... we all have a shared responsibility to keep ourselves and others safe.



Source: What Is a Safe System Approach? | US DOT

42

The Safe System Principles

- **Human Vulnerability:** Recognizes that humans make mistakes and designs the system to protect them from severe injury or death.
- **Shared Responsibility:** Ensures safety is a shared responsibility among road users, designers, planners, and policymakers.
- **Redundancy in Safety Measures:** Incorporates multiple layers of protection so that if one fails, others mitigate the risk.
- **System-Wide Thinking:** Focuses on improving the entire transportation system rather than isolated fixes

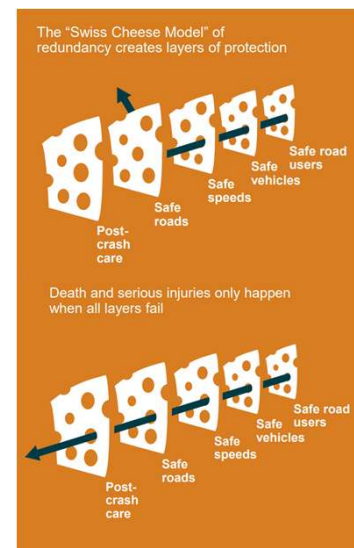


43

The Safe System Principles

Key Components:

- **Safe Roads:** Design roads to reduce the likelihood and severity of crashes (e.g., roundabouts, rumble strips).
- **Safe Speeds:** Set speed limits appropriate for the context and road type, balancing mobility and safety.
- **Safe Vehicles:** Promote technology and design features in vehicles that enhance safety (e.g., automatic braking, lane departure warnings).
- **Safe Road Users:** Encourage safe behavior through education



44

The Safe System Elements



Safer people

- Encourage safe, responsible driving and behavior
- Create conditions that allow them to reach their destination unharmed



Safer vehicles

- Expand vehicle systems to prevent crashes
- Minimize the impact of crashes on those in and out of the vehicle



Safer speeds

- Promote safer speeds in all roadway environments

45

The Safe System Elements



Safer roads

- Design roadways to mitigate human mistakes, account for injury tolerances, encourage safe behaviors, facilitate safe travel for VRUs



Post-crash care

- Enhance the survivability of a crash
- Create a safe working environment for first responders
- Prevent secondary crashes

Post crash care doesn't stop here!



46

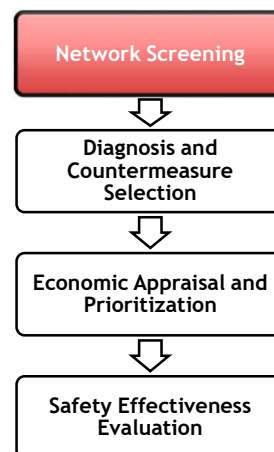
Transportation Engineer's Role in Safety

- Be a safe road user
- Work to reduce the frequency and severity of traffic crashes
 - Identify safety concerns
 - Diagnose safety deficiencies
 - Develop safety solutions
 - Plan and design engineering safety improvements
 - Evaluate the past or future effectiveness of treatments

47

Hotspot & Systemic Safety Evaluation Steps

1. Network Screening
 - Find potential safety concerns
2. Diagnosis
 - Figure out crash patterns and risks
3. Solution Development
 - Identify the right treatments
4. Prioritization
 - Decide where to invest resources



48

Step 1: Network Screening

- Crash Rate Method
 - Accounts for crash frequency and exposure, but does not account for crash severity
 - Locations are ranked in descending order by crash rate
 - Should only compare locations with similar characteristics
 - Signalized intersections have different crash patterns than stop-controlled intersections, for example.

51

Step 1: Network Screening

- Crash Rate Method (continued)
 - In Oregon, ODOT publishes “Critical Crash Rates” for comparison purposes
 - “Expected” (90th percentile) statewide crash rates for certain facility types
 - Calculated crash rates that exceed the Critical Crash Rate indicate a potential safety concern

52

Step 1: Network Screening

- Equivalent Property Damage Only (EPDO)
 - Ranking that weights crash frequency by crash severity
 - Weighting factors typically based on relative crash cost
 - Some agencies (like ODOT) use an order of magnitude weighting
 - PDO = 1
 - Minor/Possible Injury = 10
 - Fatal/Serious Injury = 100

53

Network Screening in Practice

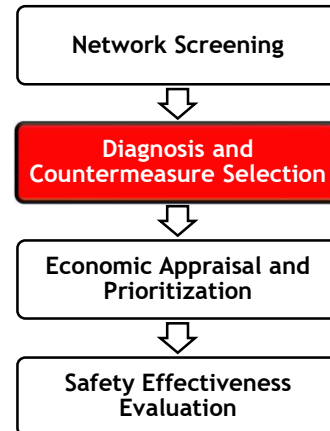
Best practices

- Apply multiple methods, or
- Apply the method that most closely aligns with your goals
- Consider other data sources and public feedback

54

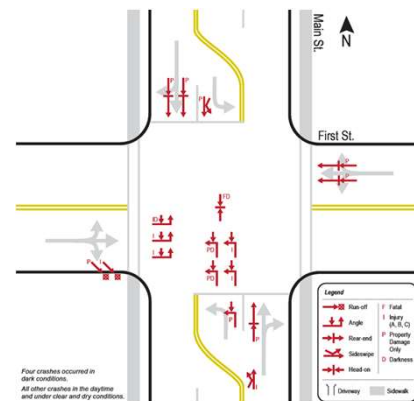
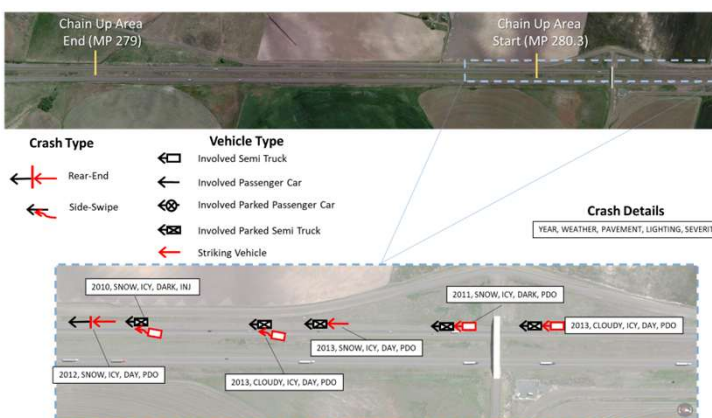
Step 2: Diagnosis of Safety Deficiencies

- Hotspots
 - Detailed analysis of crashes and infrastructure
 - Determine the “what, when, where, how, and who” for every crash during study period
 - Identify patterns in crash events/contributing factors
 - Create collision diagrams
 - Typically based on 3-5 years of crash data
 - Conduct field observations, road safety audits, video analytics, etc.



55

Example Collision Diagrams



56

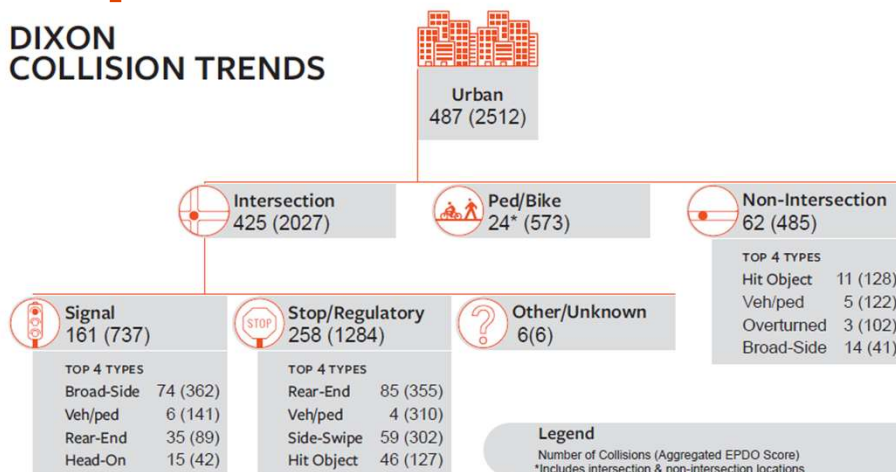
Step 2: Diagnosis of Safety Deficiencies

- Systemic
 - Network-wide analysis of crashes and infrastructure
 - Identify patterns in crash events/contributing factors
 - Crash types, location type, traffic control, vehicle movements, time of day, weather
 - Typically focus on fatal and serious injury crashes to identify patterns, then identify all locations where those patterns/risks exist
 - Can use collision trees, spatial analysis, queries, etc.
 - Overlay with other data sources

57

Example Crash Tree

DIXON COLLISION TRENDS



58

Step 3: Develop Solutions

- Remember the Safe System Approach
 - Holistic solutions that cover all of the “E’s”
- Identify treatments that address some or all of the identified crash risks/patterns
 - Focus on risks/patterns that have a higher likelihood of higher severity outcomes

59

Step 3: Develop Solutions

- Hotspot
 - Engineering solutions tend to be higher cost, more complex
 - Roundabouts, medians, turn lanes
- Systemic
 - Engineering solutions tend to be lower cost, easy to implement
 - Signing and striping, signal timing changes

60

Step 3: Develop Solutions

- Sources for Countermeasures
 - CMF Clearinghouse
 - FHWA Proven Safety Countermeasures
 - NCHRP Report 500 Series
 - State-specific countermeasure lists
 - ODOT CRF List

61

Step 4: Prioritization

- Safety projects are typically prioritized for funding and programming based on cost effectiveness (benefit-cost ratio)
 - Benefit = societal cost of crashes reduced
 - CMFs, HSM Predictive Method, Estimated Risk Reduction
 - Cost = construction and maintenance costs

62

Before-and-After Studies

- Agencies assess the performance of their investments after implementing countermeasures.
- **Before-and-After Studies:** Analyze crash patterns to measure the impact and effectiveness of treatments.
- **Advanced Tools:** Video analytics and connected/autonomous vehicle (CAV) data provide faster, more detailed evaluations.

63

Before-and-After Studies

Frequently conducted incorrectly or naively due to:

- **Small Sample Sizes:** Insufficient data to draw reliable conclusions.
- **Short Time Periods:** Limited "before" and "after" durations.
- **Ignoring Confounding Factors:** External influences like:
 - Road construction altering travel patterns.
 - Atypical weather events or pandemics.
- **Regression to the Mean:** Natural variability misinterpreted as a treatment effect.

64



Statistics can Help Save Lives (if done correctly)

65



**Safety models are like parachutes—if
they're poorly designed, you might not get
a second chance to fix them.**

-Unknown

66

Crash Rates

Before				After			
Year	# Crashes	AADT	Crash Rate	Year	# Crashes	AADT	Crash Rate
1988	13	2,900	2.11	1992	30	10,600	1.33
1989	11	2,900	1.79	1993	30	13,200	1.07
1990	13	3,050	2.01	1994	36	14,300	1.19
1991	23	3,400	3.19	1995	40	13,900	1.36

Average Crash Rate: 2.28

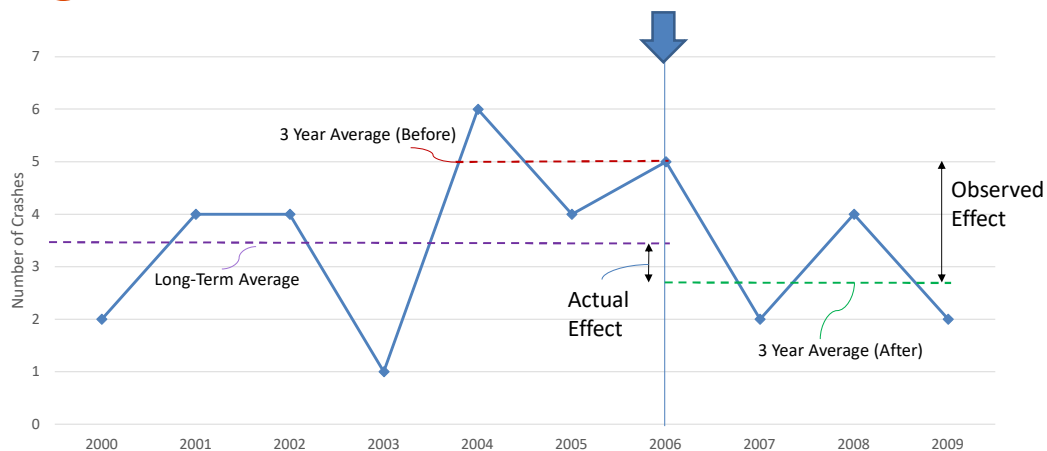
Average Crash Rate: 1.24

Casino constructed in 1992

Does gambling and impaired driving improve safety?

Example courtesy
Jake Kononov,
Colorado DOT
67

Regression to the Mean



68

Crash Modification Factors

Countermeasure Name	Conversion of signalized intersection into single- or multi-lane roundabout	Conversion of signalized intersection into single- or multi-lane roundabout	Conversion of intersection into multi-lane roundabout	Conversion of intersection into multi-lane roundabout
CMF ID				
CMF	0.29	1.16	0.99	0.8
Study Reference				
Unadjusted Standard Error CMF	0.07	0.32	0.4	
CMFunction				
Star Rating	★★★★★	★★☆☆☆	★★☆☆☆	★★☆☆☆
Crash Type	All	All	All	All
Crash Severity	Serious injury, Minor injury	Fatal, Serious injury, Minor injury		

69

Consequences of Poor Data and Analysis

- **Wasted Time and Resources:** Efforts spent on flawed studies lead to inefficiencies.
- **Inefficient Use of Funding:** Misguided decisions divert valuable resources away from critical needs.
- **Missed Opportunities to Save Lives:** Poor insights delay or prevent effective safety improvements.

70





Purpose



Introduce Practitioners to the standards, practices, devices, and technologies used in Work Zones.

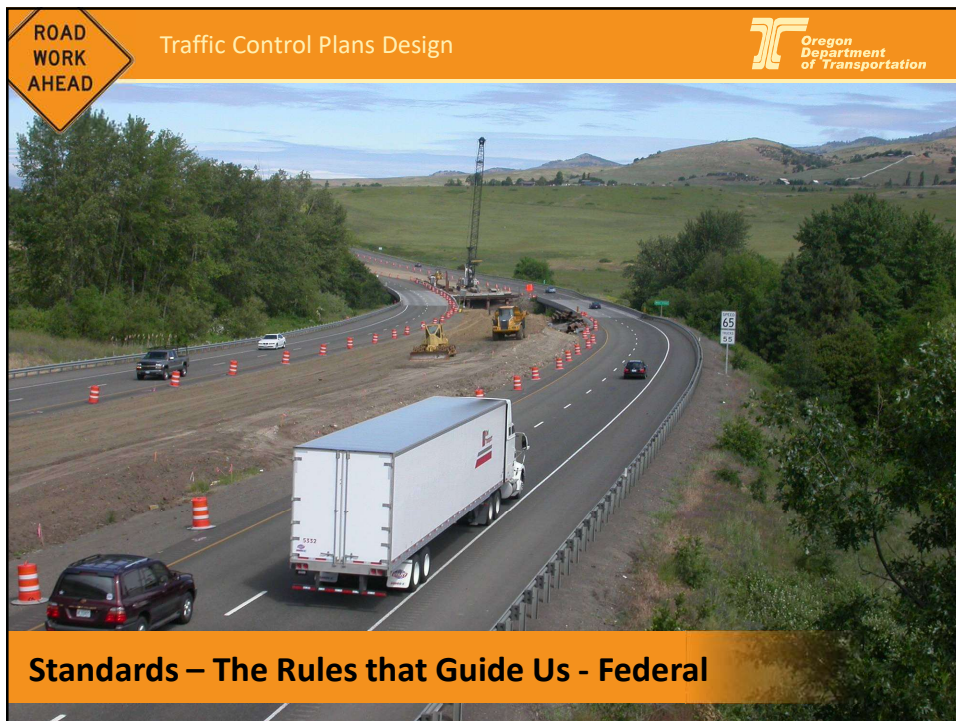
Work Zones - Purpose

- Safety
 - Road Users
 - Workers
- Balance
 - Mobility
 - Project Schedule



Work Zones - Purpose

- Work Zones should:
 - Warn, protect, and guide road users
 - Protect workers
 - Optimize traffic flow and safety for all Traffic, including vehicles, bicycles and pedestrians
- Work Zones should NOT:
 - Compromise safety
 - Ignore non-motorized road users
 - Use cost as primary design factor



Standards – The Rules that Guide Us - Federal



Traffic Control Plans Design



Standards - Federal

- Final Rule on Work Zone Safety and Mobility
- Manual on Uniform Traffic Control Devices



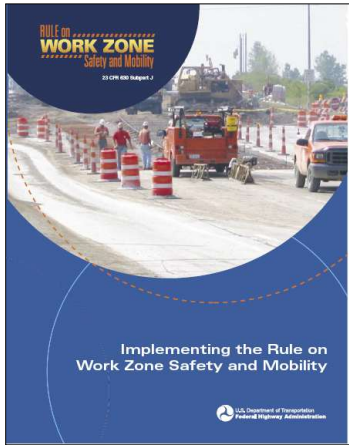


Traffic Control Plans Design



Final Rule on Work Zone Safety & Mobility

- 23 CFR 630 Subpart J & K
 - J: Work Zone Safety and Mobility
 - K: Temporary Traffic Control Devices
 - Updated Dec. 2024
 - Perf. Measures
 - Positive Protection
 - Process Reviews



ROAD
WORK
AHEAD

Final Rule on Work Zone Safety & Mobility

Systematic approach to traffic impact mitigation

- Statewide Level
 - Oregon Highway Plan
 - Oregon Transportation Plan
- Corridor Level
 - Mobility Liaisons
 - Mobility Committee
- Project Level
 - Traffic Control Plans (TCP)
 - Traffic Operations (TO) & Demand Management
 - Public Information (PI) Strategies and Campaigns



ROAD
WORK
AHEAD

Final Rule on Work Zone Safety & Mobility

- **Key Concept:** “Systematic Approach” to project development
- We now have: **Transportation Management Plans**





ROAD
WORK
AHEAD

Traffic Control Plans Design



Transportation Management Plans

Goal: Minimize disruptions to motorists, freight, and communities without compromising public or worker safety, or quality of work.

“Project Development Diary”

- Decision Tree
- TCP/TPARP Design & Construction Staging
- Traffic operations and demand management
- Motor Carrier Coordination, PD16
- Access management
- Right-of-way needs
- Local agency partnerships (IGAs)

[TMP Guidance Manual](#)



ROAD
WORK
AHEAD

Traffic Control Plans Design



ODOT Guiding Principle

Mission: ODOT’s mission is to provide a safe, efficient transportation system that supports economic opportunity and livable communities.

Goal: Our work zone safety goal is zero fatalities and injuries, including ODOT employees, contractors, public safety professionals and the traveling public while efficiently moving people and goods.

Guiding Principle: The best work zone design and management plan will maintain safety and mobility, a balance that shall be analyzed continuously throughout the lifecycle of the facility.

- Work Zone Separation Decision Tree
 - Bring issues forward early in the scoping and design stage to avoid surprises and keep everyone in the problem solving mode.
 - The decision tree will help us identify separation options available per work zone.
 - Impacts to safety, mobility, scope, schedule, budget, delay, driver convenience, and ‘other’ impacts shall be identified when assessing separation options.
 - To help guide us through our decision making, the following decision tree is intended to provide new tools and approaches.



Approved 12/7/15



OREGON TRUCKING ASSOCIATIONS



AGC Oregon
Columbia
Chapter



OSU
Oregon State



KEEP
LIFE
GOING





Traffic Control Plans Design



ODOT WZ Decision Tree



Work Zone Decision Tree
 Evaluate Separation Opportunities, WZ Concepts, WZ Devices

Print Form

Project Name (Section)

Key No.

Contract No.

Highway

Project Leader / Project Manager

Agency Project Manager

Region

Phase: ☐ 1 - Scoping ☐ 2 - Project Initiation to DAP ☐ 3 - DAP to Final PS&E ☐ 4 - Construction

Contractor

Opportunities to Evaluate	Phase	Possible / Viable	Impacts	Stakeholders & Input	Status Recommendation (R) / Decision (D)
Road closure (full closure, directional closure)	1				
Crossover/on-site diversion	1				
Rigid barrier (concrete, steel, temporary painted)	1				
Work at night	1				
Staged construction with temporary widening	1				
Standard lane closures with channelizing devices	1				
Law enforcement overtime	1				
Smart Work Zone System/Work Zone ITS	1				
Accelerated contracting strategies	1				
Accelerated construction strategies	1				
Automated Flagging Assistance Devices (AFAD)	1				
Temporary Transverse Rumble Strips (TTRS)	1				
Radar speed trailers	1				
Construction Speed Zone Reductions	1				
Increased lateral buffer space	1				
Public information campaigns	1				
Other:	1				
	2				
	3				
	4				

ADD ANOTHER ITEM

754-50426 (11-2-2016)

<http://www.odot.gov/ODOT/1861/CONTRACTS/CON7/Topic/WorkZoneForm1.aspx>

1 of 2



Traffic Control Plans Design

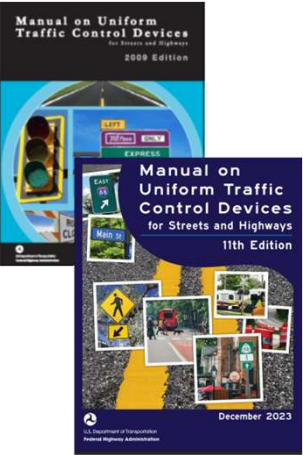


Manual on Uniform Traffic Control Devices

- New MUTCD, 11th Ed.
 - Dec. 2025 Adoption
 - TPAR, New TA's, Re-org
- Part 6 – Temporary Traffic Control

http://mutcd.fhwa.dot.gov/pdfs/2009/pdf_index.htm

- FHWA Standard Highway Signs
- AASHTO Roadside Design Guide



MUTCD Ch. 6 Principles

- General plans or guidelines should be developed to provide safety for motorists, bicyclists, pedestrians, workers, enforcement/emergency officials, and equipment.
- Road user movement should be inhibited as little as practical
- Motorists, bicyclists, and pedestrians should be guided in a clear and positive manner while approaching and traversing TTC zones and incident sites.
- To provide acceptable levels of operations, routine day and night inspections of TTC elements should be performed
- Attention should be given to the maintenance of roadside safety during the life of the TTC zone
- Each person whose actions affect TTC zone safety, from the upper-level management through the field workers, should receive training appropriate to the job decisions each individual is required to make.
- Good public relations should be maintained



MUTCD Ch. 6 Organization

- 2009 MUTCD
 - 6A – General
 - 6B – Fundamental Principles
 - 6C – Temporary Traffic Control Elements
 - 6D – Pedestrian and Worker Safety
 - 6E – Flagger Control
 - 6F – Temporary Traffic Control Zone Devices
 - 6G – Type of Temporary Traffic Control Zone Activities
 - 6H – Typical Applications
 - 6I – Incident Management Areas
- 11th Edition MUTCD(2023)
 - 6A – General
 - 6B – Temporary Traffic Control Elements
 - 6C – Pedestrian and Worker Safety
 - 6D – Flagger Control
 - 6E – One-Lane, Two-Way Traffic Control
 - 6F – Temporary Traffic Control Zone Signs – General
 - 6G – TTC Zone Regulatory Signs
 - 6H – TTC Zone Warning Signs
 - 6I – TTC Zone Guide Signs
 - 6J – TTC Zone Pavement Markings
 - 6K – TTC Zone Channelizing Devices
 - 6L – Other TTC Zone Traffic Control Devices
 - 6M – Other TTC Zone Design Features and Safety Devices
 - 6N – Types of Temp. Traffic Control Zone Activities
 - 6O – Incident Management Areas
 - 6P – Typical Applications







Traffic Control Plans Design



Standards – State



OAR and ORS

Oregon Administrative Rules (OAR)
Oregon Revised Statutes (ORS)

- **OAR 734-020-005:** Adopts MUTCD as reference for TCD standards for State Highways
- **ORS 811.230, .231, .233:** Fines Doubled and Yielding to Highway Workers
- **ORS 672/OAR 820-040-0030:** Engineers/Engineering. Engineer responsible for “..use, and design of traffic control devices....”





Traffic Control Plans Design





Standards – State

Traffic Control Plans (TCP) Design Manual

Design Standards for Oregon's TCPs





Traffic Control Plans Design



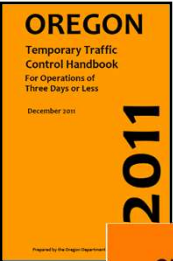
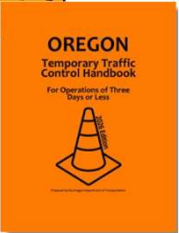


Standards – State

Oregon Temporary Traffic Control Handbook

- Maintenance/Utility/Other Permit Operations
- Incident Response Events
- NOT** for ODOT Highway Construction contracts
(See 00225.01(c) for exception)
- OTTCH – updated along w/MUTCD
 - 2025 Version
 - Updates – TPAR, AFAD,



Standards - State

ODOT Sign Policy and Guidelines

ODOT PCMS Handbook

ODOT Highway Design Manual

ODOT Mobility Procedures Manual

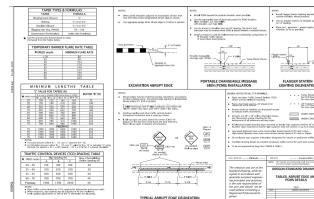
- Delay
- Oversize Restrictions
 - Width, Length, Height, Weight, etc
 - Notifications to MCTD, Contract work = 35 days

Standards - State

ODOT Specifications



ODOT Standard Drawings



Standards – State

Work Zone Pedestrian Guidance

- Temporary Pedestrian Accessible Route (TPAR)
- Equal or greater accommodation
- Do not introduce any significant new obstacles / obstructions



Standards – APWA / City /County

- Own Standards
- Adopt Federal, State, or alternative Standards

ODOT Standards, Manuals, Resources – available for use to all Counties, Cities, etc in Oregon.

- includes drafting cell libraries, cache files, etc.





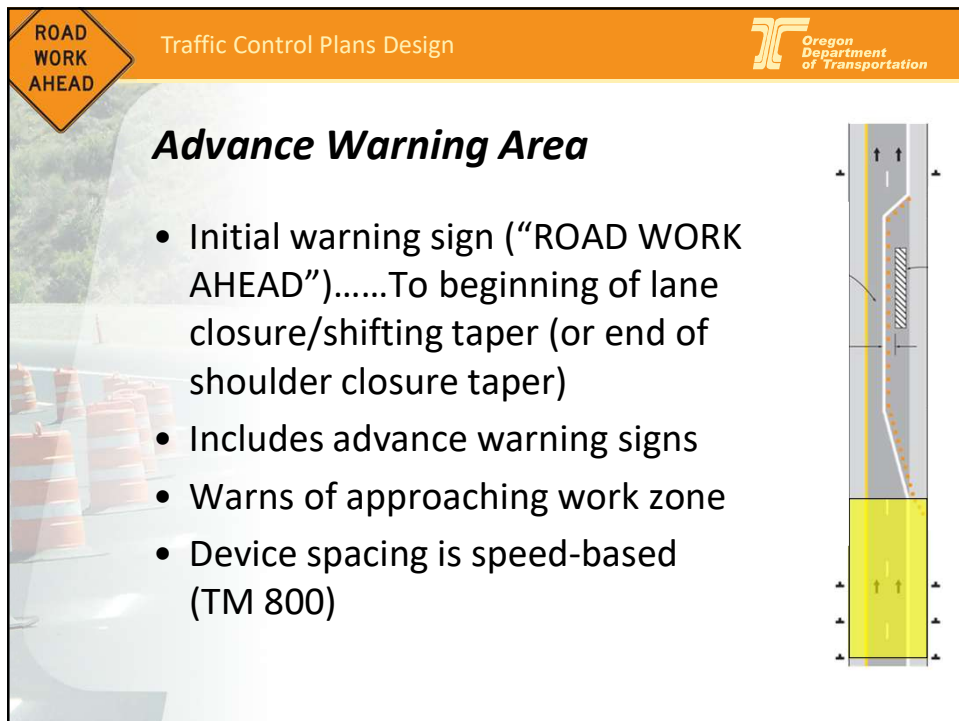
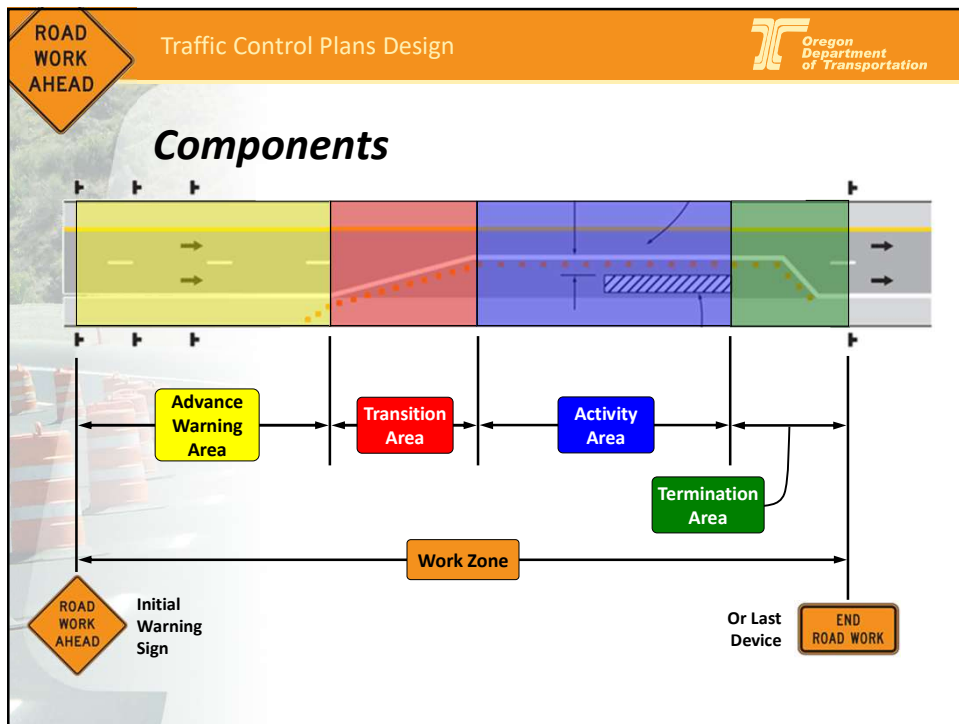


Traffic Control Plans Design

Oregon Department of Transportation

Work Zone Limits

- 11th Edition MUTCD (6B.02)
- 2024 Standard Specifications (00110.20)
- Oregon Vehicle Code (ORS 811.230)
 - Initial advance warning sign (“ROAD WORK AHEAD”) or high-intensity rotating, flashing, or strobe lights on a vehicle...
 - To the “END ROAD WORK” sign or last device



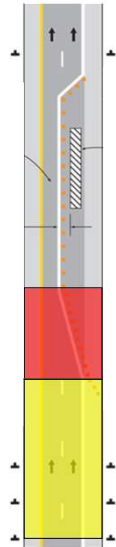


Traffic Control Plans Design



Transition Area

- Merging or shifting traffic
- Highest density of crashes!
- 3 Kinds of Tapers
 - Merging (Lane Closure) = “L”
 - Shifting = “L”/2
 - Shoulder Closure = “L”/3
- “L” based on speed & width (TM 800)



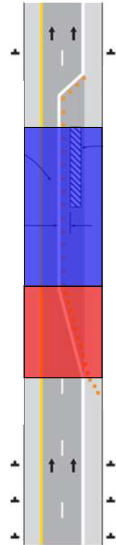


Traffic Control Plans Design



Activity Area

- Where work takes place
- Includes Work Area and:
 - Longitudinal Buffer “B”
 - Required (ODOT)
 - Lateral Buffer (e.g. “shy”, 2-4 ft)
 - Provide where practical
 - Buffer space must be EMPTY
- “B” is based on speed (TM 800)



Page 7 |

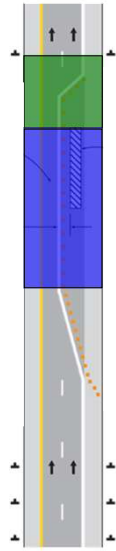


Traffic Control Plans Design



Termination Area

- Transition back to existing conditions and exit work zone
- Includes:
 - Downstream Buffer “B”
 - Optional (ODOT)
 - Downstream Taper
 - Optional (All)
 - Length = ~100 ft per lane
 - “END ROAD WORK” sign
- “B” is based on speed (TM 800)

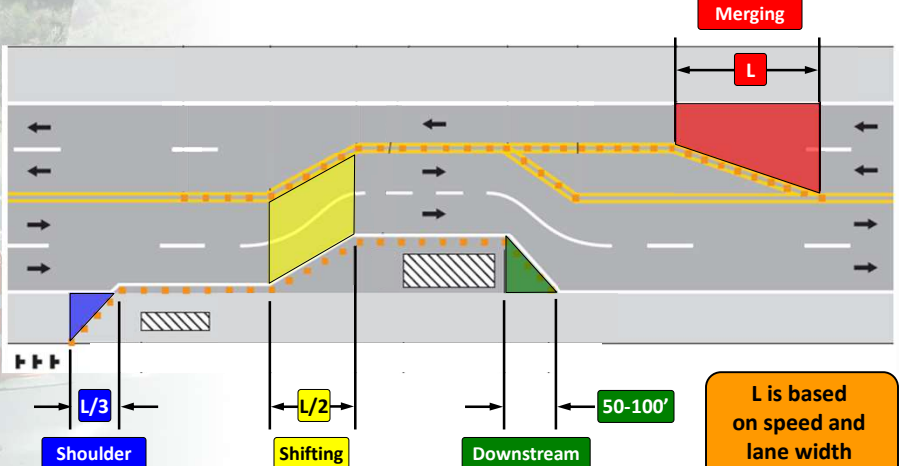




Traffic Control Plans Design



Types of Tapers



L is based on speed and lane width (TM800)

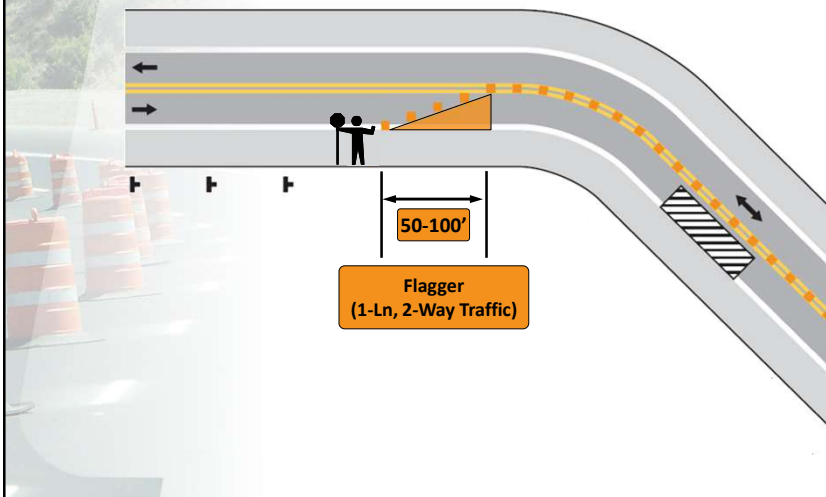


ROAD WORK AHEAD

Traffic Control Plans Design

Oregon Department of Transportation

Types of Tapers



50-100'

Flagger
(1-Ln, 2-Way Traffic)



ROAD WORK AHEAD

Traffic Control Plans Design

Oregon Department of Transportation

Variables, L, Spacings

TAPER TYPES & FORMULAS	
TAPER	FORMULA
Merging (Lane Closure)	"L"
Shifting	"L"/2 or 1/2"L"
Shoulder Closure	"L"/3 or 1/3"L"
Flagging (See Drg. TM850)	50' - 100'
Downstream (Termination)	Varies (See Drawings)

★ Use Pre-Construction Posted Speed to select the Speed from the Tables below:

MINIMUM LENGTHS TABLE			
"L" VALUE FOR TAPERS (ft)			
SPEED (mph)	W ≤ 10	W = 12	W = 14
25	105	125	145
30	150	180	210
35	205	245	285
40	265	320	375
45	320	380	440
50	380	450	520
55	440	520	600
60	500	590	680
65	560	660	770
70	620	730	860

NOTES:
 • For Lane closures where W < 10', use "L" value for W = 10'.
 • For Shoulder closures where W < 10', use "L" value for W = 10'.
 • When necessary, sign spacing may be adjusted to fit any Lane spacing adjustments to 30% of the "L" dimension.

TRAFFIC CONTROL DEVICES (TCD) SPACING TABLE				
SPEED (mph)	Sign Spacing (ft)			Max. Channelizing Device Spacing (ft)
	A	B	C	
20 - 30	100	100	100	20
35 - 40	350	350	350	20
45 - 55	500	500	500	40
60 - 70	700	700	700	40
Freeway	1000	1500	2640	40

NOTES:
 • Place traffic control devices on 10 ft. spacing for intersection and access road.
 • When necessary, sign spacing may be adjusted to fit site conditions.
 • Limit spacing adjustments to 30% of the "A" dimension for all speeds.

MINIMUM LENGTHS TABLE			
"L" VALUE FOR TAPERS (ft)			
SPEED (mph)	W ≤ 10	W = 12	W = 14
25	105	125	145
30	150	180	210
35	205	245	285
40	265	320	375
45	320	380	440
50	380	450	520
55	440	520	600
60	500	590	680
65	560	660	770
70	620	730	860

NOTES:
 • For Lane closures where W < 10', use "L" value for W = 10'.
 • For Shoulder closures where W < 10', use "L" value for W = 10' or calculate "L" using formula, for Speeds ≥ 45; L = WS, Speeds < 45; L = 5"W/60, S = Speed, W = Width

TRAFFIC CONTROL DEVICES (TCD) SPACING TABLE				
SPEED (mph)	Sign Spacing (ft)			Max. Channelizing Device Spacing (ft)
	A	B	C	
20 - 30	100	100	100	20
35 - 40	350	350	350	20
45 - 55	500	500	500	40
60 - 70	700	700	700	40
Freeway	1000	1500	2640	40

NOTES:
 • Place traffic control devices on 10 ft. spacing for intersection and access road.
 • When necessary, sign spacing may be adjusted to fit site conditions.
 • Limit spacing adjustments to 30% of the "A" dimension for all speeds.

FLAGGER STATION LIGHTING DELINEATION

DRAWINGS:
 • Temp. Plastic Delineator
 • 28" Taper Markers
 • 28" Taper Markers
 • 28" Taper Markers
 • 28" Taper Markers

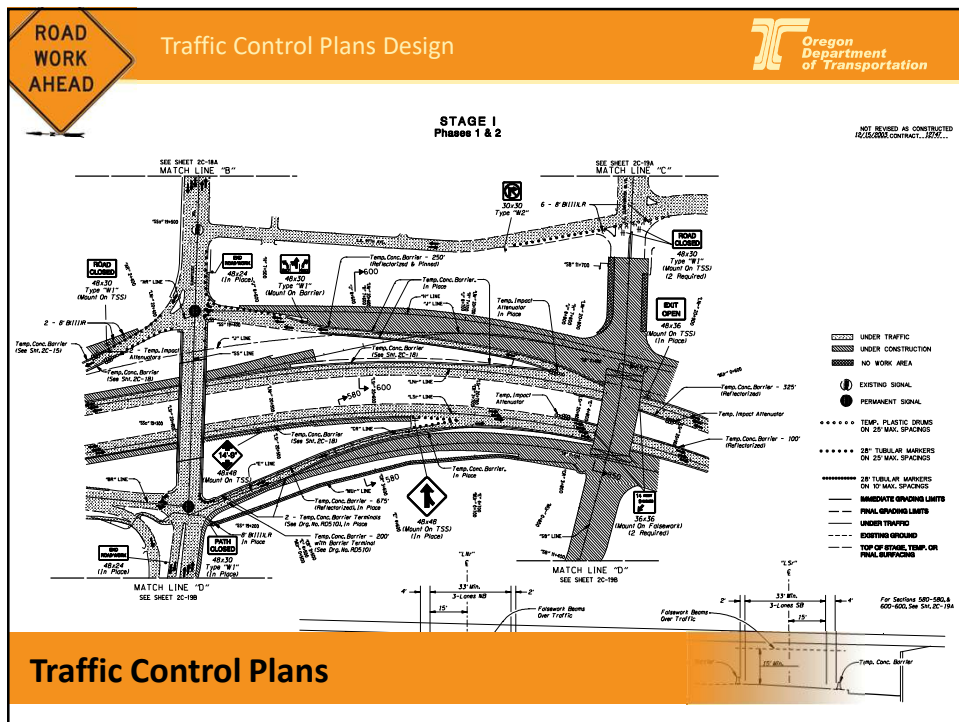
UNDER TRAFFIC:
 • 28" Taper Markers
 • 28" Taper Markers
 • 28" Taper Markers
 • 28" Taper Markers

UNDER CONSTRUCTION:
 • 28" Taper Markers
 • 28" Taper Markers
 • 28" Taper Markers
 • 28" Taper Markers

TABLES, ABRUPT EDGE AND PCMS DETAILS

2024

TM800



ROAD WORK AHEAD

Traffic Control Plans Design

TCP Measures

Traffic Control "Plan"

Developed by Design Team and Stakeholders to provide reasonably safe and efficient movement of road users through or around the work zone while reasonably protecting road users, workers, and equipment.

PLAN FIRST!



**ROAD
WORK
AHEAD**

Traffic Control Plans Design

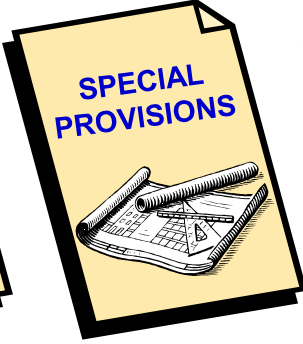


Oregon
Department
of Transportation

TCP Components



PLANS



**SPECIAL
PROVISIONS**



**COST
ESTIMATES**



**ROAD
WORK
AHEAD**

Traffic Control Plans Design



Oregon
Department
of Transportation

TCP Examples

NOTES:

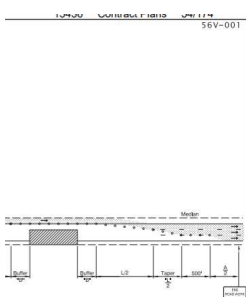
- If full-size signs are used, attach the correct ODOT-46. Refer to the sign face only for text and design elements.
- Do not place traffic signs longitudinally under an existing traffic sign. Remove existing signs to place a new sign.
- Remove existing signs according to the sign.

GENERAL NOTES FOR ALL DETAILS:

- Flagger are not permitted to stop or halt traffic by vehicle.
- Stop and wait 100 yards to be installed in compliance with the work area, shall move with the work area.
- Use Concrete Barrier Edge Support for mounting signs with a maximum 12 in. E of 1000 sign area. Sign Top No. 1000 to Concrete Barrier Edge Support (width).
- Unless otherwise shown, use the "MINIMUM LENGTHS" in this sign. No. 1000 to Concrete Barrier Length "X" and "Y".

SCHEDULE OF ITEMS

ITEM NO.	ITEM DESCRIPTION	UNIT OF MEASURE	QUANTITY	UNIT PRICE (IN FIGURES)	TOTAL (IN FIGURES)
SECTION 0001 TEMPORARY FEATURES AND APPURTENANCES					
0010	0100-010000T TRAINING	HOURLY	20.00	20.00	12,800.00
0020	0210-010000A MOBILIZATION	LUMP SUM	ALL	457,000.00	457,000.00
0030	0211-010000A TEMPORARY PROTECTION AND DIRECTION OF TRAFFIC	LUMP SUM	ALL	382,000.00	382,000.00
0040	0221-010000J TEMPORARY SIGNS	SQFT	2,540.00	28.33	71,958.20
0050	0222-016000E SEQUENTIAL ARROW SIGNS	EACH	2.00	2,245.14	4,490.28
0060	0222-016000E PORTABLE CHANGABLE MESSAGE SIGNS	EACH	4.00	4,738.95	18,955.84
0070	0222-016700E PORTABLE CHANGABLE MESSAGE SIGNS, ROLLER MOUNTED	EACH	2.00	2,940.56	5,881.12
0080	0222-016700E RAGGED SPEED TRAILER	EACH	2.00	3,844.58	7,689.16
0090	0223-016000T FLAGGERS	HOURLY	300.00	66.83	20,049.00
0100	0223-016100E FLAGGER STATION LIGHTING	EACH	2.00	5,141.06	10,282.12
0110	0223-016200E TRAFFIC CONTROL SUPERVISOR	HOURLY	177.00	600.00	106,200.00
0120	0223-017000T PILOT CARS	HOURLY	150.00	86.83	13,024.50
0130	0224-010000E TEMPORARY BARRICADES, TYPE II	EACH	12.00	62.84	754.08
0140	0224-010000E TEMPORARY BARRICADES, TYPE III	EACH	12.00	188.51	2,262.12



56V-001

10/21/2021 10:00 AM

ORIGIN: 12-2017

DESIGNED BY: JACOB B. EISEN

CHECKED BY: JACOB B. EISEN

DATE: 12-31-2021

PROJECT: 12-31-2021

TRAFFIC CONTROL DETAILS

56V-001

ROAD
WORK
AHEAD

Traffic Control Plans Design



Best Practice – Job Hazard Assessment

- “Tailgate Talk”
- Before doing the work, assess all the hazards of the job and mitigate as necessary (poison oak, traffic, PPE, etc)
- SHOULD include Temporary Traffic Control information. At a minimum a reference to what Engineered document is being used for Temporary Traffic Control. Document any minimal changes, as necessary.

ROAD
WORK
AHEAD

Traffic Control Plans Design



Traffic Control Devices (TCD) – Our Toolbox

Traffic Control Devices (TCD)

- Regulate, warn, or guide road users placed on, over, or adjacent to a road open to public travel.
- Must be uniform, effective, and crashworthy (NCHRP Report 350, MASH)
- Qualified Products List (QPL)



Device Principles

- Fulfill a need
- Command attention
- Convey clear, simple meaning
- Command respect
- Give adequate response time

Crashworthy

Meets test and
evaluation criteria

- NCHRP Report 350
- Manual for Assessing
Safety Hardware
(MASH)

And/Or

FHWA “Letter of
Acceptance”

[FHWA Crashworthy WZ Devices](#)

| Page 23

Categories

- Category 1: Cones, Drums, Delineators
- Category 2: Barricades, Sign & Supports
- Category 3: Barriers, Impact Attenuators
- Category 4: Trailer Mounted Devices

| Page 23

ROAD
WORK
AHEAD

Traffic Control Plans Design



Example



ROAD
WORK
AHEAD

Traffic Control Plans Design



Additional Information

- <https://www.oregon.gov/ODOT/Engineering/Pages/Accessibility.aspx>
- <https://www.oregon.gov/ODOT/Engineering/Pages/Work-Zone.aspx>
- WorkZoneStandards@odot.state.or.us
- Monthly TPAR Meeting, 3rd Tuesday of month, 1 PM, ODOT TLC





Traffic Control Plans Design


Additional Classes – TCP Design



Oregon Department of Transportation - Traffic Control Plans Design Course



Welcome to the Oregon Department of Transportation's (ODOT) Traffic Control Plans Design course! This training course provides designers, engineers or technical staff, members of City or County Public Works offices, inspectors, and private consultant engineering firms an introduction to the policy standards and deliverables that serve as the foundation for developing temporary traffic control plans for construction work along Oregon's Highway System.

The lessons below are not intended to be fully comprehensive, but rather are designed to guide individuals who are working with ODOT to commonly referenced resources, materials, and standard practices to be utilized in the development of temporary traffic control plans for use on Oregon's Highway System. Professionals conducting work outside of ODOT for other agencies should exercise caution in applying standards and practices within these lessons and resources as differences in design policy and standards may exist between ODOT and those established by other agencies.



Traffic Control Plans Design


Additional Classes – TPAR



Oregon Department of Transportation - Temporary Pedestrian Accessible Route (TPAR) Design Course

Welcome to the Oregon Department of Transportation's (ODOT) Temporary Pedestrian Accessible Route Design course! This training provides Designers, Engineers or Technical Staff, members of City or County Public Works offices, inspectors, and private Consultant Engineering Firms an introduction to the policy standards and deliverables that serve as the foundation for developing Temporary Pedestrian Accessible Route (TPAR) Plans for construction activities along Oregon's Highway System.

The lessons below are not intended to be fully comprehensive, but rather are designed to guide individuals who are working with ODOT to commonly referenced resources, materials, and standard practices to be utilized in the development of temporary pedestrian accessible route plans for use on Oregon's Highway System. Professionals conducting work outside of ODOT for other agencies should exercise caution in applying standards and practices within these lessons and resources as differences in design policy and standards may exist between ODOT and those established by other agencies.

Choose an activity below to get started!

ROAD
WORK
AHEAD

Traffic Control Plans Design





Questions/Comments

ROAD
WORK
AHEAD

Traffic Control Plans Design



Urban

- Strengths & Opportunities
- Weaknesses & Threats



ROAD
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AHEAD

Traffic Control Plans Design



Rural Freeway

In developing a TCP, we want to look for:

- Strengths & Opportunities
- Weaknesses & Threats



ROAD
WORK
AHEAD

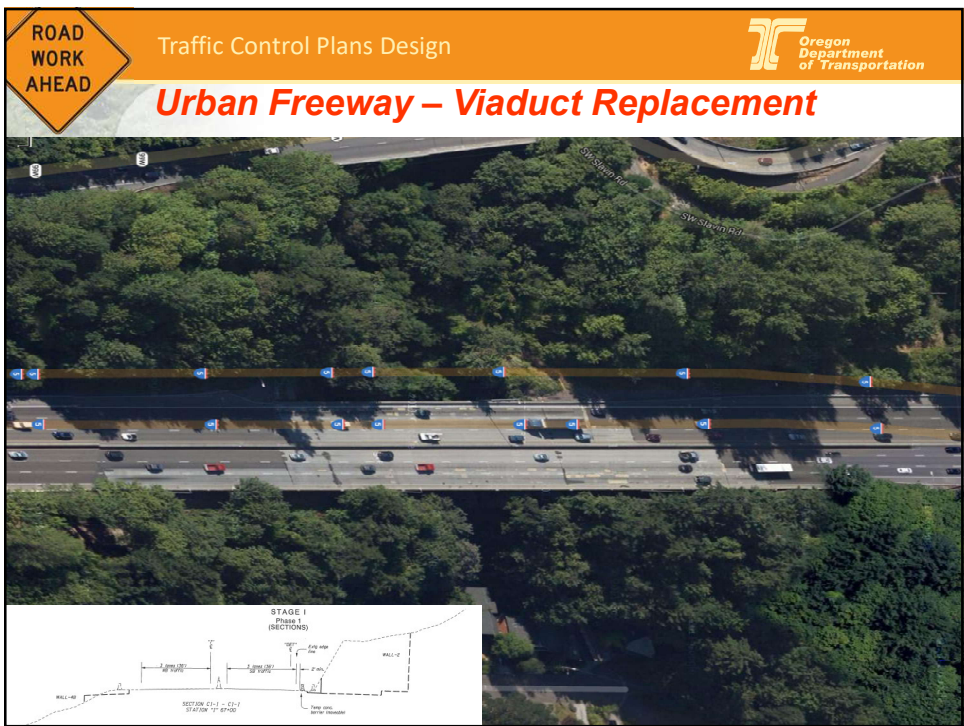
Traffic Control Plans Design



Urban Freeway

- Strengths & Opportunities
- Weaknesses & Threats





Transportation Engineering in School Areas

Gary R. Obery, PE, PTOE
ODOT Traffic-Roadway Section



Why Focus on School Zones?

- Potential to build community, encourage livability, add value to neighborhood
- Also potential for lots of frustration and tragic events
- Demand for more protection, signals, signs, enforcement

Some Basic Design Principles

- Slow speeds
- Reduce number of conflicts
- Increase predictability of ped, bike, and motorist movements
- Increase visibility of ped, bike, and motorist movements
- Minimize roadway widths
- Use treatments to create “place”

Transportation Engineering Fundamentals 2025

Safe Routes to School

- Primary Walking Route
 - Half-mile radius around school
 - Import student points
 - Plot shortest route to school
 - Finalize recommended route



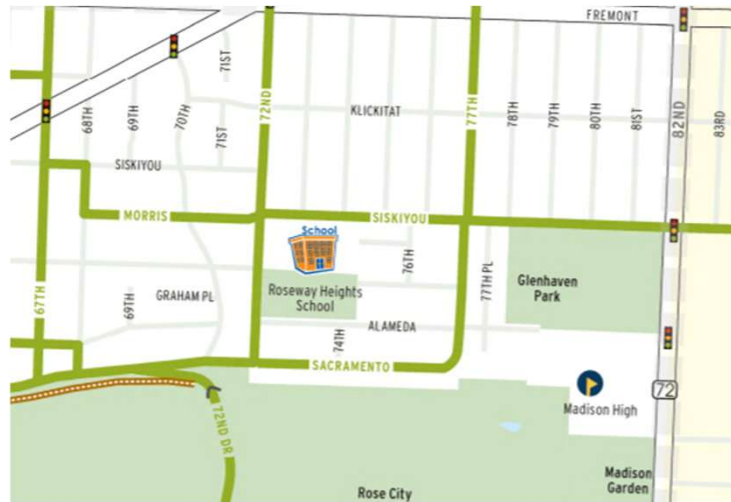
Transportation Engineering Fundamentals 2025

Safe Routes to School

Portland, OR



Oregon State University
College of Engineering



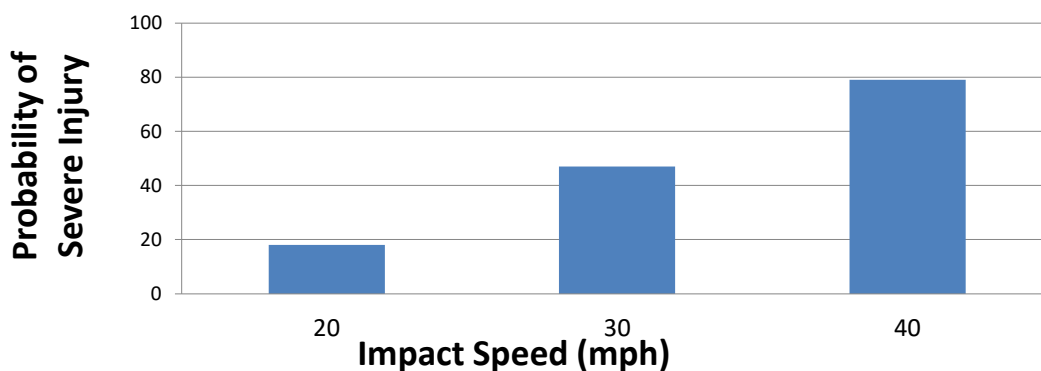
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Pedestrian Crashes

Why is going slow so important?*



Oregon State University
College of Engineering



*Tefft, Brian. *Impact Speed and a Pedestrian's Risk of Severe Injury or Death*. AAA Foundation for Traffic Safety, 2011.

Transportation Engineering Fundamentals 2025

The Law

"School Zone" Definition

ORS 801.462

- Segment adjacent to school grounds "marked by signs"
- A crosswalk that is not adjacent to school grounds and "marked by signs"

ORS 811.235

Notice of school zone must be plainly indicated by traffic control devices conforming with standards adopted by Oregon Transportation Commission.

School Zone Sign



School Speed Limit

ORS 811.111(1)(e)

Adjacent to school grounds:

1. Flashing light; or
2. 7 AM – 5 PM on days when school is in session.

At a crosswalk away from school grounds:

1. Flashing light; or
2. Children are Present

CONDITION "A"



Adjacent to
School Grounds

CONDITION "B"



Crosswalk
Non-adjacent to
School Grounds



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College of Engineering

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School Zone "Fines Higher"

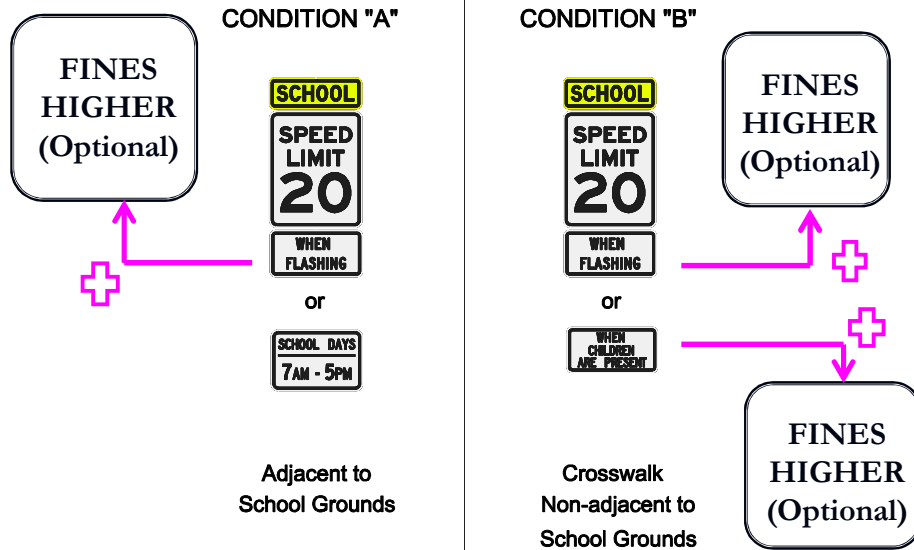
ORS 810.245 and ORS 811.235



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College of Engineering

- Signs must be posted for violators to face higher fines
- Only when -
 - Children are Present; or
 - Flashing lights
- Does not apply to 7 am to 5 pm zones.
- Entirely optional
- Doesn't quite double anymore (~1.8 times)

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Transportation Engineering Fundamentals 2025

"Children Are Present"

ORS 811.124

Children are present at any time and on any day in a school zone when:

- Occupying or walking within the crosswalk; OR
- Occupying or Waiting on the curb or shoulder; OR
- A traffic patrol member is present.

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Operation of a Flashing Light

ORS 811.106

A flashing light “may be operated only at times when children are scheduled to arrive at or leave the school”.

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Transportation Engineering Fundamentals 2025

MUTCD Chapter 7 School Areas

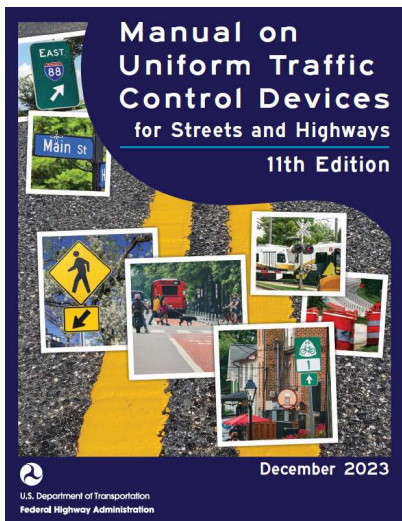
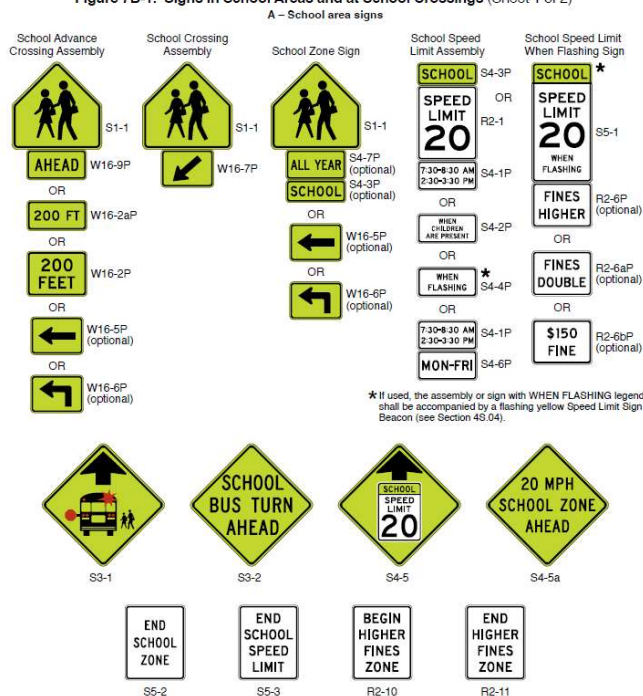


Figure 7B-1. Signs in School Areas and at School Crossings (Sheet 1 of 2)



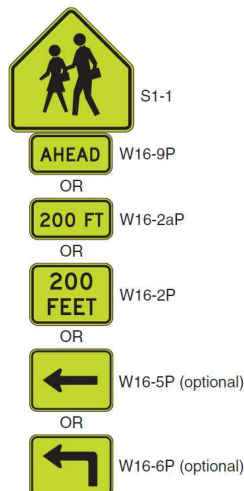
Uses for School Sign S1-1



School Zone



Advance School Crossing



School Crossing



Reduced School Speed Limit Ahead

- Should be used when the posted speed is 35 mph or higher
- Should be posted 150-250' in advance of School Zone sign



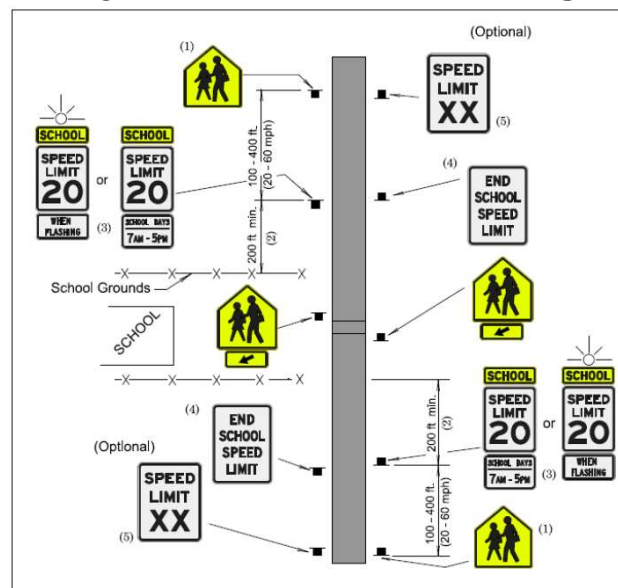
S4-5

Transportation Engineering Fundamentals 2025

Putting it all together

Condition "A" with School Adjacent to School Crossing

ODOT Sign
Policy &
Guidelines

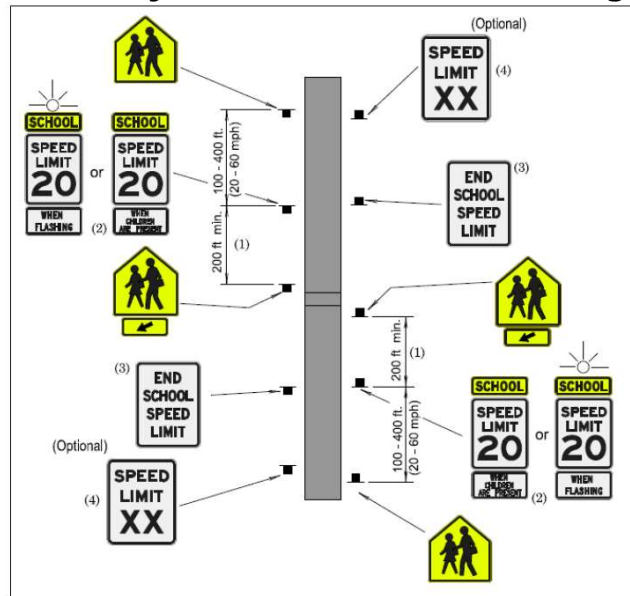


Transportation Engineering Fundamentals 2025

Putting it all together

ODOT Sign Policy & Guidelines

Condition "B" with School NOT Adjacent to School Crossing



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Locations where school speed zones are typically appropriate

- Property houses full time school;
- Roadways adjacent to the school grounds;
- Posted speed is 40 MPH or less;
- One or more marked crosswalk(s) do not have a signal or stop sign



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21

Locations where school speed zones require some justification

- Public early childhood education program;
- Few students currently walk to school;
- The marked school crosswalk is at a signalized intersection or stop sign;
- Children walking on the school's Safe Routes Plan do not cross the roadway

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Locations where school speed zones are discouraged

- Posted speed is 45 MPH or more and other walking routes are available;
- No children desire to walk or bike to school; or,
- When other safety improvements may be more appropriate (i.e., grade separated crossing, pedestrian median refuge, etc).

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Safe School Zones

Beyond Just School Speed Zones

- Safe school crossings
- Safe sidewalks
- Safe bike lanes
- Safe drop-off, pick-up zones



https://www.oregon.gov/ODOT/Engineering/Docs_TrafficEng/Guide_to_School_Area_Safety.pdf

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Safe School Crossings

Fundamental Elements

- Convenient location
- Crossing is visible to drivers
- Pedestrians are visible to drivers
- Crossing is short
- Slow vehicle speeds
- Minimal conflicts



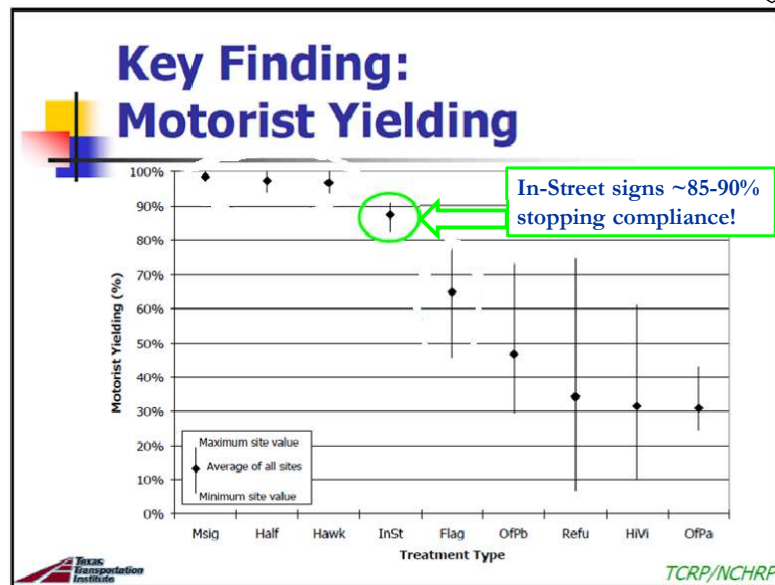
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In-Street Crosswalk Signs



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Stopping Compliance - NCHRP 562



Transportation Engineering Fundamentals 2025

RRFB in School Zone



Transportation Engineering Fundamentals 2025

Traffic Calming in School Zones

- Chicanes
- Traffic Circles
- Mini-Roundabouts
- Roundabouts
- Speed Humps
- Raised Crosswalks
- Raised Intersections
- Street Width Reduction
- Corner Extensions
- School Pavement Markings
- Chokers
- Median Islands
- Road Diet
- Diverter
- Half-closure
- In-Street Signs
- Speed Feedback Signs
- School Speed Zone
- School Crossing Guards

See FHWA Traffic
Calming ePrimer

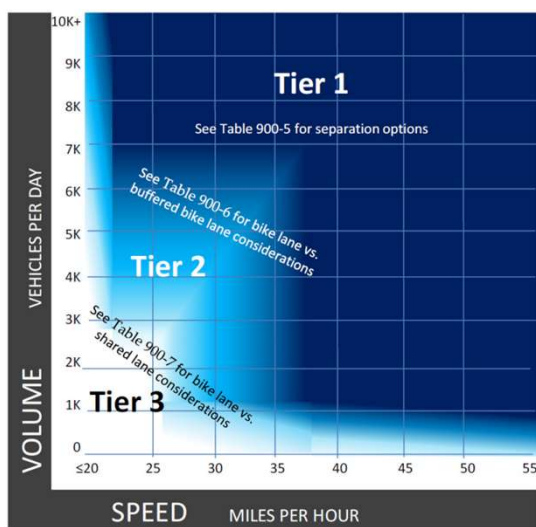
Transportation Engineering Fundamentals 2025

Speed Feedback Signs



Transportation Engineering Fundamentals 2025

Safe Bike Lanes



ODOT Highway Design Manual, Figure 900-4



Separated Bikeway

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Parking Lot Circulation Design Principles

- Separate cars, buses, peds, bikes.
- Slow vehicle speeds
- Don't require students to walk through parking lot
- Separate entry from exit



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Parking Lot Circulation



Transportation Engineering Fundamentals 2025

Bike Parking Areas

Design Principles

- Close to front doors
- Visible from inside building
- Easily accessed from street
- Preferably covered



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Bike Parking

Rack Selection

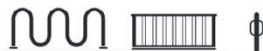
Desirable Attributes

- 2 points of contact on frame
- Allowance for use of U-lock
- No requirement to lift bike
- Accommodate baskets

Racks for ALL Applications



Racks to AVOID



Transportation Engineering Fundamentals 2025

Skateboard Parking



Transportation Engineering Fundamentals 2025

What might be added?



Transportation Engineering Fundamentals 2025

When a Highway Runs Through It (2007)



[US 197 in
Maupin, OR](#)

Transportation Engineering Fundamentals 2025

When a Highway Runs Through It (now)



Transportation Engineering Fundamentals 2025

When a Highway Runs Through It (now)



Transportation Engineering Fundamentals 2025

What's Wrong?



Context

- Condition A - School is adjacent to street.

Recommended Corrections

- Add Flashing beacons to sign.

Transportation Engineering Fundamentals 2025

What's Wrong?



Context

- Condition A - School is adjacent to street.

Recommended Corrections

- Either take down Fines Double sign or change speed zone condition to When Flashing.

Transportation Engineering Fundamentals 2025

What's Wrong?



Context

- School is not adjacent to street.

Recommended Corrections

- Change school speed zone condition to When Flashing or When Children Are Present.

Transportation Engineering Fundamentals 2025



Questions?
Innovative Treatments?

Gary R. Obery
Gary.r.obery@odot.oregon.gov
503-480-6725



THE KIEWIT CENTER FOR INFRASTRUCTURE & TRANSPORTATION

Fundamentals of Transportation Engineering - Virtual Workshop

November 4- December 4, 2025

Instructors

David Hurwitz , Ph.D., F.ITE OSU, School of Civil and Construction Engineering	Frank Belleque , P.E. Traffic Markings & Sign Engineer Oregon Department of Transportation
Albert Wang , Ph.D. OSU, School of Civil and Construction Engineering	Marie Kennedy , P.E. State Sign Engineer Oregon Department of Transportation
Sal Hernandez , Ph.D. OSU, School of Civil and Construction Engineering	Chris Primm , P.E. State Traffic Operations Engineer Oregon Department of Transportation
Logan Scott-Deeter , Ph.D., EIT Assistant Engineer, Olsson Engineering	Brian K. Copeland , P.E. DKS Associates
Aaron Myton , P.E. Senior Interchange Engineer Oregon Department of Transportation	Steve Boice , PE, PTOE DKS Associates
Laura Prusakiewicz , P.E. Traffic Speed Zone Engineer Oregon Department of Transportation	Justin King , P.E. State Work Zone Engineer Oregon Department of Transportation
Camilla Dartnell , P.E. Senior Engineer/Planner Kittelson & Associates	Gary R. Obery , P.E., PTOE Active Modes Traffic Engineer Oregon Department of Transportation
Matt Bell Associate Planner Kittelson & Associates	Rodger Gutierrez , P.E. Bike-Ped Design Engineer Oregon Department of Transportation

NOTE These course notes are a compilation of highway operational characteristics and standards along with the professional opinions of the authors. They are not to be construed as a standard, but rather as a guide to appropriate references for identifying, analyzing, and correcting traffic engineering problems.

DOCUMENT PROTECTION**23 U.S.C.**

United States Code, 2011 Edition

Title 23 - HIGHWAYS

CHAPTER 4 - HIGHWAY SAFETY

§409. Discovery and admission as evidence of certain reports and surveys

Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or railway-highway crossings, pursuant to sections 130, 144, and 148 of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

AGENDA
Transportation Engineering Fundamentals
Module 3

Module 3, Day 2 - Thursday, December 4, 2025

1:00pm	Non-Motorized Modes (Bike, Ped, ADA)	Pg. 4	Rodger Gutierrez &
	BREAK		Taundra Mortensen
2:40pm	Technical Assistance on Temporary Pedestrian Accessible Routes (TPAR) in Oregon	Pg .57	Justin King
	ODOT Specific Q&A		

Nonmotorized Transportation (Walkways, Bikeways and ADA)

Transportation Engineering Fundamentals
Oregon State University
December 4, 2025



OUTLINE



- What is Non-Motorized Transportation
 - History
 - ADA
 - Complete Streets
- Bikeways
- Walkways
- Crossings
- Intersections
- Shared Use Paths
- Final Thoughts

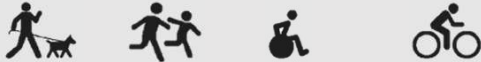


WHAT IS NON-MOTORIZED TRANSPORTATION?

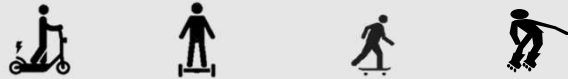
- Human Powered (aka Active Transportation) & includes equestrian

WHAT IS ACTIVE TRANSPORTATION?

- Walking, running, wheelchair, bicycling,...



- Scooting, hover-boarding, skating, roller blading,...



- Includes people of all ages and abilities



- Walk to/from parked car or transit

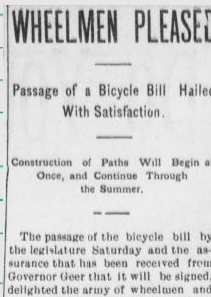


(BICYCLE) TRANSPORTATION HISTORY

1817	Invention of velocipede (bicycle)
1870's-1910's	Good Roads Movement
1886	Invention of Automobile
1899	Oregon's Bicycle Tax
1913	Oregon Highway Division (ODOT)
1919	Oregon's Gas Tax
1941-1945	World War 2, oil rations
1950's-60's	Post-war boom
1967-1972	Experimental Bicycle Lanes
1971	Oregon Bicycle Bill (complete streets law)
1974	Oregon's 1st Bikeway Design Guide, AASHTO's 1st Guide for Bicycle Routes
1978	1st MUTCD with Bicycle Lanes
1980's-2000's	"Effective Cycling"
2010's-20's	Separated bike lanes, E-bikes, Shared micro mobility

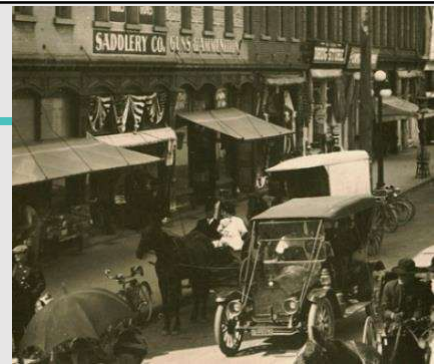


Image: Wikipedia



February 21, 1899

Image: breakfastonbikes.blogspot.com - 5-6-2022



Salem, Oregon 1913

Image: breakfastonbikes.blogspot.com - 11-23-2012



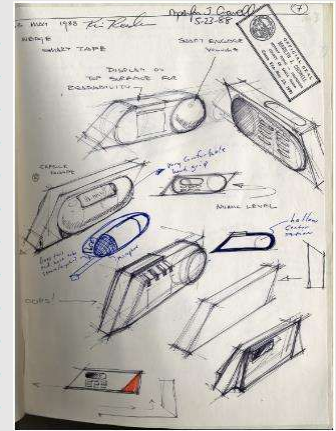
Davis, California, 1967

Image: <https://www.cityofdavis.org/about-davis/history-symbols/first-bicycle-lanes-in-davis>



(ACCESSIBLE) TRANSPORTATION HISTORY

1968	Architectural Barriers Act
1971,1973,1974	Oregon Statutes include "curb cuts"
1973	Rehabilitation Act (Section 504), US Access Board created
1982	Uniform Federal Accessibility Standards (UFAS)
1987	Civil Rights Restoration Act
1990	Americans with Disabilities Act
1991	ADA Accessibility Guidelines (for buildings and sites)
1985-1990, 1992+	Smart Level invented (patent 1990)
1999-2001	Public Rights-of-Way Access Advisory Committee
2004/2006/2010	Revised ADA Standards (for buildings and sites)
2008	ADA Amendment Act
2001/05/11/13	Draft Public ROW Accessibility Guidelines (PROWAG)
2014	Accessibility Guidelines for Outdoor Developed Areas (ABA)
2021/2022	Accessible Electric Vehicle Charging & Autonomous Vehicle
2023/2025	Final PROWAG, adopted by USDOT



Patent drawing for the Smart Level device, 1990. Image: Smithsonian



5

The Americans with Disabilities Act (ADA)

Providing a service to some people and excluding others is considered discrimination.



All 3 photos - Google maps



Sidewalk/Walkway is a service to get to your destination.

Parking is service at the site arrival point.

Pushbutton activators for a signal/ RRFB is service.

6

COMPLETE STREETS – ALLOCATING SPACE



pedbikeimages.org – Nathan Roseberry CDOT

- Pedestrians
- Bicycles
- Transit Vehicles
- Motor Vehicles



WHERE ARE MICRO MOBILITY USERS TO GO?



pedbikeimages.org – Laura Sandt



Image: Google Street view



pedbikeimages.org – Toole Design Group



Image: ODOT



Image: <https://www.dailydot.com/irl/hoverboard-illegal-london/>



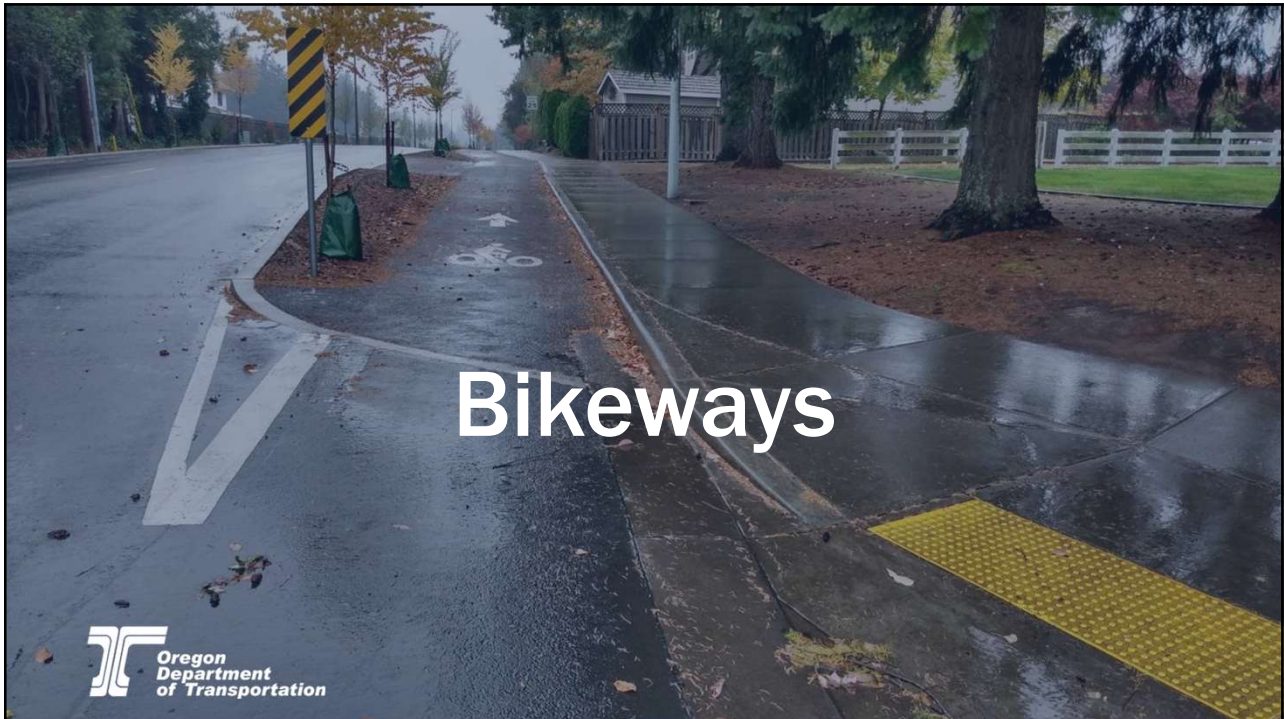
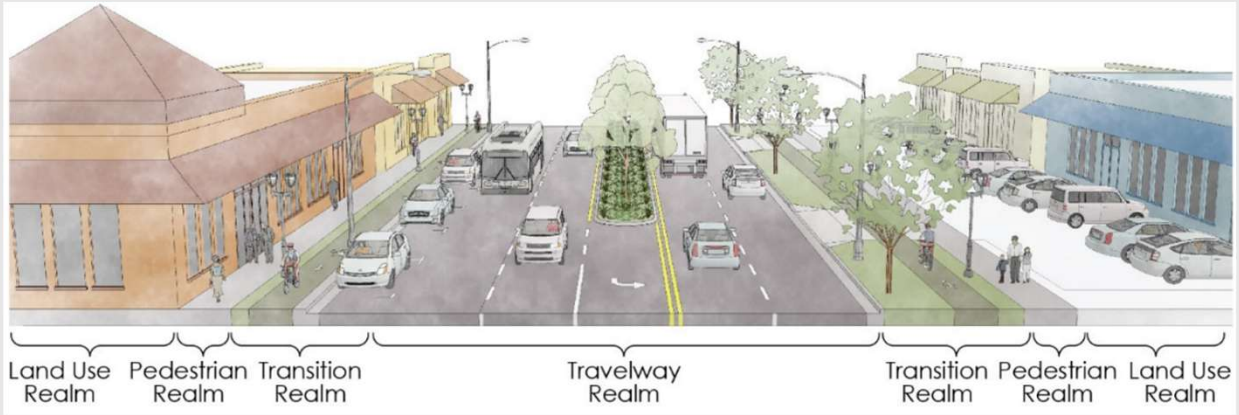
Image: Pexels.com – Mauricio Mascaro



Image: Pexels.com – Maksim Goncharenko



CROSS SECTION REALMS



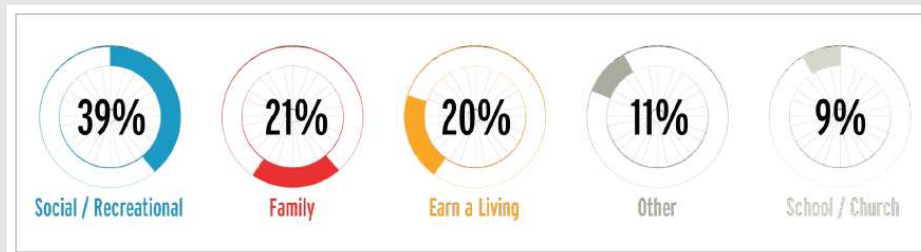
BICYCLING TRIPS

Recreational

- Start and end points are often the same
- Directness of route less important
- Wide range of trip distances
- Groups or individual

Utilitarian

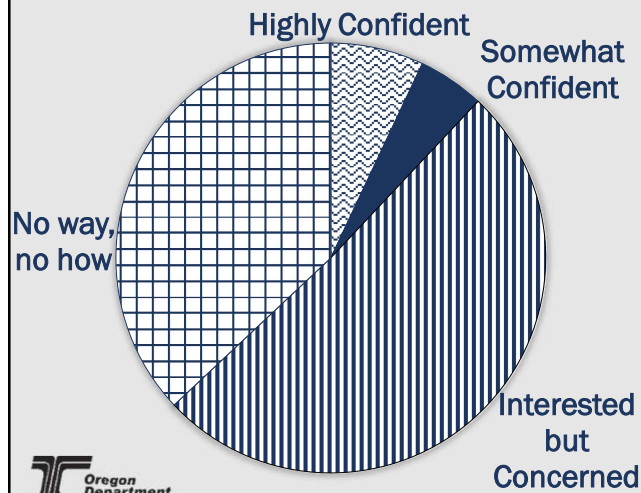
- Frequent starts and stops
- Greater need for secure bicycle parking
- Desire for flat topography and “normal” clothing



League of American Bicyclists using 2017 National Household Travel Survey data

DESIGN USER (BICYCLIST)

Confidence Typologies:



Individual or Group

- School child/children
- Families
- Bike Club Group Rides

Other Bike Lane Users

- Wheelchairs
- Micro-mobility



MOTOR VEHICLE DESIGN SPEED

- People are affected by steep grades when riding
- People are more vulnerable on a bike than in a car



Image: ODOT



Image <https://www.nmsportssystem.com/articles/newbie-blunders-pg75.htm>

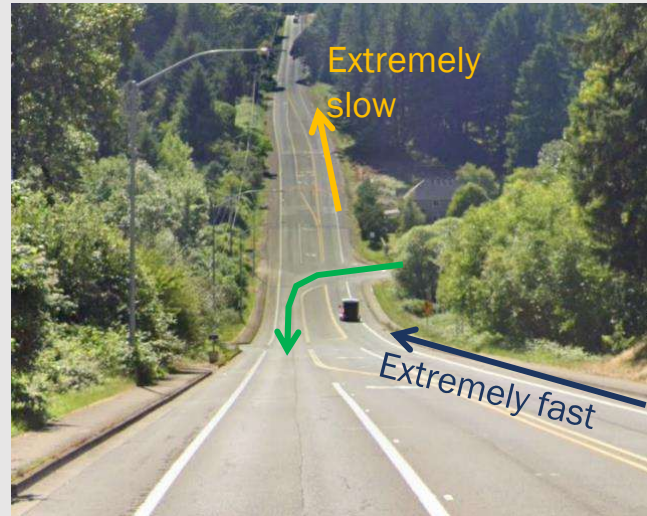


Image: Google Street view



BICYCLIST DESIGN SPEED



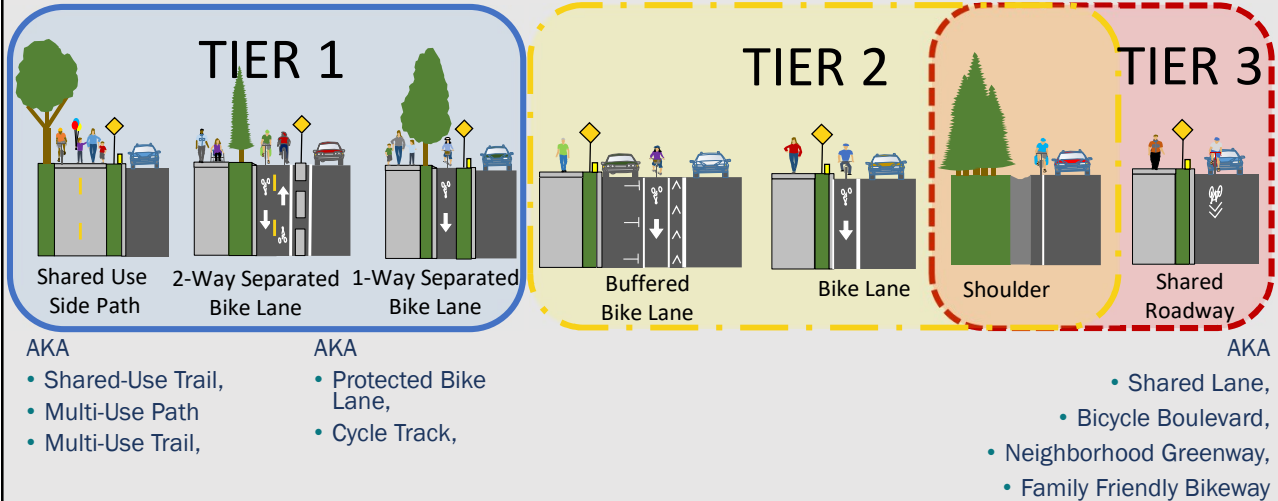
- Alignment, SSD – fastest design user



- Bicycle signals – slower design user



TYPES OF BIKEWAYS



TIER 1 (PHYSICALLY SEPARATED)



One-way Separated Bike Lane



Two-way Separated Bike Lane



Shared Use Side Path



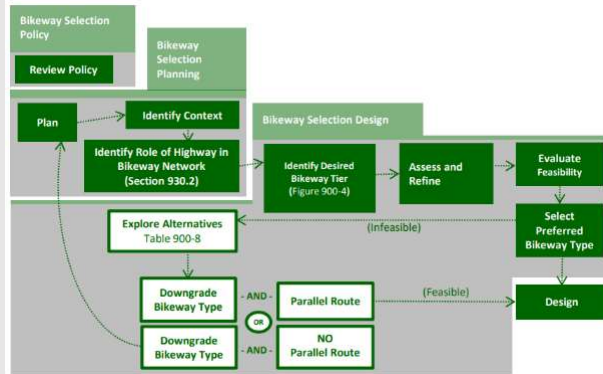
TIER 2 & TIER 3



BIKEWAY SELECTION

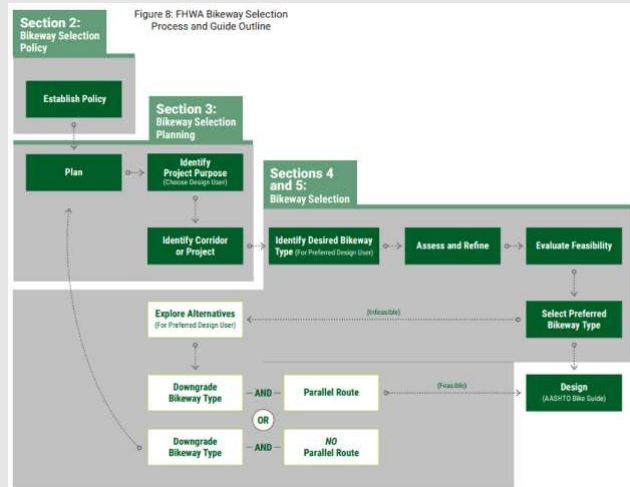
ODOT Highway Design Manual

Figure 900-3: Bicycle Facility Selection Process ²⁰



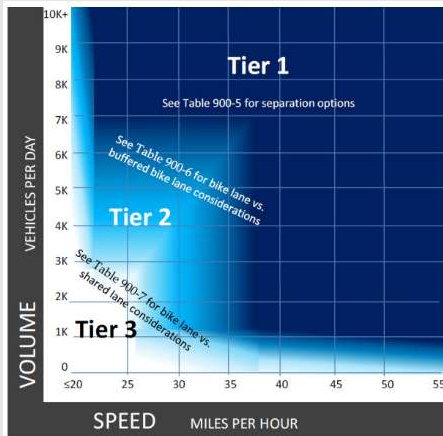
FHWA Bikeway Selection Guide

Figure 8: FHWA Bikeway Selection Process and Guide Outline

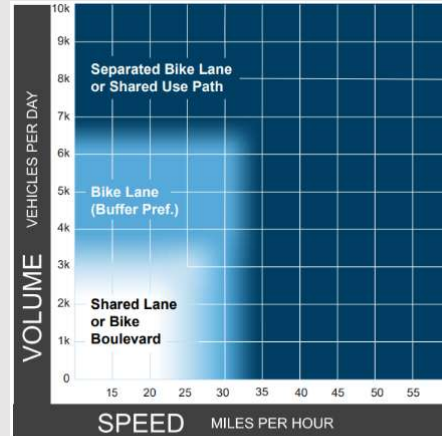


BIKEWAY SELECTION

ODOT Highway Design Manual



FHWA Bikeway Selection Guide



Notes

1. Chart assumes operating speeds are similar to posted speeds. If they differ, use operating speed rather than posted speed.
2. Advisory bike lanes may be an option where traffic volume is <3K ADT.
3. See page 32 for a discussion of alternatives if the preferred bikeway type is not feasible.

TRANSITION REALM & BIKEWAY ZONES



BIKE LANE ZONE

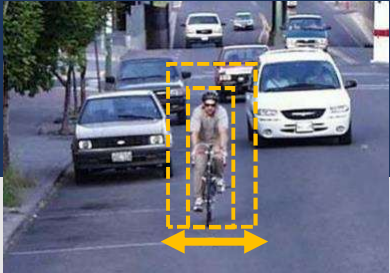


Image: ODOT

Bicyclist
Physical width $\approx 2.5'$
Operating width $\approx 3.5'$
+ shy space
• curb, fence, trees, poles, etc.
• door zone, moving vehicles
6' standard

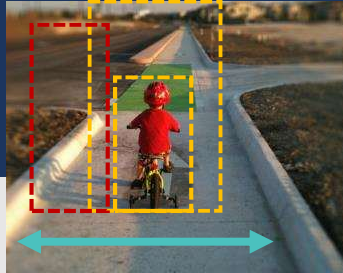


Image: pedbikeimages.org - Greg Griffin

Width to pass another bicyclist
Physical width x 2
+ 0.5'-1' between
+ shy space both sides
Operating width overlaps
6.5' minimum

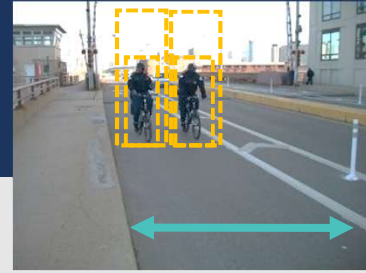


Image: pedbikeimages.org - Chicago DOT

Width to ride side-by-side
Operating width x 2
+ 0.5'-1' between operating width
Operating width not overlapping
8' + preferred

STREET BUFFER ZONE

Parking Lane



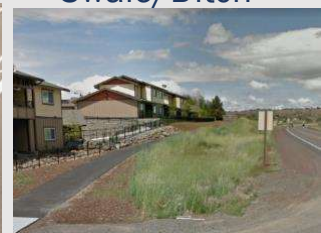
Raised Island



Flexible Posts



Swale/Ditch



Planter Boxes



Landscaping



Image: ODOT

Guardrail/Barrier



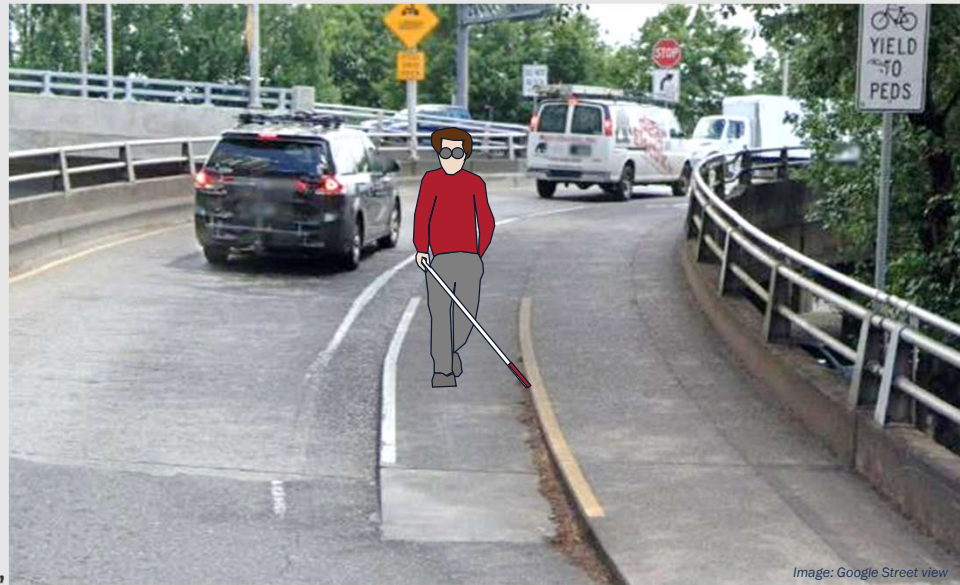
All other Images: Google Street view

Bio-swale



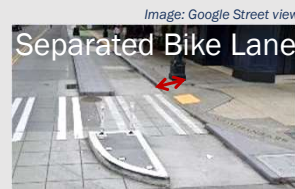
pedbikeimages.org - Carl Sundstrom

SIDEWALK BUFFER ZONE



ALL BIKEWAYS HAVE ALL 3 BIKE LANE ZONES

Sidewalk Buffer Zone



Bicycle Lane Zone



Street Buffer Zone

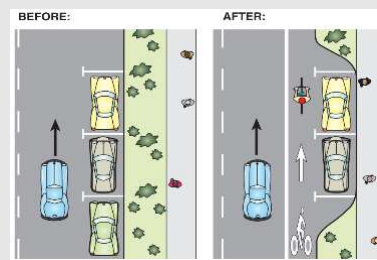
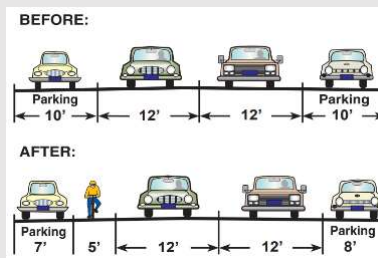
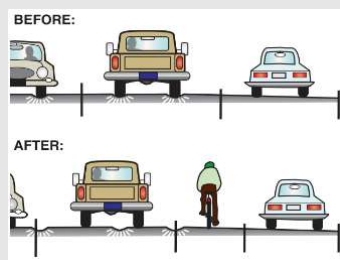
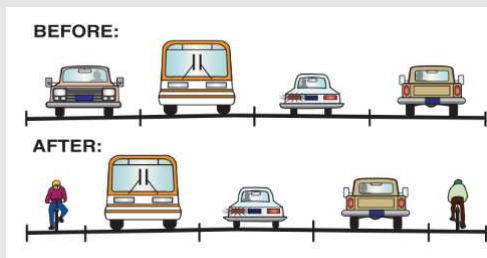


RESTRIPING TO PROVIDE BIKE LANES

- Reduce lane widths
- Modify parking
- Remove parking one side
- Narrow parking lanes
- Reduce number of lanes
- Quick-Build, demonstration



RESTRIPING TO PROVIDE BIKE LANES



OTHER USES OF THE ROAD SPACE



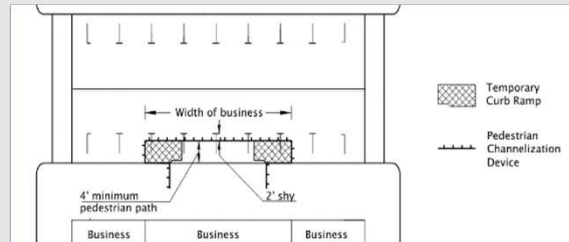
Image: NACTO



Image: www.vermontpublic.org/vpr-news/2014-06-05/states-first-parklet-opens-friday-in-montpelier



ODOT



ODOT



SHARED MICRO MOBILITY Docking Stations, Docking Areas, Dockless



pedbikeimages.org – Greg Griffin



pedbikeimages.org – TREC



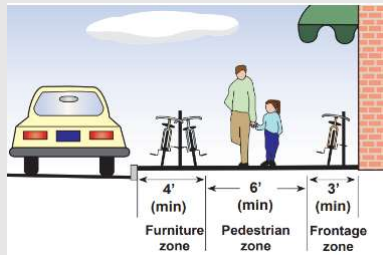
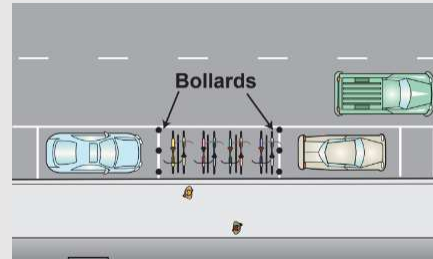
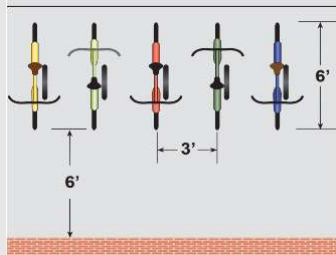
pedbikeimages.org – Elizabeth Hilton



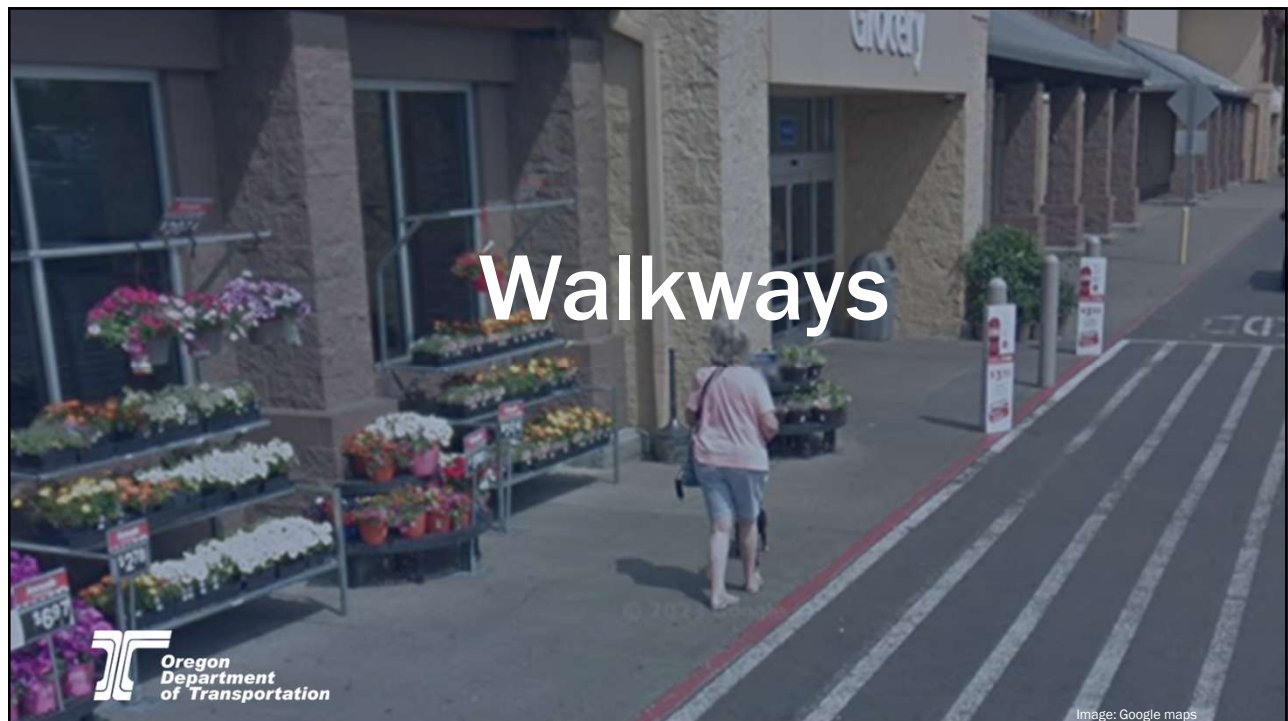
pedbikeimages.org – Toole Design Group



BICYCLE PARKING



Walkways



TYPES OF WALKWAYS



Sidewalk

Image: ODOT



Shared Use Path

Image: ODOT



Walkway within a Site

Image: ODOT



Shared Street

Image: ODOT



Shoulder

Image: ODOT Flickr

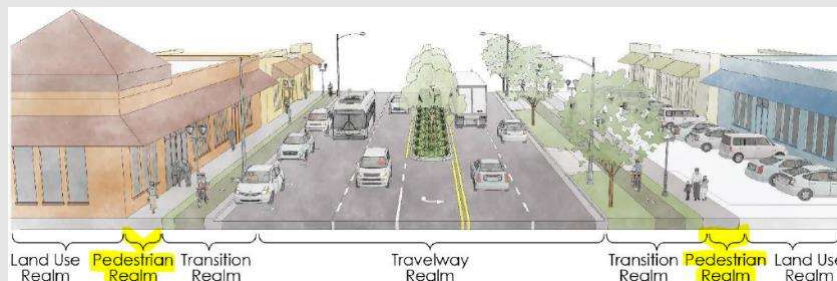


Pedestrian Lane

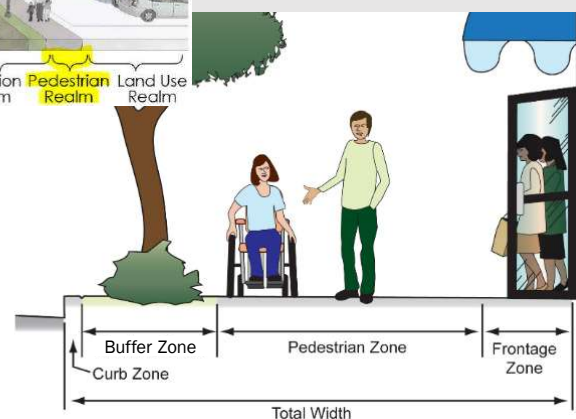
Image: Google maps



THE SIDEWALK ZONE SYSTEM

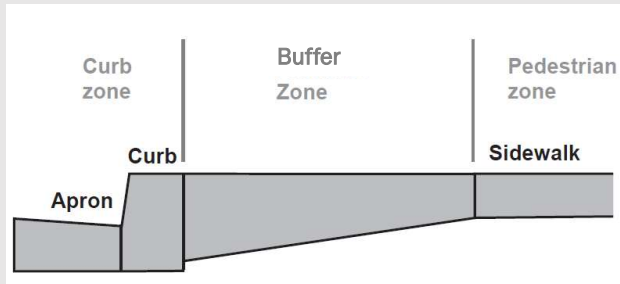


Land Use Realm Pedestrian Realm Transition Realm Travelway Realm Transition Realm Pedestrian Realm Land Use Realm

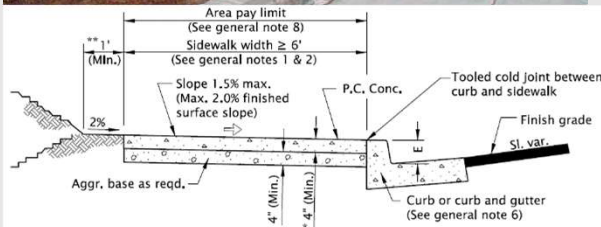


THE BUFFER (OR FURNITURE) ZONE

- Pedestrians separated from traffic (sense of security and comfort);
- Place objects outside of walking zone (bicycle parking, poles, posts, mailboxes, parking meters, fire hydrants, etc.)
- Street trees and other landscaping (select plants that require little maintenance, with roots that don't buckle sidewalks)
- The sidewalk can stay level across driveways;
- Helps with ramp alignment to crosswalks
- Improves drainage
- Snow storage during winter.



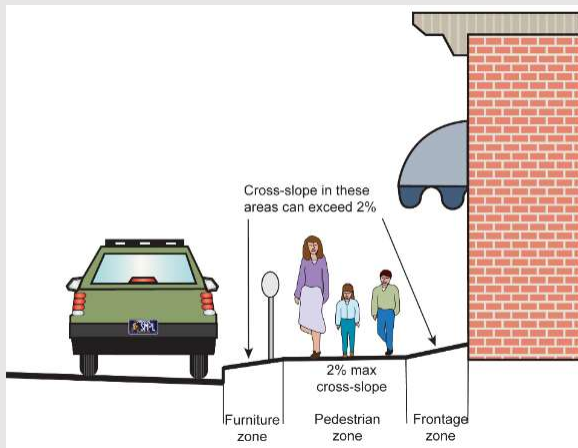
THE FRONTAGE ZONE



From the ped zone up to the property line
Business Districts:

- The area for activity and objects associated with adjacent properties
- Door zones
- Window shopping
- Outdoor dining
- Takeout windows

THE PEDESTRIAN (WALKING) ZONE



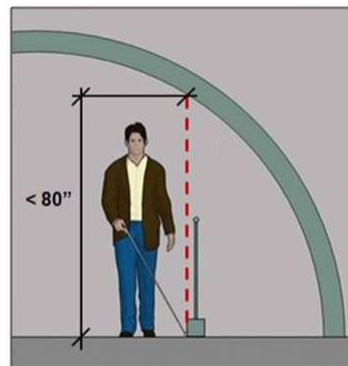
CONSIDERATIONS FOR SIDEWALK WIDTH



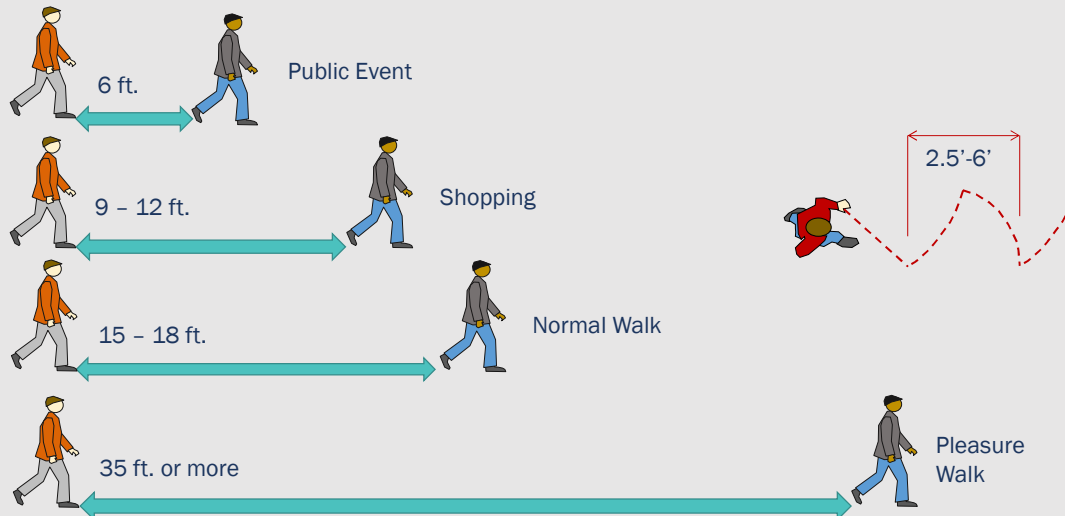
A photograph showing a man in a wheelchair being pushed by a woman on a paved path. The man is wearing a striped shirt and jeans. The woman is wearing a blue shirt and khaki pants. They are outdoors, with a large tree on the right and a green hedge on the left.



A top-down diagram of a person on a treadmill. The person is wearing a blue shirt and dark pants. The treadmill has two side rails. Four arrows indicate movement directions: an upward arrow on the left side rail, a downward arrow on the right side rail, and two curved arrows forming a circle around the person, one pointing clockwise and one pointing counter-clockwise.



PEDESTRIAN SPATIAL BUBBLES



Source: Adapted from AASHTO Pedestrian Guide Figure 2-7, Preferred Distance of Unobstructed Forward Vision Based on Different Types of Walking, Washington State DOT, 1997

39

TACTILE WALKING SURFACE INDICATORS

DETECTABLE WARNING SURFACE (DWS)
DOTS – ATTENTION PATTERN

TACTILE DIRECTIONAL INDICATOR (TDI)
BARS – GUIDE PATTERN

TACTILE WARNING DELINEATOR (TWD)
BOUNDARY EDGE

New Research Report (2024):
TCRP B-46
Tactile Wayfinding in Transportation Settings for Travelers Who Are Blind or Visually Impaired



Images above: ODOT

Image: Linda Myers from TCRP B-46

Image: Beezy Bentzen, from TCRP B-46

FOUR USES FOR TDI GUIDE STRIPS

Sidewalk Alert



Image: Sarah O'Brien, from TCRP B-46

Wayfinding



Image: Sarah O'Brien, from TCRP B-46

Bike Ramps

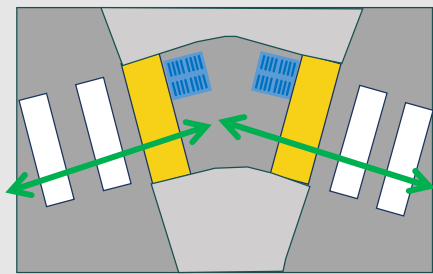
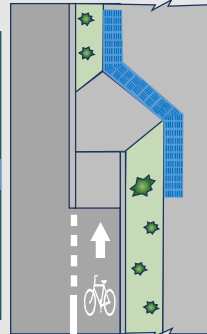
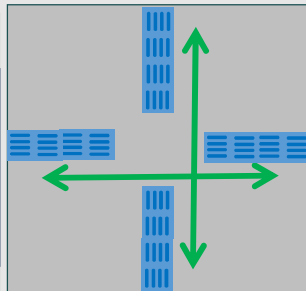
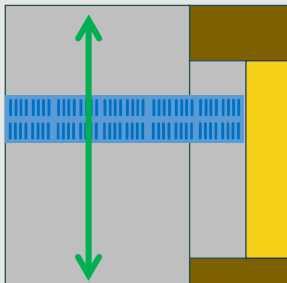


Image: ODOT

Crosswalk Alignment



Image: Beezy Bentzen, from TCRP B-46



DESIGN PRINCIPLE: Direct Routes and Path of Travel

- Obstructions in walkways can make them inaccessible for persons with disabilities and are a nuisance for everyone.
- Meandering walkways are not efficient

Design Principle: Shortest Route



Sidewalk in-fill, goat trails



Using the shoulder as the path of travel

DESIGN PRINCIPLE:

Provide walkways on both sides of a street.

The shortest route means not having to cross the street to use a walkway (sidewalk).

44

DESIGN PRINCIPLE: PROPER DRAINAGE



DESIGN PRINCIPLE: CONNECT TO EXISTING SIDEWALK



DESIGN PRINCIPLE: CONSIDER SNOW PLOWING



DESIGN PRINCIPLE: DIRECT WHETHER TO CURB



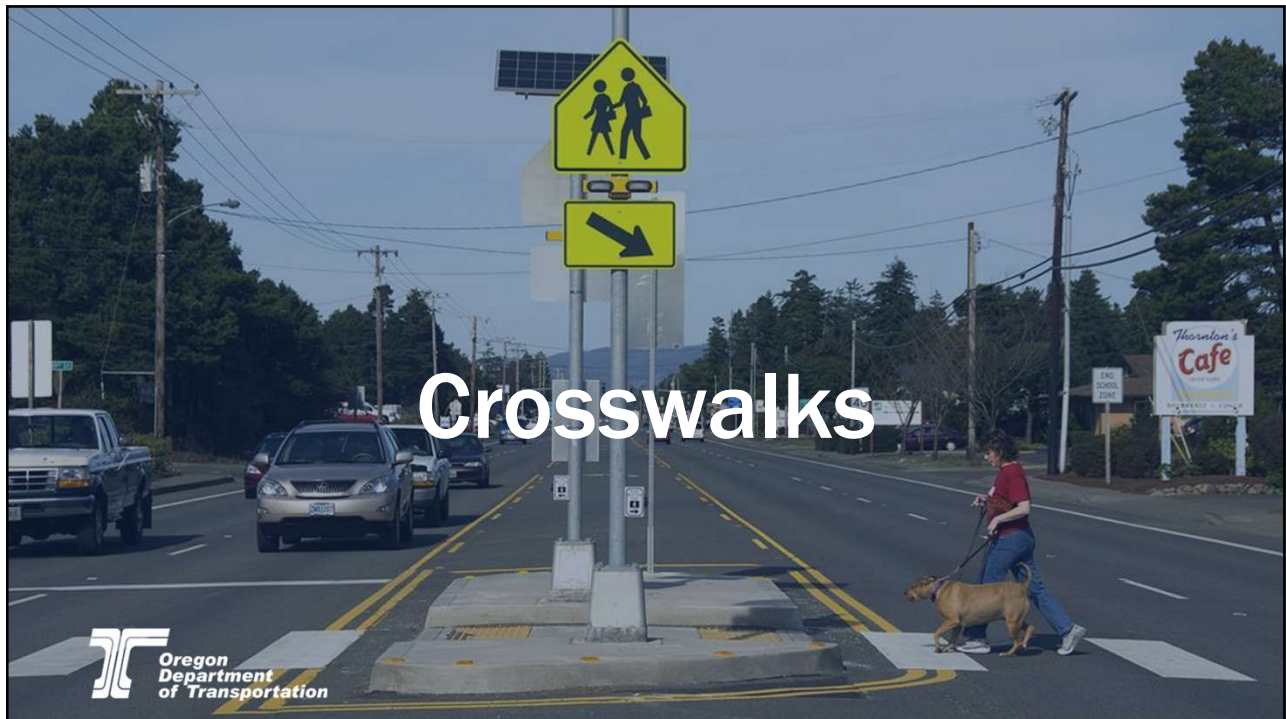
WHERE THE SIDEWALK ENDS



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49

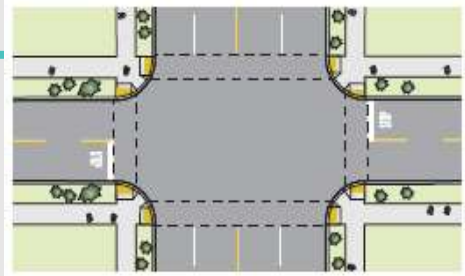


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Department
of Transportation

WHAT IS A CROSSWALK?

Extension of the sidewalk, curb, shoulder or edge of roadway across the intersection of two public streets.

Outside an intersection, a crosswalk is created with MUTCD-compliant markings.



Marked Crosswalks

Mid-block Crosswalk

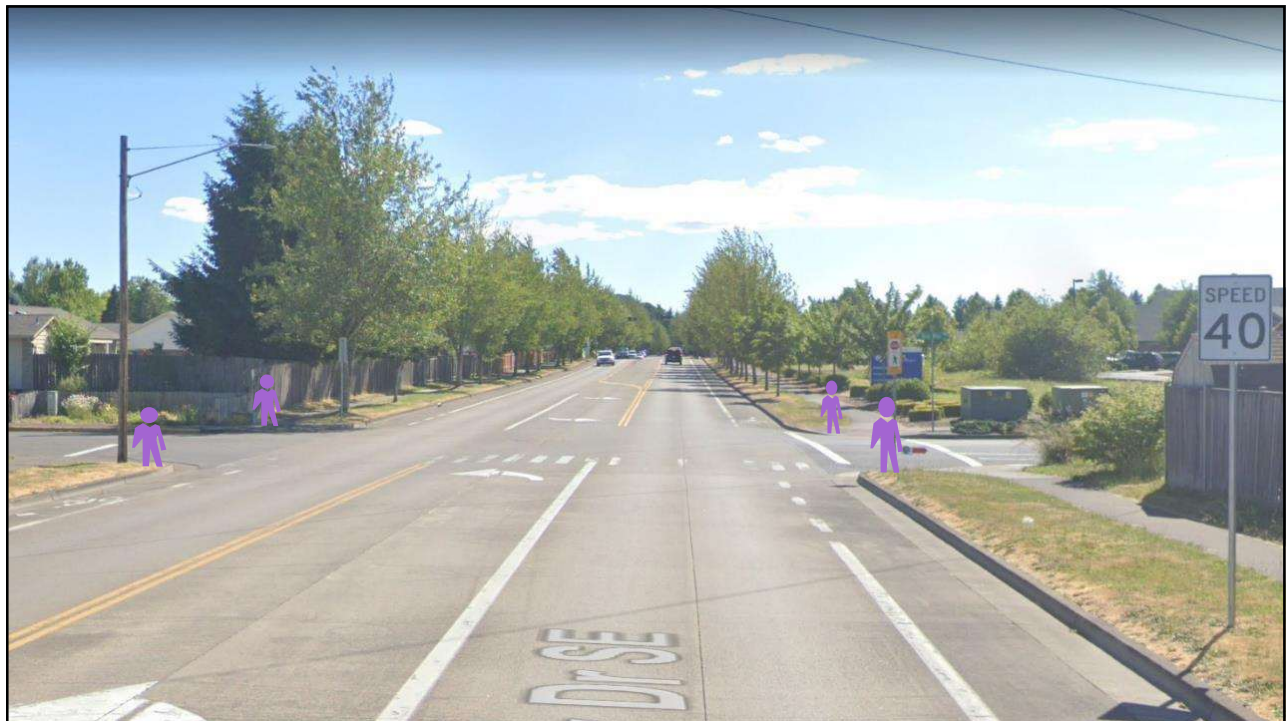
Unmarked Crosswalk



CROSSWALK CLOSURE BARRICADES



- Curb Ramps are not required where a crosswalk is closed.
- If pedestrian crossing is prohibited, signs and detectable features are required.
- Closure barricade should be directly in line with walking path



CROSSWALK TREATMENT SELECTION

ODOT Traffic Manual
Table 310.3-A (2022)

FHWA Guide for Improving Ped Safety at
Uncontrolled Crossing Locations (2019)

Table 310.3-A: Uncontrolled marked crosswalk treatments

Lanes Crossed**	Refuge Island	AADT & Posted Speed***											
		<3000 veh/day			3000-9000 veh/day			9000-12,000 veh/day			12,000-15,000 veh/day		
		≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph
1	N/A	A B C	E I	C	A B C	E I	C	A B C	E I	C	A B C	E I	C
2	Yes	A B C	E I	C	A B C	E I	C	A B C	E I	C	A B C	E I	C
	No	D E F	E I	C	D E F	E I	C	D E F	E I	C	D E F	E I	C
3	Yes	A B C	E I	C	A B C	E I	C	A B C	E I	C	A B C	E I	C
	No	D E F	E I	C	D E F	E I	C	D E F	E I	C	D E F	E I	C
4	Yes	A B C	E I	C	A B C	E I	C	A B C	E I	C	A B C	E I	C
	No	D E F	E I	C	D E F	E I	C	D E F	E I	C	D E F	E I	C



Table 1. Application of pedestrian crash countermeasures by roadway feature.

Roadway Configuration	Posted Speed Limit and AADT								
	Vehicle AADT <9,000			Vehicle AADT 9,000-15,000			Vehicle AADT >15,000		
	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph
2 lanes (1 lane in each direction)	1 2 4 5 6	1 2 5 6	1 2 5 6	1 2 4 5 6	1 2 5 6	1 2 5 6	1 2 4 5 6	1 2 5 6	1 2 5 6
3 lanes with raised median (1 lane in each direction)	1 2 3 4 5	1 2 3 5	1 2 3 5	1 2 3 4 5	1 2 3 5	1 2 3 5	1 2 3 4 5	1 2 3 5	1 2 3 5
3 lanes w/o raised median (1 lane in each direction with a two-way left-turn lane)	1 2 3 4 5 6	1 2 3 5 6	1 2 3 5 6	1 2 3 4 5 6	1 2 3 5 6	1 2 3 5 6	1 2 3 4 5 6	1 2 3 5 6	1 2 3 5 6
4+ lanes with raised median (2 or more lanes in each direction)	1 2 3 4 5 6	1 2 3 5 6	1 2 3 5 6	1 2 3 4 5 6	1 2 3 5 6	1 2 3 5 6	1 2 3 4 5 6	1 2 3 5 6	1 2 3 5 6
4+ lanes w/o raised median (2 or more lanes in each direction)	1 2 3 4 5 6	1 2 3 5 6	1 2 3 5 6	1 2 3 4 5 6	1 2 3 5 6	1 2 3 5 6	1 2 3 4 5 6	1 2 3 5 6	1 2 3 5 6

TYPES OF CROSSING TREATMENTS



MARKED CROSSWALK
(SIGNS & ILLUM.)



RAISED CROSSWALK



ADVANCED SIGNS
& STOP BARS



IN-STREET PED.
CROSSING SIGN



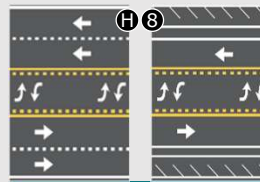
CURB EXTENSIONS



PEDESTRIAN
REFUGE ISLAND



RECTANGULAR RAPID
FLASHING BEACON (RRFB)

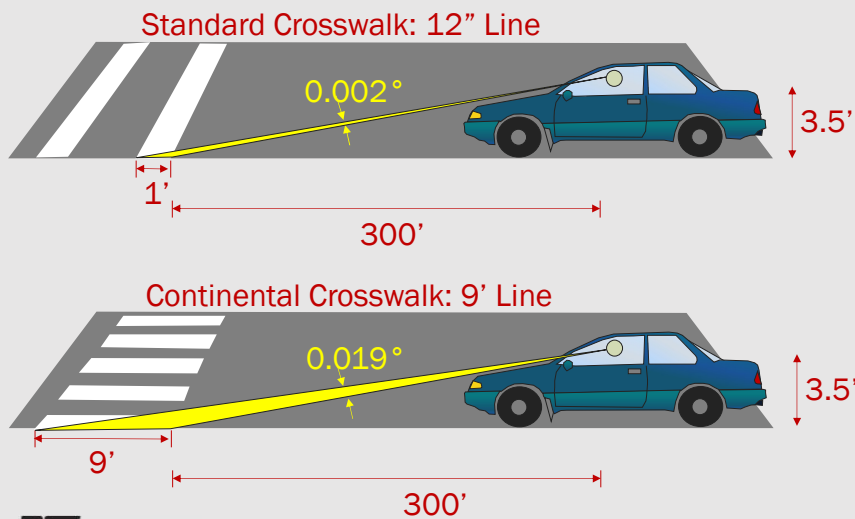


REDUCE NUMBER OF
LANES TO CROSS



PED HYBRID BEACON (PHB)
OR PEDESTRIAN SIGNAL

HIGH VISIBILITY CROSSWALK MARKINGS



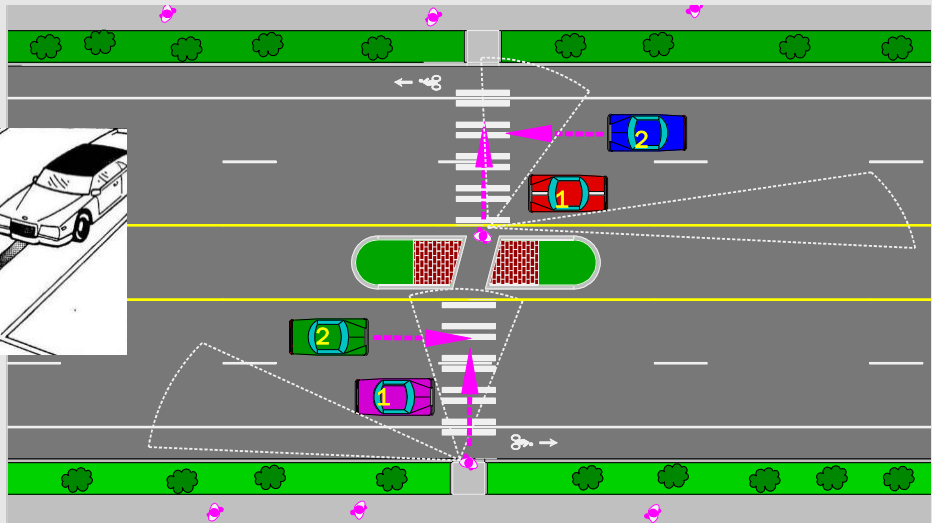
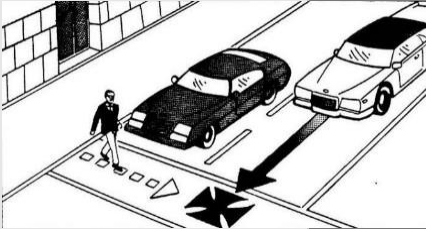
 Oregon
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of Transportation

COLORED/TEXTURED PAVEMENT ≠ MARKED



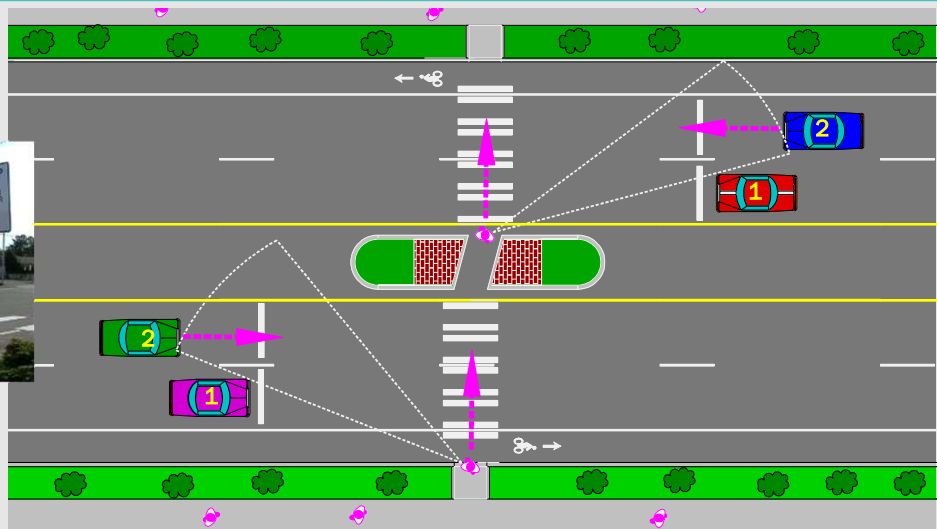
 Oregon
Department
of Transportation

MULTIPLE-THREAT CRASH



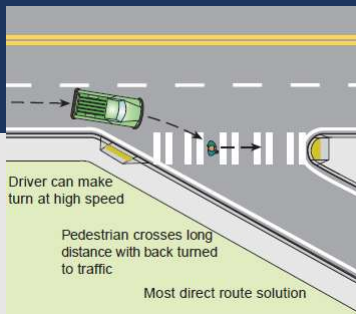
Problem: Car 1 stops to let pedestrian cross; car 1 masks car 2, which doesn't stop, hits pedestrian at high speed.

ADVANCE STOP BAR

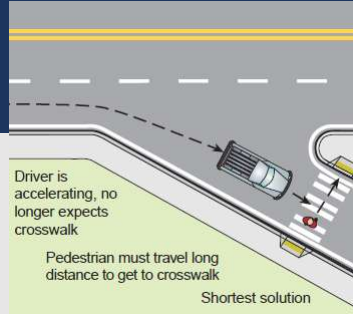


Solution: place advance stop bar, so car 1 stops further back; car 1 no longer masks car 2, which can be seen by pedestrian.

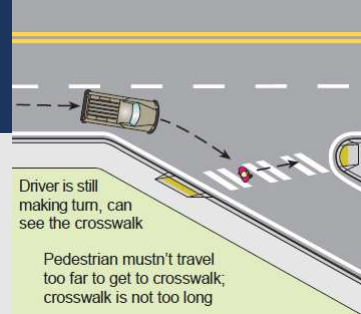
Crosswalk Placement



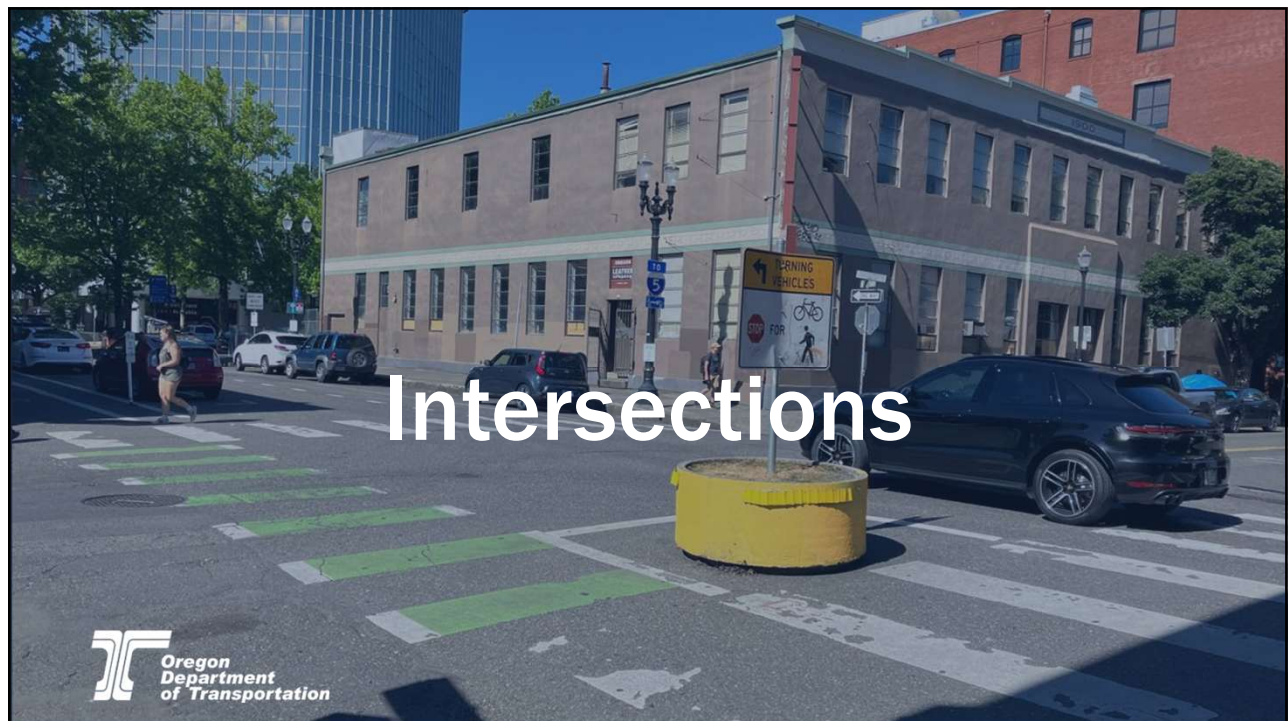
Crosswalk placed at most direct route



Crosswalk placed at shortest crossing point



Crosswalk placed midway between direct and shortest routes



What is an intersection?

Oregon Statute 801.320

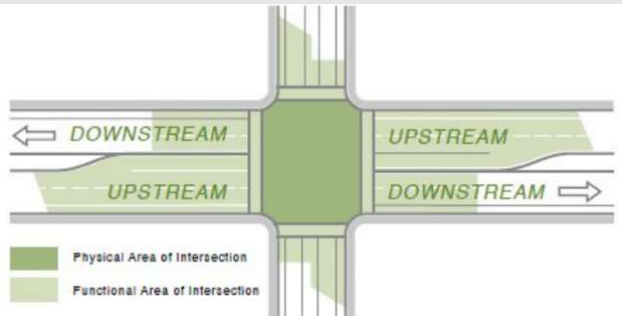
...area of a roadway created when two or more roadways join together...

- ...at any angle...
- ...The junction of an alley with a roadway does not constitute an intersection...

MUTCD: 1A.13 #94

...area... two highways that join one another...

- ...approximately at right angles...OR
- ...area within which vehicles traveling on different highways that join at any other angle might come into conflict...
- ...alley or driveway...shall not constitute an intersection, unless the roadway or highway at said junction is controlled by a traffic control device...

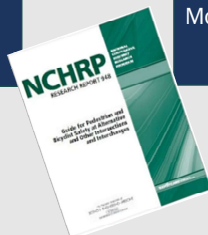


20 FLAGS TO ASSESS INTERSECTION SAFETY

PEDESTRIAN FLAGS

- Motor vehicle right turn
- Uncomfortable/Tight Walking Environment
- Non-intuitive Motor vehicle movement

NCHRP 948



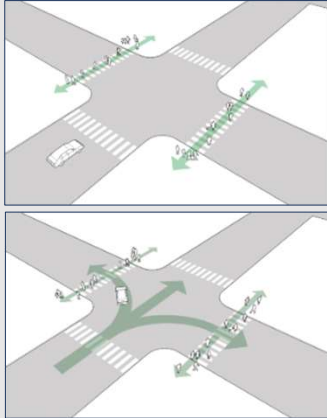
BOTH

- Crossing Yield or Uncontrolled Vehicle Paths
- Multilane Crossing
- Motor Vehicle Left Turn
- Indirect Paths
- Long Red Times
- Intersecting Driveways and Side Streets
- Grade Change
- Executing Unusual Movements
- Undefined Crossing at Intersection
- Sight Distance for Gap Acceptance

BICYCLIST FLAGS

- Riding in Mixed Traffic
- Lane Change Across Motor Vehicle Lanes
- Turning Motorists Crossing Bicycle Path
- Bicycle Clearance Times
- Channelized Lanes
- Riding Between Travel Lanes
- Off-Tracking Trucks in Multi-Lane Curves

MANAGE TURN CONFLICTS



Images: FHWA

Protected Phasing
Caution – Flashing Yellow Arrow
& Permissive Lefts



Image: ODOT

Leading Pedestrian (Bicycle) Interval

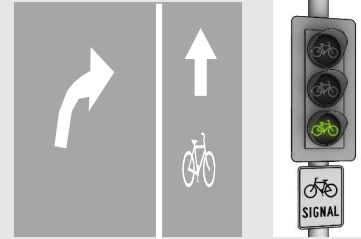
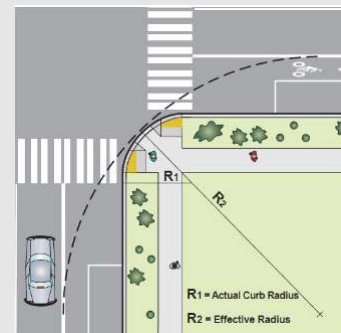
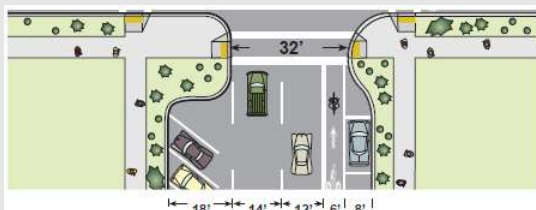
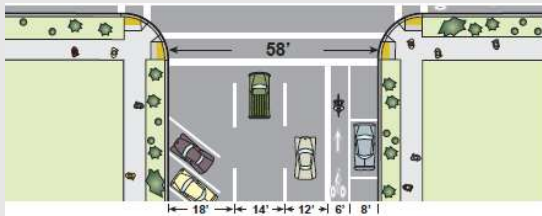


Image: Google

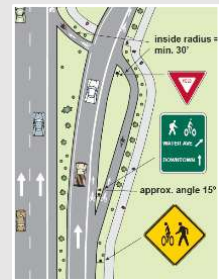
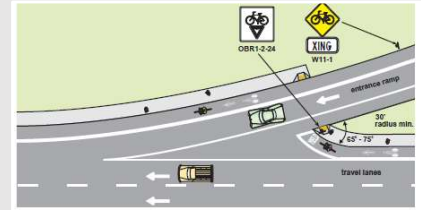
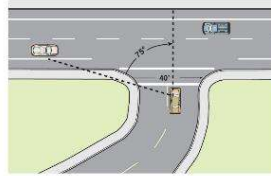
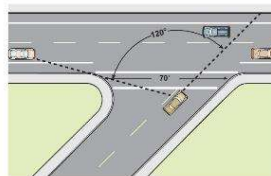
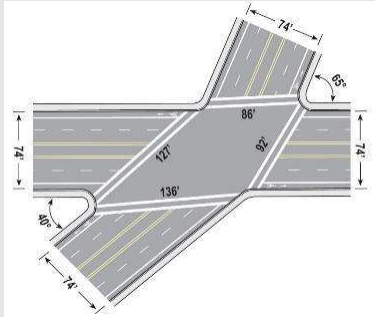
Right Turn Across Bike Lane Conflict

MINIMIZE CROSSWALK LENGTH



SKEWED INTERSECTIONS & INTERCHANGES

- Simple right angle intersections are best for bicycle and pedestrian movement. The problems are more complex at skewed and multi-legged intersections.
- Free-flowing movements should be avoided



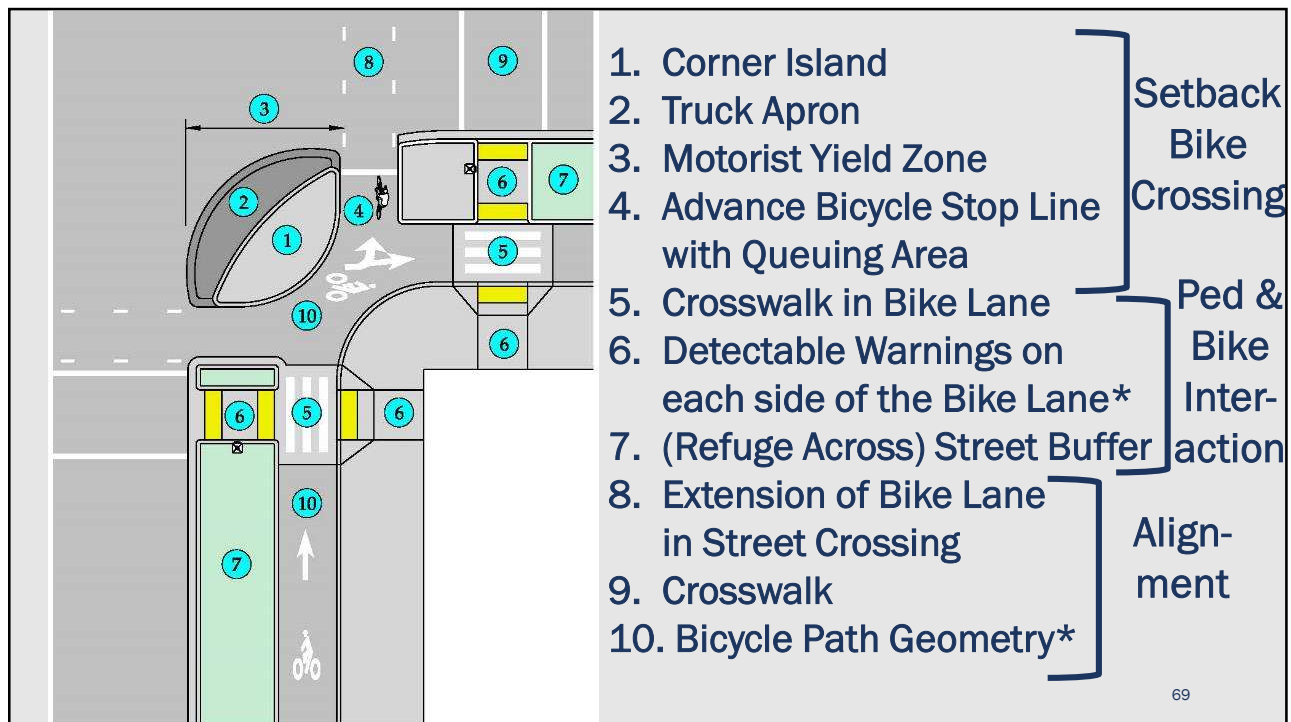
PURPOSE OF PROTECTED INTERSECTION

There are two main purposes for a protected intersection:

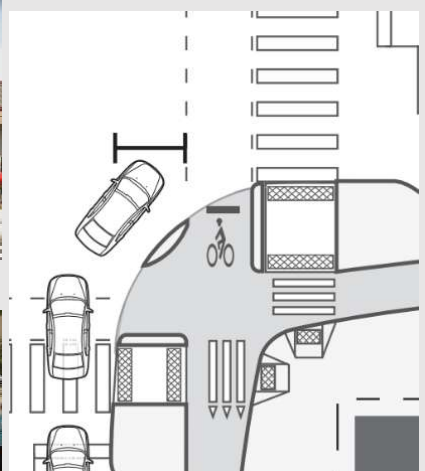
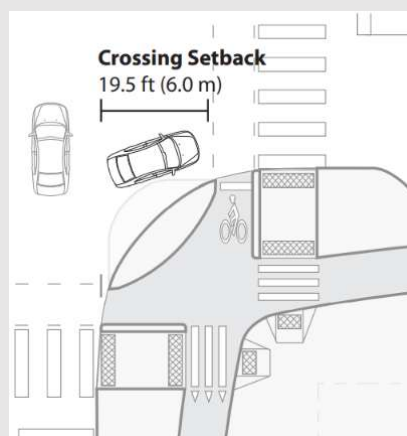
- Mitigating unprotected conflicts between through bikes and right or left turning vehicles;
- Facilitating two-stage left turns for bikes in a protected space.

Sources:
Photos - Google
Cartoony Bikes - I drew them.





1,2,3,4 WHAT'S A SETBACK BICYCLE CROSSING?



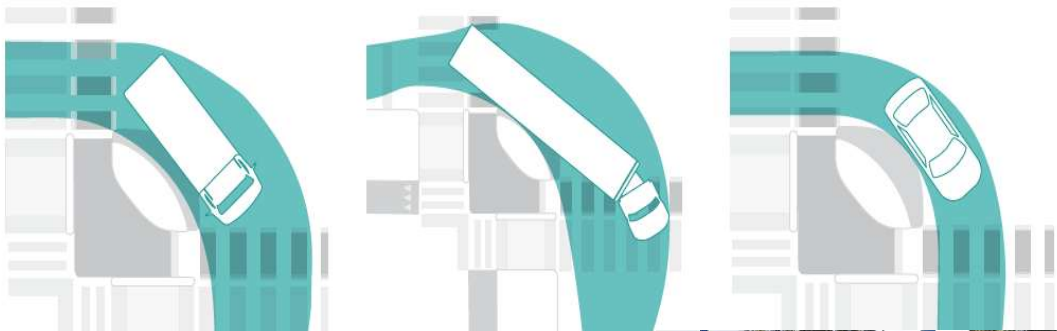
Sources:
Diagrams - Alta Planning
Photos - Google

1. SETBACK BIKE CROSSING → CORNER ISLAND



Sources:
Photos - Google

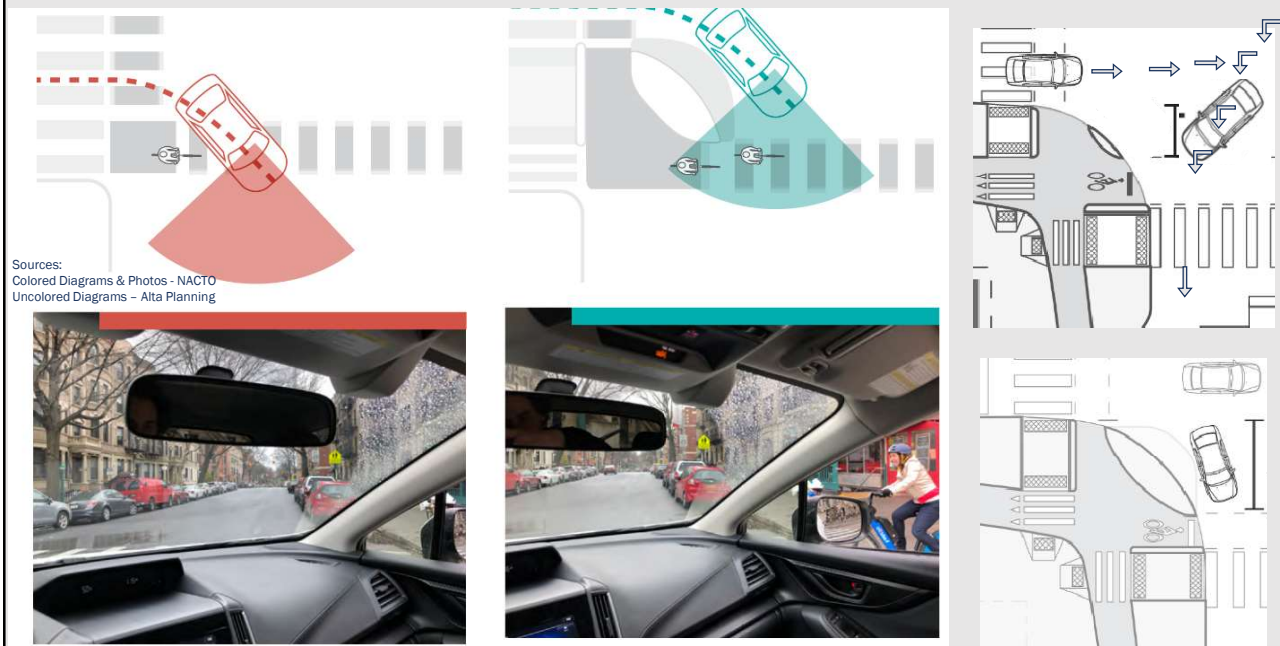
2. SETBACK BIKE CROSSING → TRUCK APRON



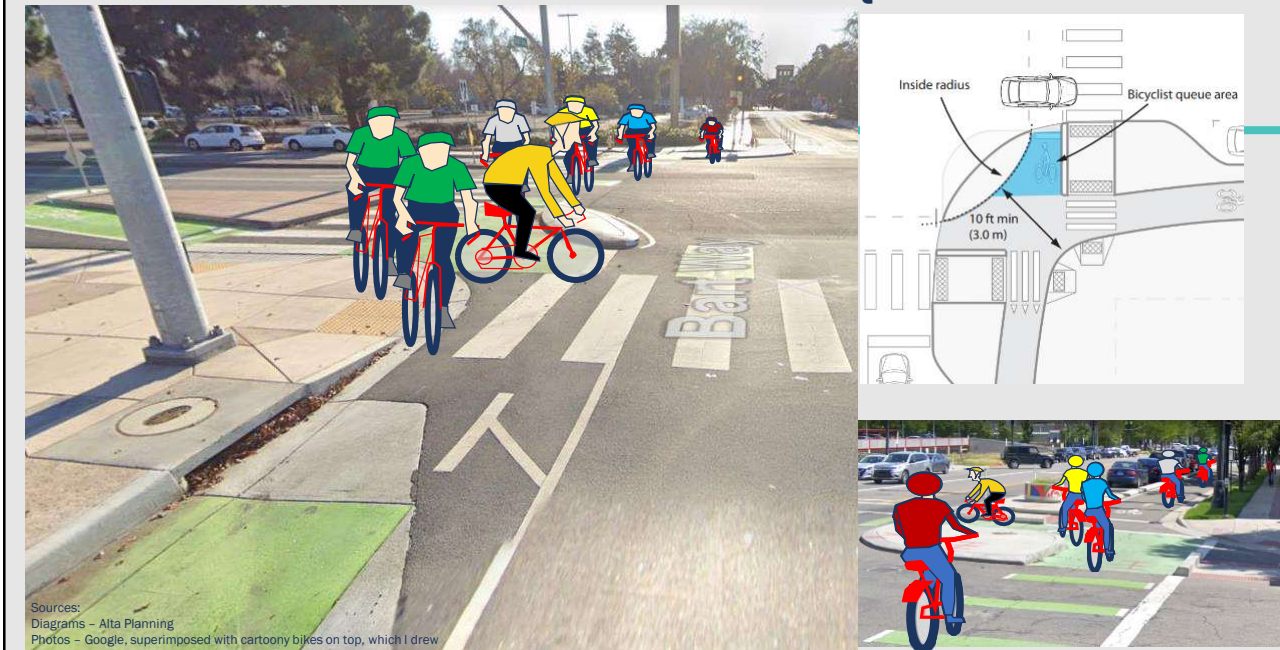
Sources:
Diagrams - NACTO
Photos - Google

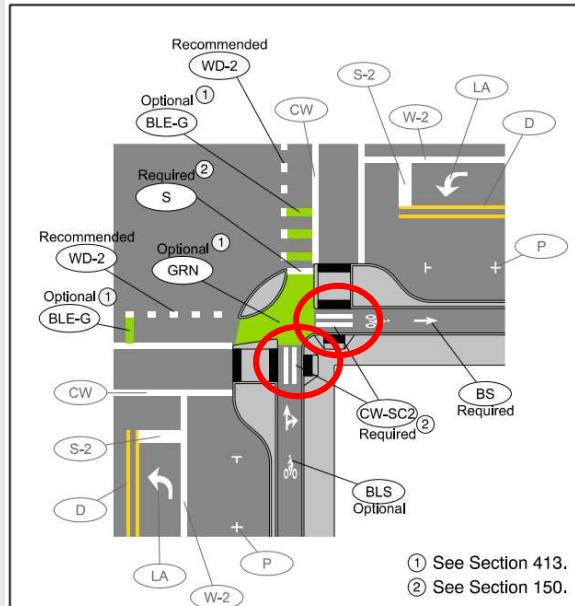


3. SETBACK BIKE CROSSING → MOTORIST YIELD ZONE



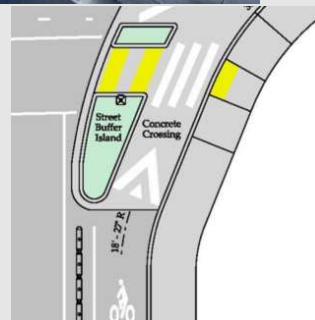
4. ADVANCE BICYCLE STOP LINE WITH QUEUING AREA





41
Page 150 of 188

7. REFUGE ACROSS STREET BUFFER

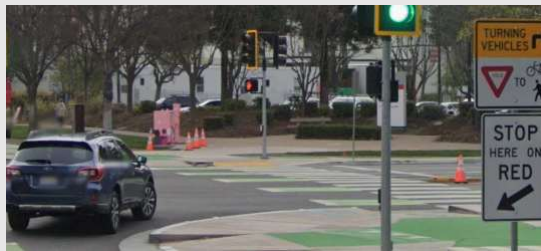


Sources:
Photos - Google
Diagram - ODOT

8 EXTENSION OF BIKE LANE IN STREET CROSSING



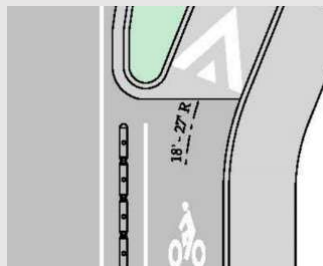
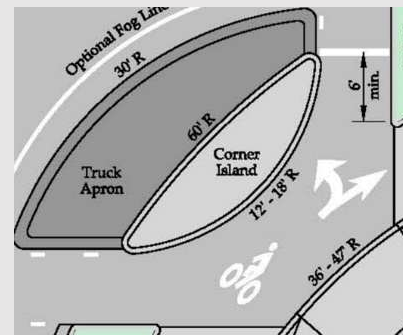
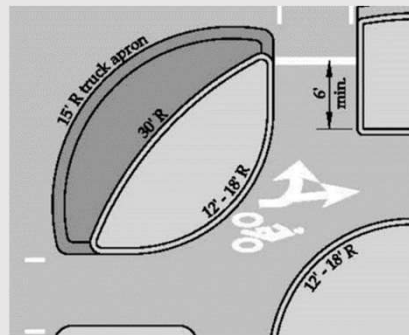
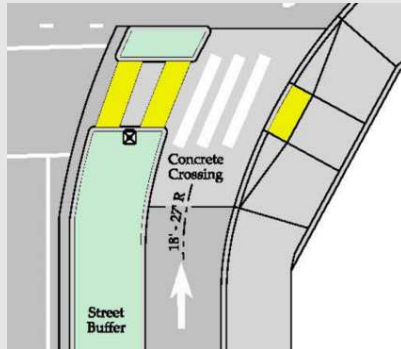
8,9 EXTENSION OF BIKE LANE IN STREET CROSSING



Source:
Photos - Google



10. GEOMETRIC ALIGNMENT / HORIZONTAL CURVATURE



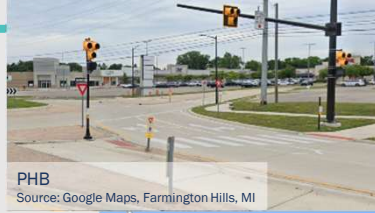
Source:
ODOT HDM

	Bike Lane Alignment	Deflection Approaching Intersection	Corner Island
Design Speed	14-16 MPH	10-12 MPH	8-10 MPH
Curve Radius	36-47 FT	18-27 FT	12-18 FT

PEDESTRIAN CROSSINGS AT ROUNDABOUTS



Source: ODOT



PHB
Source: Google Maps, Farmington Hills, MI



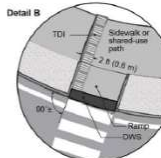
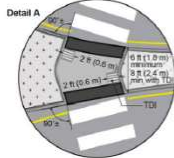
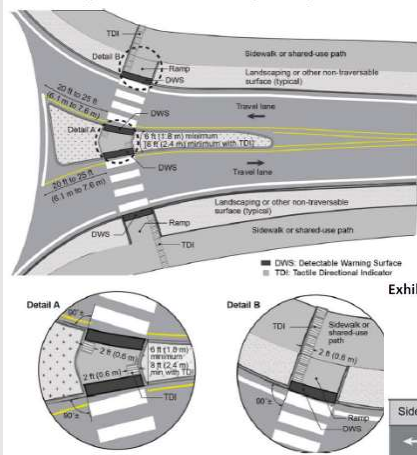
RRFB
Source: Google Maps, White City, OR



Raised Crosswalk
Source: Google Maps, Riverdale, UT

PEDESTRIAN WAYFINDING

Exhibit 10.27. Typical features and dimensions of angled crossing.



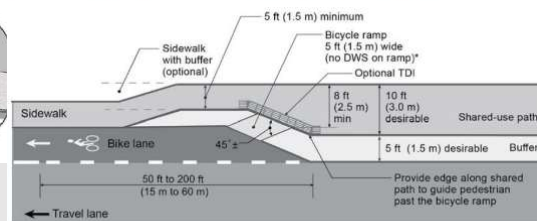
Graphics from
NCHRP 1043 Guide
for Roundabouts



Principles for designing roundabouts for those using non-visual cues:

1. Use features to guide pedestrians away from where they should not cross
2. Orient curb ramps in the direction of the crosswalk
3. Ramps, channelization and splitter islands should all align

Exhibit 10.26. Transition from shared-use path to on-street bike lane.



*DWSs are no longer recommended on bicycle ramps. If desired, optional TDIs can be used to delineate the desired path for pedestrians near the ramp. See FHWA (12).



82

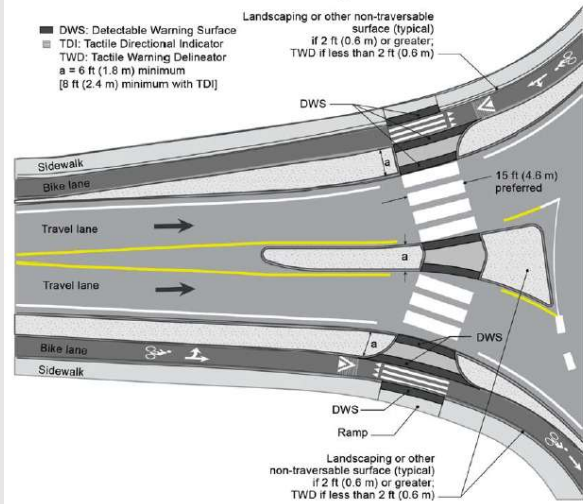
3 WAYS FOR BIKES TO USE ROUNDABOUT



Oregon Department of Transportation

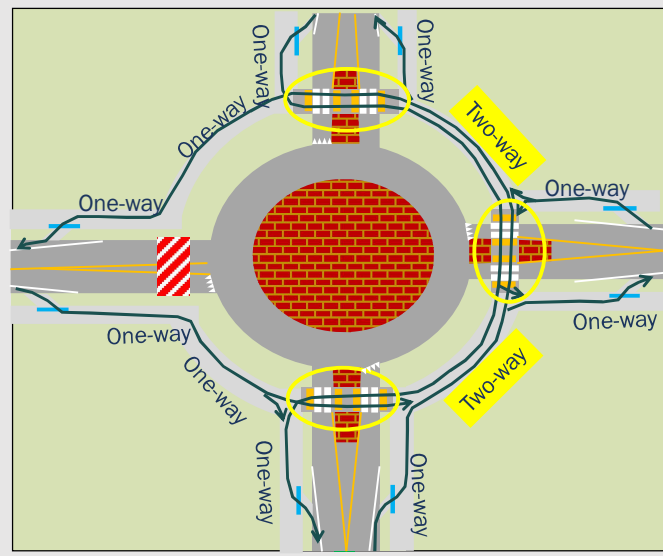
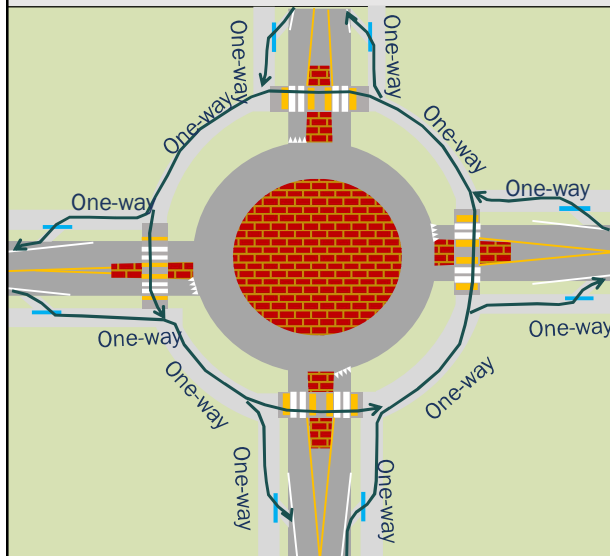
3 Images: ODOT

Exhibit 10.33. Widened and shared-use crossing at roundabout.



NCHRP 1043 Guide for Roundabouts

DO ROUNDABOUTS HAVE SHARED USE PATHS?





Shared use paths can be found...



Crossing a Road



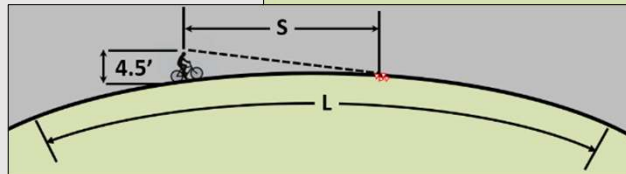
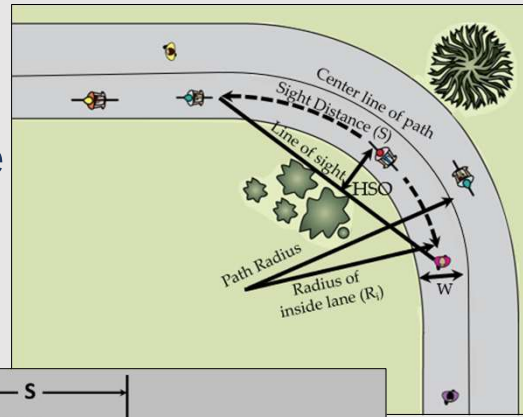
Parallel to Road



Between segments
of a road

PATH DESIGN: GEOMETRIC FACTORS

- Design speed
- Curve Radius
- Stopping Sight Distance
- Side Slopes
- Lateral Clearance



Path Width & Centerlines

Shared Use Path Peak Hour Volume	Recommended Width (feet)
Less than 50	8*
50 to 150	8 to 10*
150 to 300	10 to 12
300 to 500	12 to 15
500 to 600	16 to 20

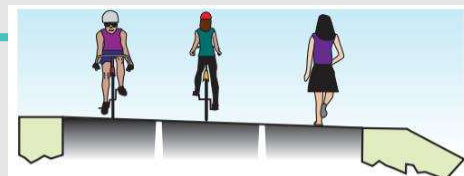
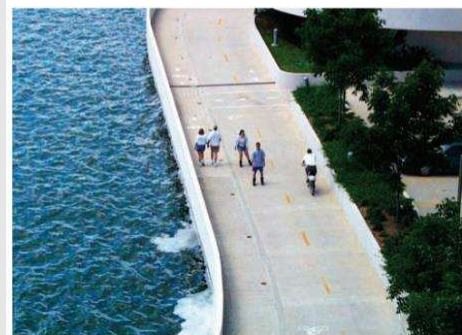
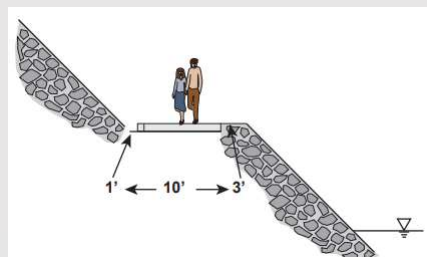
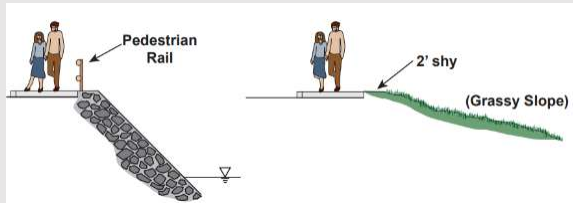


Figure 7-5: Wide path striped to separate modes



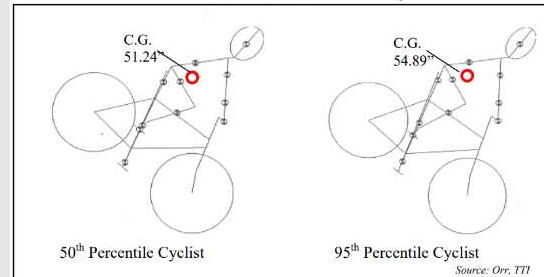
Path striped to separate users

Side Slopes and Handrail

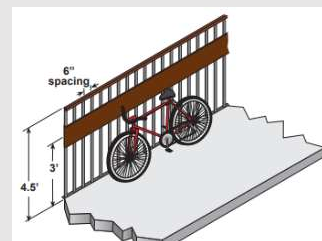


Oregon
Department
of Transportation

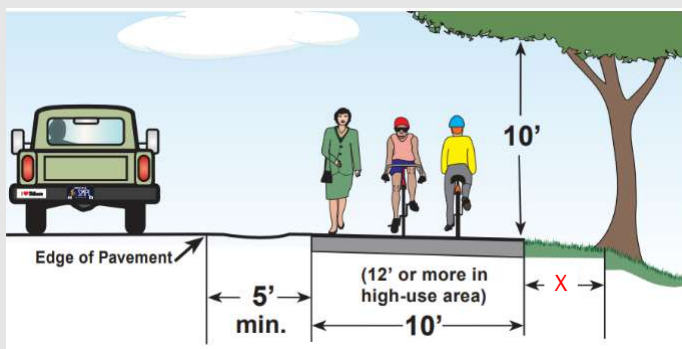
Figure 8
Simulation Center of Gravity



NCHRP 20-7



Clear Zone/Lateral Clearance, Shy Space



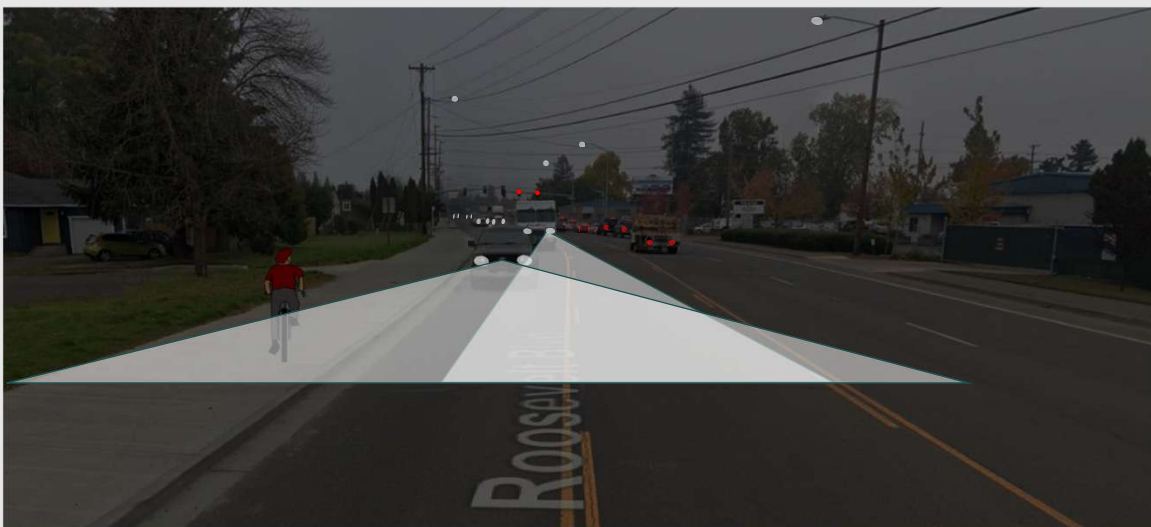
- 5' street buffer
- 2' shy on both sides
- 3' shy where signs or other objects are along path
- 1' graded at 1:6 or flatter
- 3' max side slope at 1:2
- 2' from poles or sign posts
- 1' from path edge fences, barriers, railings

Oregon
Department
of Transportation

Why is the 5' minimum separation from the roadway important?



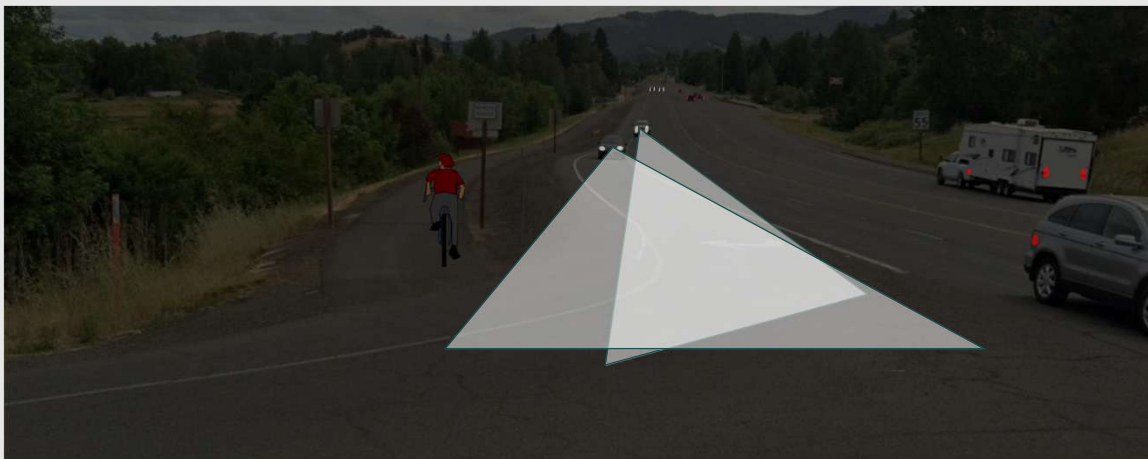
Why is the 5' minimum separation from the roadway important?



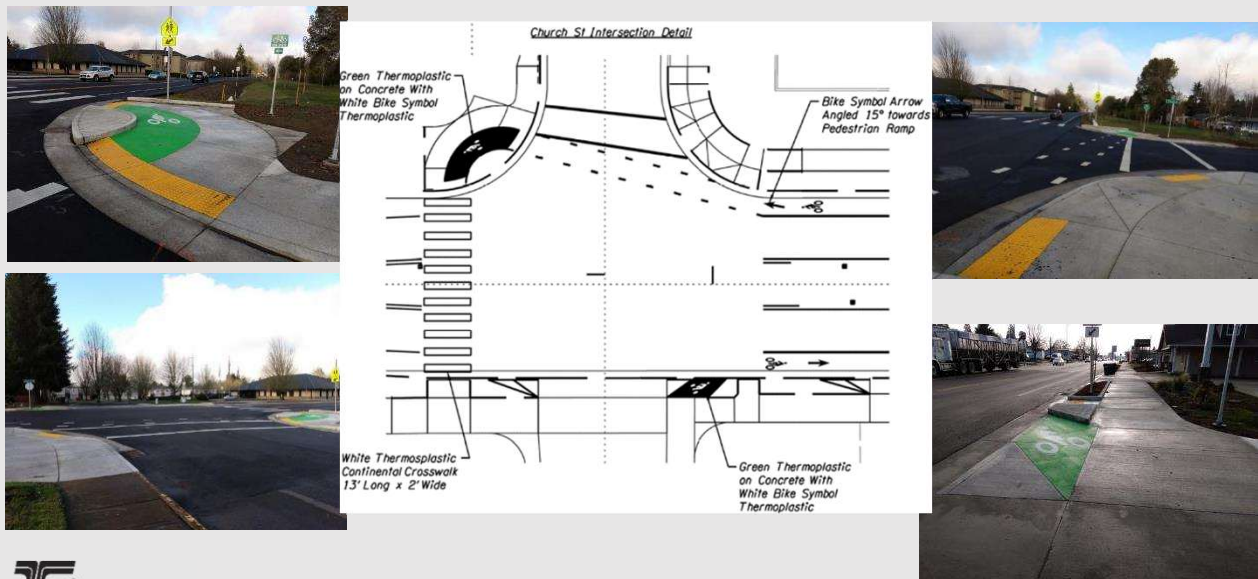
Why is the 5' minimum separation from the roadway important?



Why is the 5' minimum separation from the roadway important?



SIDE PATHS & TWO-WAY SEPARATED BIKE LANES TRANSITION TO BIKE LANES



Accessibility Requirements

• Pedestrian Access Route

- “On shared use paths, the clear width of the pedestrian access route shall extend the full width provided for pedestrian circulation on the path. Obstructions, such as bollards, shall not reduce the clear width of the pedestrian access route to less than 48 inches (1220 mm) measured from the edge of the obstruction.” (R302.2.2)

- PAR requirements includes: continuous width (no obstructions), grade (5% or equal to street grade if along road [side path]), cross slope (2%), surface (firm), vertical & horizontal (no lips or gaps).

• Curb Ramps

- On shared use paths, the width of curb ramp runs (excluding any flared sides) and blended transitions shall be equal to the width of the shared use path. (10 feet). (PROWAG R304.5.1.2)
- Two Curb Ramps per corner (PROWAG R203.6.1.1)



96

BOLLARDS



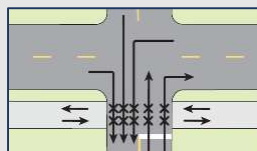
Bollards should only be used cautiously and when justified.

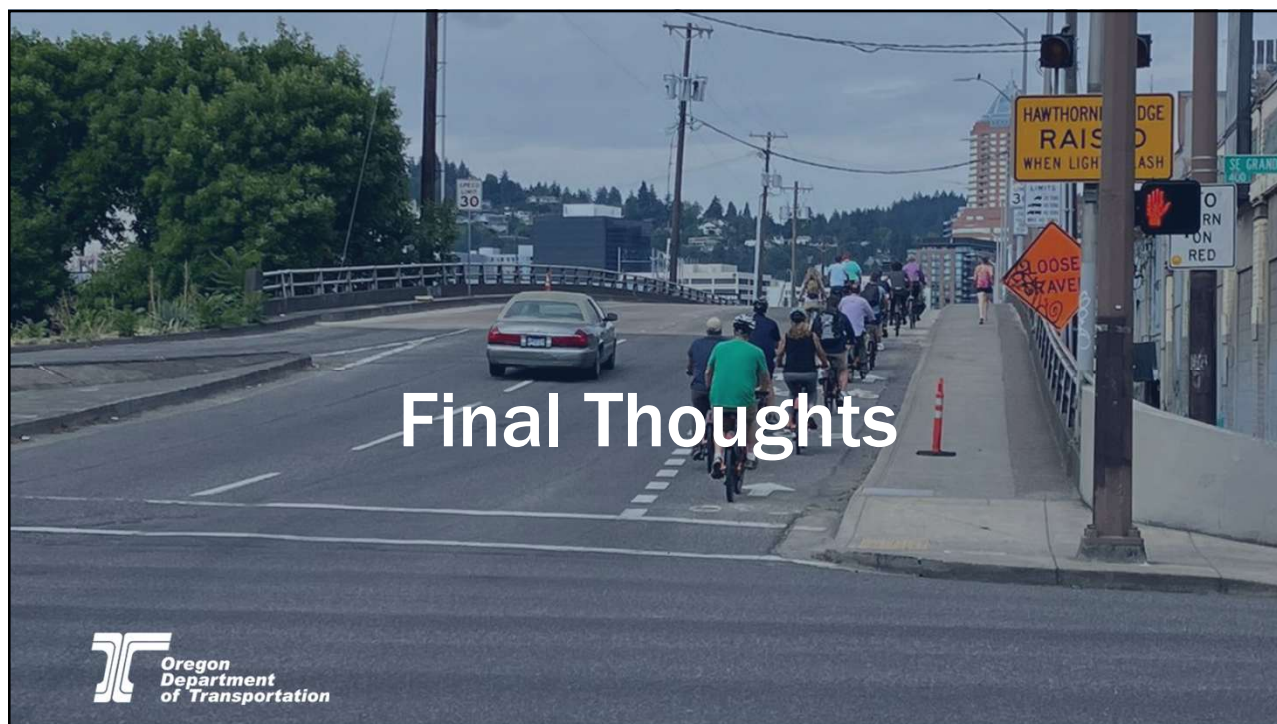
Discouraged because:

- bicycle crashes have occurred that are otherwise avoidable.
 - Most collisions with bollards are injury crashes, but there have actually been fatalities.
- Bollards are a hazard to bicyclists when they are not seen.
- At night
- In group rides.

Conditions for a Successful Side Path

- Bicycle and pedestrian use is anticipated to be high;
- The traffic conditions (high-speed, high-volumes) on the adjacent roadway are such that on-road bikeways and sidewalks may be undesirable;
- The path can be kept separate from motor vehicle traffic, with few roadway or driveway crossings;
- There are no reasonable alternatives for bikeways and sidewalks on nearby parallel streets;
- There is a commitment to provide path continuity throughout the corridor;
- The path can be terminated at each end onto streets with good bicycle and pedestrian accommodation, or onto another safe, well designed path;
- There is adequate access to local cross-streets and other facilities along the route;
- Any needed grade-separation structures do not add substantial out-of-direction travel; and
- The total cost of providing the path is proportionate to the need. This evaluation should consider the costs of the costs of grading, paving, drainage, fences, retaining walls, sound walls, crossings, signs and other necessary design features;
- Grade-separated structures needed to eliminate at-grade crossings; and
- Additional maintenance, including the need for specialized maintenance equipment.
- Headlight glare at night is mitigated.





SIMILARITIES AND DIFFERENCES IN DESIGNING FOR PEDESTRIANS & BICYCLES

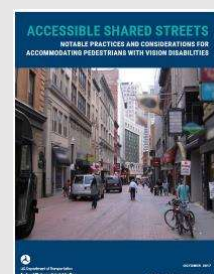
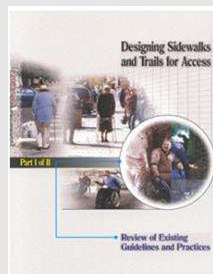
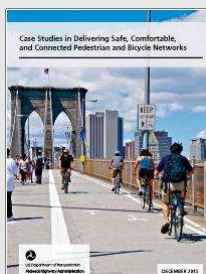
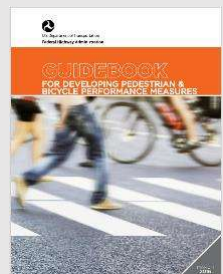
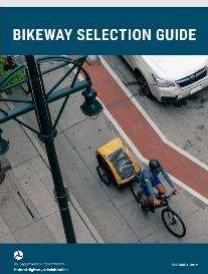
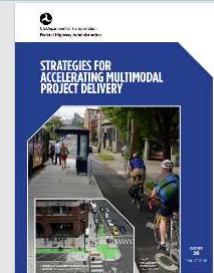
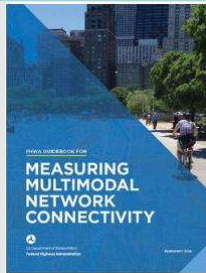
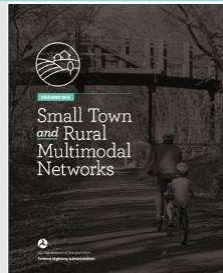
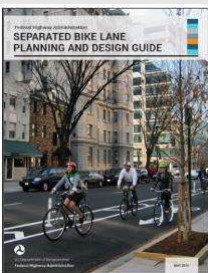
- | | |
|--|---|
| <ul style="list-style-type: none"> • Walkway location may conflict with utilities, signs, street furniture, etc. • Exposed to elements. Vulnerable in crashes. Can be any age. No license required. • Prefer separation from traffic. May walk side-by-side with walking companion(s). • Slower than bicyclists. Often not visible to motorists. • Less tolerant of delay and out-of-direction travel, and often take shortcuts where there is no convenient or direct access. • Must be designed for accessibility to people with disabilities. • Direct access to destinations. Pedestrians simply walk on a sidewalk, enter a building, leave it and continue on their way, with no need for parking, a driveway or specially designed access. • 2-3.5 mph (20 min. walk ≈ 1 mile for typ. errands) | <ul style="list-style-type: none"> • Bikeway location may conflict with utilities (grates), debris, & other hazards. • Exposed to elements. Vulnerable in crashes. Can be any age. No license required. • Prefer separation from traffic. May ride side-by-side with riding companion(s). • Slower than motor vehicles. Less visible than other cars. • Bicyclists use their own power, must constantly maintain their balance & don't like to interrupt their momentum. • Bicycles are considered vehicles & riders are legitimate road users. Bikeway design should enable bicyclists to follow vehicle code. • Need bike parking at destination. • 10-15 MPH (25 min. trip ≈ 5 miles, commute trip). |
|--|---|

SCOPING FOR ACTIVE TRANSPORTATION

- Make the best use of the available right of way.
 - Functional vs. better
 - Illumination
- How will it be used?
 - Origin/Destination pairs?
 - What is tomorrow's scenario?
- Context sensitive.
 - Look at the planning documents.
 - Look at the network.



FHWA Guides – design helps



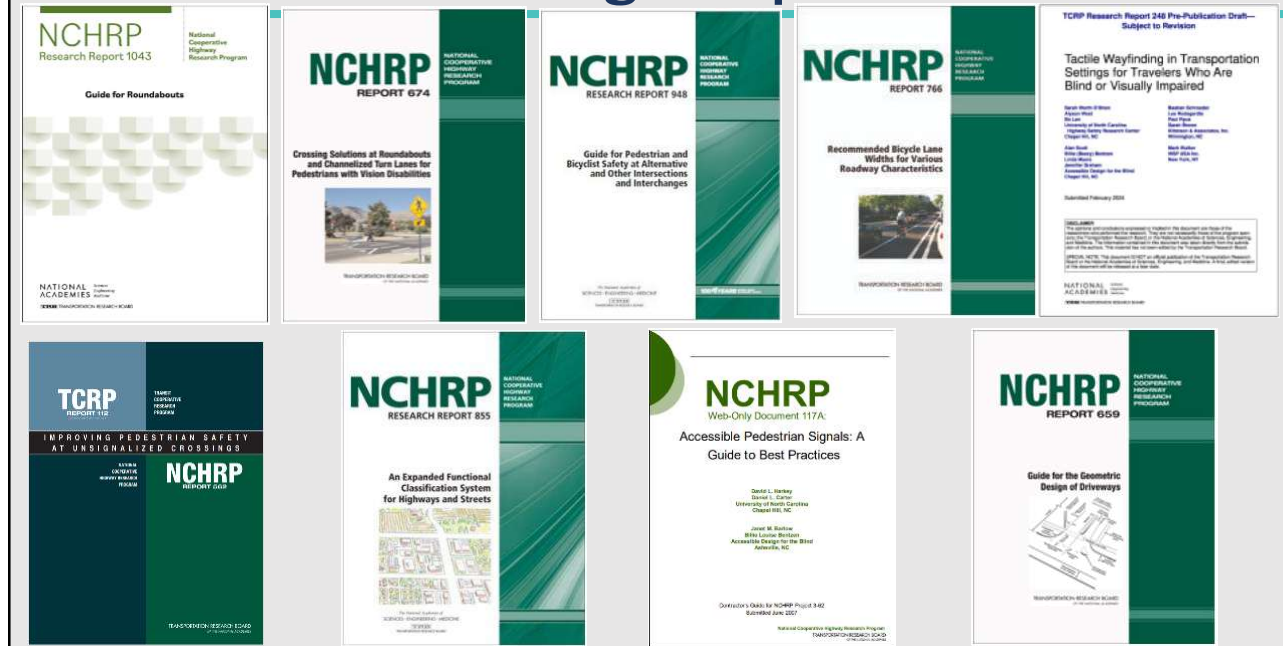
AASHTO guides – design helps



NACTO Guides – design helps



NCHRP Guides – design helps





Temporary Pedestrian Accessible Routes (TPAR), in Oregon

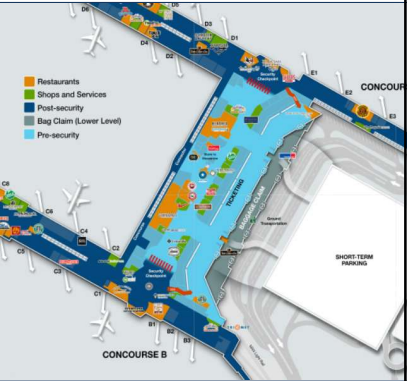
OSU Transportation Engineering Fundamentals - TPAR

Justin King, State Work Zone Engineer





TPAR



- Restaurants
- Shops and Services
- Post-security
- Bag Claim (Lower Level)
- Pre-security

CONCOURSE B

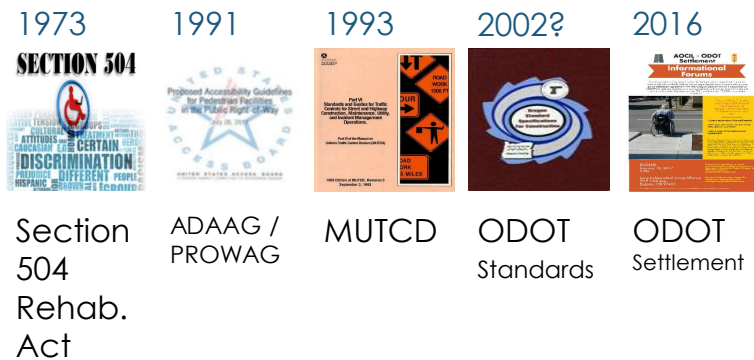
CONCOURSE

SHORT-TERM PARKING



TPAR History

US and Oregon, Pedestrian Accommodation Requirements



3

TPAR

Critical Definitions

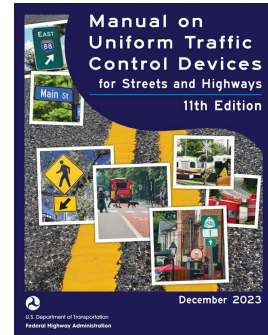
- ***“PEDESTRIAN” – Includes pedestrians with accessibility needs***
- ***“ACCESSIBILITY” – Continued access to facilities during work***
- ***“TEMPORARY PEDESTRIAN ACCESSIBLE ROUTE” (TPAR)***
 - ***Area used by pedestrians to navigate through or around work area***
- ***“TEMPORARY PEDESTRIAN ACCESSIBLE ROUTE PLAN”***
 - ***Written and/or drawn plan for the project***
 - ***Identifies required responsibilities and components within TPARs***



4

Manual on Uniform Traffic Control Devices

- New MUTCD, 11th Ed.
 - Dec. 2025 Adoption
 - TPAR, New TA's, Re-org
 - TPAR(PROWAG)
 - Audible Devices
- Part 6 – Temporary Traffic Control



5

TPAR - MUTCD

Pedestrian Accommodation Principles

1. Do not lead pedestrians into conflicts..
2. Use existing roadway features..
3. Provide a convenient, contiguous pathway that equals or exceeds existing path.
4. Minimize travel
5. Sign closures at and in advance of closures.
6. Provide public information



6

TPAR - MUTCD

Key Components of TPAR

1. A level of accessibility equal to or better than the existing pedestrian facility
2. Accessible Features – Sidewalk ramps, landing pads, traversable surfaces, manageable grades, cross slopes, etc.
3. Detectable Warning Features, detectable edges, curbs.
4. Route and route features meeting applicable ODOT and MUTCD Standards including
 1. Sidewalk ramps with a maximum running slope of 7.5%
 2. Constructed temporary sidewalks, paths and sidewalk ramps with a maximum cross slope of 1.5%
 3. 60 inch continuous sidewalk widths; or, 48 inch widths with 60 inch x 60 inch level landings (max. 2% slope) every 200 feet
 4. Continuous and detectable surfaces with vertical drops or edges less than 1/4 inch



7

TPAR - Standards

ODOT Traffic Control Plans Design Manual – Jan. 2025 Ed.
Accommodation Principles – During Design and Construction

- **MUTCD (Chapter 6), ADA; and...**
- **Provide “EQUAL TO” or “BETTER” Level of Accessibility (ODOT)**

Not necessarily “ADA-compliant”, but no new accessibility barriers



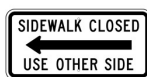
TPAR – Full Standards

- Temporary Path/Sidewalk
- 60" width, ADA compliant ramps
- Continuous, smooth hard surface
- Separation between path/sidewalk and work/traffic
- Detectable Channelizing
- Guidance
- TCP Plans w/TPAR
- Transit Stops access maintained



TPAR Devices

Existing



PCD



Ramps



Signs



Vehicle



Markings



Transit



Flagger



Surface



Domes



TPAR – “EQUAL TO” or “BETTER”

Why not always meet full ADA Standards?



11

TPAR – “EQUAL TO” or “BETTER”

- Match Existing Level of Accessibility
- Provide an alternate method to accommodate peds
 - Detour / Alternate Route
 - Flaggers
 - Shuttle
 - Full Closure, all traffic



12

TPAR – Applications

Project specific solutions for each project



13

TPAR – Document Existing Condition

Document existing condition

- Survey
- Photos/Video
- TMP



TPAR – Document Exceptions

Document any TPAR exceptions versus existing condition

- TMP



TPAR – Design Considerations

- Existing Facility Inventory – What are we starting with?
- Anticipated Pedestrian Volumes – Generators? Destinations?
- Scope of Work
- Impact Duration and Severity
- TPAR Opportunities
- Staging
- Closures



16

TPAR – Design Considerations

PUBLIC NOTIFICATION & OUTREACH

- During Project Development **AND** through Construction
- Outreach to Media, Citizen Groups (AOCIL), Stakeholders
- Postings on the Project Site
- Notifications Updated over Life of the Project
 - As Project Design changes
 - 10-Day Advance Notification signing (*ODOT Specifications*)
 - Pedestrian-Specific signing (*ODOT Sign Policy*)



17

TPAR – Design Considerations

SHORT DURATIONS



- Brief, intermittent stoppages (1-5 mins).
- Workers may escort pedestrians around hazard.

LONG-TERM IMPACTS



- Longer-duration closures with detours.
- PCD, Curb ramps, and other devices used to maintain pedestrian mobility.



18

TPAR – Design Resources(ODOT)

ODOT Technical Services Bulletin, TSB17-01

PURPOSE

The purpose of this Technical Services Bulletin is to inform those responsible for the design and implementation of work zones of their obligations to include Temporary Pedestrian Accessible Routes. If pedestrians could travel through the area before the work zone is put in place, pedestrians, including people with disabilities, must be able to travel through or around the area once the work zone is in place. This requirement applies regardless of the type of facility or whether the facility has pedestrian features such as sidewalks. Temporary pedestrian routes through or around the work zone must be equivalent to or better than what existed for use before the work zone.

https://www.oregon.gov/ODOT/Engineering/Doc_TechnicalGuidance/TSB17-01D.pdf

OREGON DEPARTMENT OF TRANSPORTATION		TECHNICAL SERVICES	
Technical Services DIRECTIVE			
Topic	TSB17-01(D)	Effective Date	10/1/2017
Temporary Pedestrian Accessible Route Plans Required for Work Zones		Replaces	TSB17-01
Technical Services	Original signed by: Buck Page, P.E. Technical Services Manager / Chief Engineer		

PURPOSE
The purpose of this Technical Services Bulletin is to inform those responsible for the design and implementation of work zones of their obligations to include Temporary Pedestrian Accessible Routes. If pedestrians could travel through the area before the work zone is put in place, pedestrians, including people with disabilities, must be able to travel through or around the area once the work zone is in place. This requirement applies regardless of the type of facility or whether the facility has pedestrian features such as sidewalks. Temporary pedestrian routes through or around the work zone must be equivalent to or better than what existed for use before the work zone.

This obligation applies to all work zones included on any of the following:

- All work zones on or along the State Highway System, regardless of funding source.
- All work zones for projects funded by the federal-aid highway program.
- All work zones for projects that are controlled through ODOT. This includes projects off of the State Highway System.
- All work zones for projects delivered by ODOT work forces off the State Highway System.

The Maintenance and Operations Branch will lead the development of practices and procedures for maintenance forces and permitted third party work zones. Technical Services will lead the development of practices and procedures for STP work zones.

GUIDANCE
ADA Regulations, the MUTCD and the ODOT ADA Settlement Agreement require ODOT to assure that all work zones accommodate pedestrians, including people with disabilities through or around the work zone if they could traverse that highway section before the work zone was established.

Every work zone currently requires some level of Traffic Control Plan (TCP). Each TCP should be appropriately scaled to fit the complexity of the work and duration of the work zone. For example, on a more complex project, the TCP requirement could be met by

TSB17-01 (D)
10/1/2017
Page 1 of 3



19

TPAR – Design Resources(ODOT)

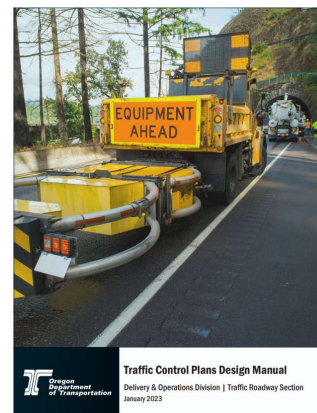
ODOT TCP Design Manual

PURPOSE

The purpose of this manual is to provide an introduction to the standards, practices, devices and technologies that serve as the foundation for the temporary traffic control discipline. This manual provides an organized collection of traffic control plan design standards, guidelines, policies, and procedures to be used in the development of a temporary Traffic Control Plan (TCP).

Chapter 3.4.5 Pedestrian Accessibility Design

https://www.oregon.gov/odot/Engineering/Docs_TrafficEng/TCP-Design-Manual.pdf



20

TPAR – Design Resources(ODOT)

Oregon Standard Specifications for Construction

PURPOSE

Standards for building highway construction projects, including TPAR.

Sections 00220 – 00228, TPAR Specifications

https://www.oregon.gov/odot/Business/Specs/2024_STANDARD_SPECIFICATIONS.pdf



21

TPAR – Design Resources(ODOT)

ODOT Standard Drawings/Details

PURPOSE

Provide Plans for common traffic control setups.

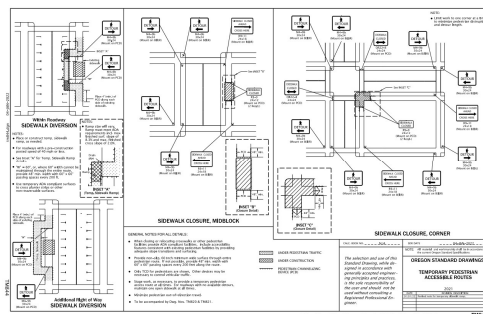
TPAR Related Standard Drawings/Details

Standard Drawings

TM800, TM844, TM851

Standard Details

DET4780 – DET 4787



<https://www.oregon.gov/odot/engineering/pages/standards.aspx>



22

TPAR – Accommodation Challenges



23

TPAR – Accommodation Challenges **CHALLENGES: BRIDGES**



24

TPAR – Accommodation Challenges
CHALLENGES: URBAN AREAS



25

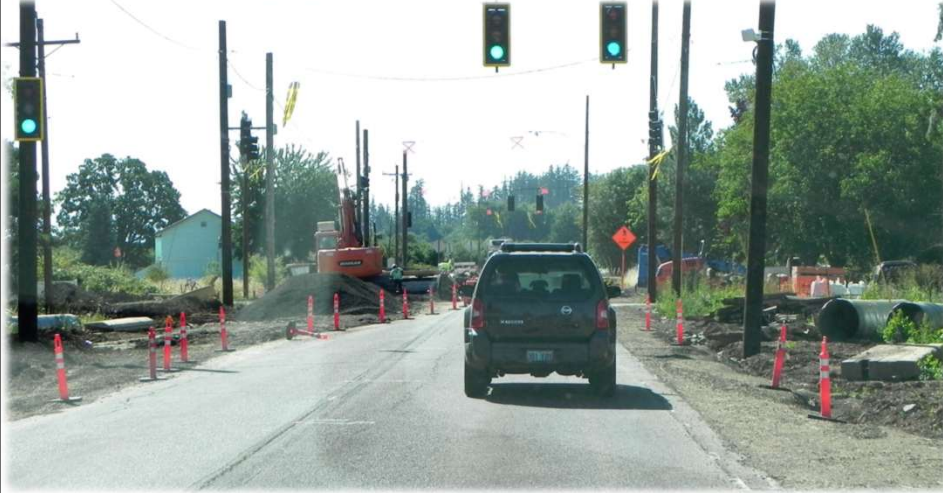
TPAR – Accommodation Challenges
CHALLENGES: URBAN AREAS



26

TPAR – Accommodation Challenges

CHALLENGES: SUBURBAN AREAS



27

TPAR – Accommodation Challenges

CHALLENGES: RURAL AREAS



28

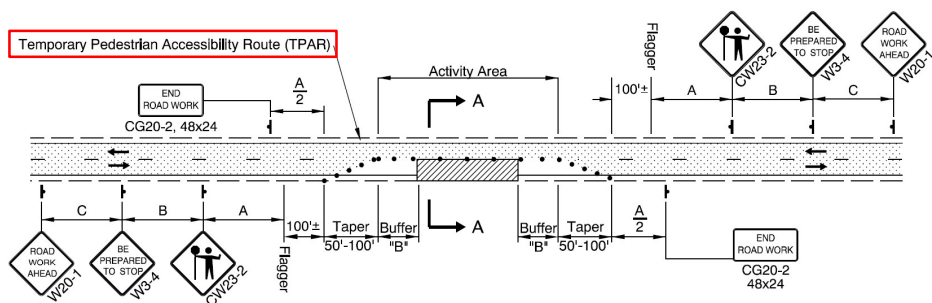
TPAR – Accommodation Developments



29

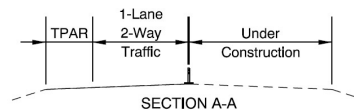
TPAR – Accommodation Developments

- **“EQUAL TO” or “BETTER” Level of Accessibility**
- TPAR Detail added to TM850



NOTE:

- When using pilot cars with flaggers to control traffic during paving operations, the Tubular Marker spacing along centerline may be increased to 200' within the Activity Area, as shown or as directed.
- Include CR4-23 signs mounted on Type II Barricade located approx. 50' before each Flagger.
- Coordinate and control pedestrians movements through the TPAR using Flaggers, other TCM, or as directed. When the existing shoulder is greater than or equal to 4' wide, provide a minimum of 4' of width for the TPAR.



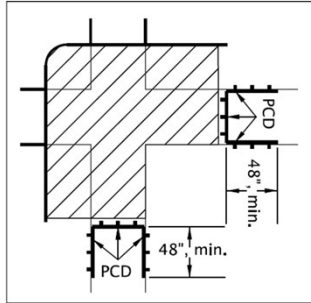
2-LANE, 2-WAY ROADWAY
ONE LANE CLOSURE



30

TPAR – Accommodation Developments

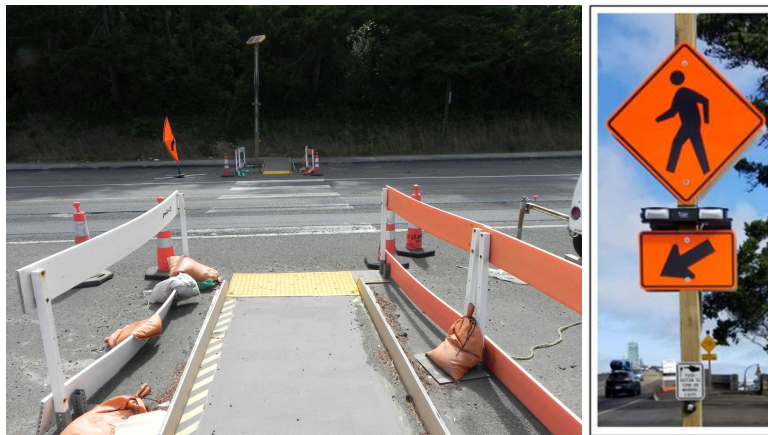
- *Sidewalk Closures and Signs mounted on PCD*



31

TPAR – Accommodation Developments

- *Midblock Crossings*

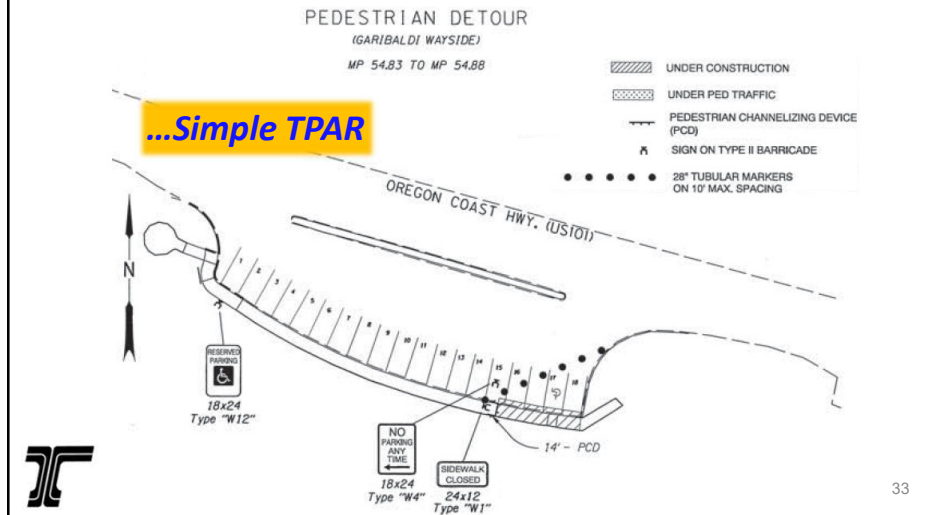


32

TPAR – Accommodation Developments

SCALABLE SOLUTIONS

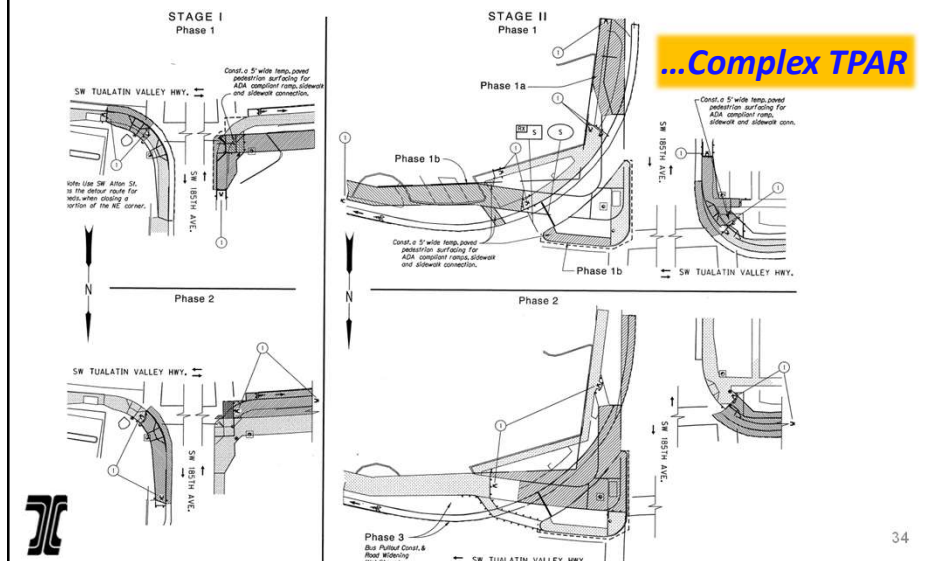
- Proportionate to Duration, Impacts and Existing Facilities
 - Larger Impacts ≈ Greater TPAR Detail, Complexity, Pay Item list



TPAR – Accommodation Developments

SCALABLE SOLUTIONS

- Proportionate to Duration, Impacts and Existing Facilities



TPAR – Accommodation Developments

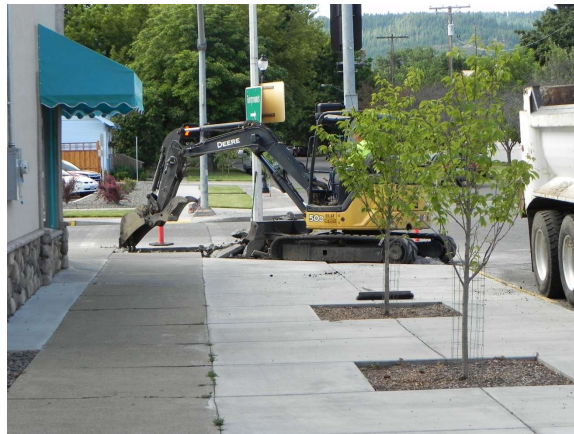
SCALABLE SOLUTIONS



35

TPAR – Construction Considerations

- It IS Required!



36

TPAR – Construction Considerations

- It HAS to work!



37

TPAR – Construction Considerations

- It HAS to work, AT ALL TIMES



38

TPAR – Construction Considerations

- It HAS to be maintained



39

TPAR – Construction Considerations

- It HAS to be Continuous



40

TPAR – Construction Considerations

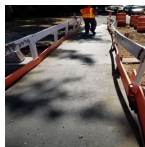
- Caution Tape is not an approved device for TPAR



41

TPAR The Good

Surface



Access



Park



Path



Lot



Access



Signal



Detour



42

TPAR The Bad

Closure



Tape



Routes



Signs



Ramps



PCD



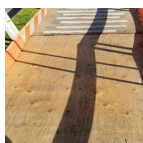
Maintain



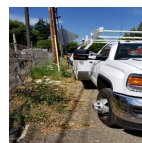
Routes



Surface



Continuous

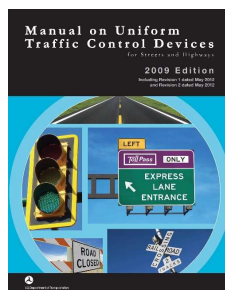


43

TPAR Additional Information

<https://www.oregon.gov/ODOT/Engineering/Pages/Accessibility.aspx>
<https://www.oregon.gov/ODOT/Engineering/Pages/Work-Zone.aspx>
WorkZoneStandards@odot.state.or.us

Monthly TPAR Meeting, 3rd Tuesday of month, 1 PM, ODOT TLC



44

TPAR

Workday Oregon – TPAR Design class



Welcome to the Oregon Department of Transportation's (ODOT) Temporary Pedestrian Accessible Route Design course! This training provides Designers, Engineers or Technical Staff, members of City or County Public Works offices, Inspectors, and private Consultant Engineering Firms an introduction to the policy standards and deliverables that serve as the foundation for developing Temporary Pedestrian Accessible Route (TPAR) Plans for construction activities along Oregon's Highway System.

The lessons below are not intended to be fully comprehensive, but rather are designed to guide individuals who are working with ODOT to commonly referenced resources, materials, and standard practices to be utilized in the development of temporary pedestrian accessible route plans for use on Oregon's Highway System. Professionals conducting work outside of ODOT for other agencies should exercise caution in applying standards and practices within these lessons and resources as differences in design policy and standards may exist between ODOT and those established by other agencies.

Choose an activity below to get started!



45

TPAR

Comments / Questions / Discussion



46