

Overaccommodating Trucks at Roundabouts: Trucker's Guide to Roundabouts



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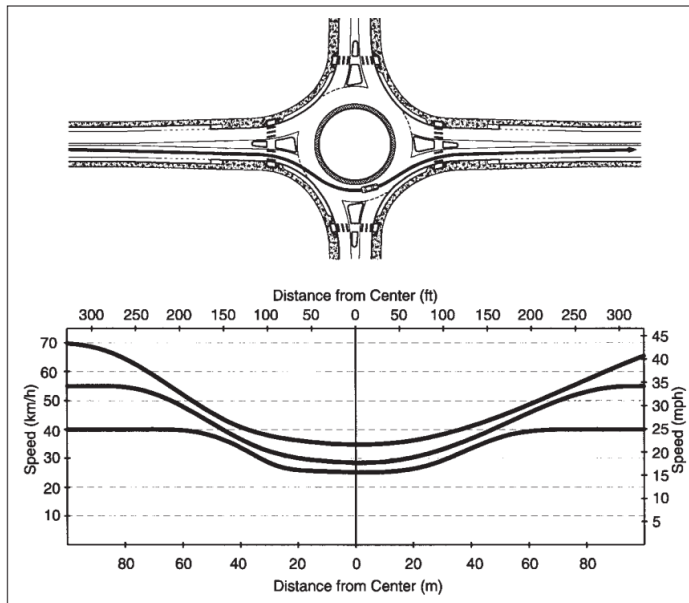
Agenda

- I. Controlling Speeds
- II. Design Vehicle
- III. Truck Aprons
- IV. Smaller Inscribed Circular Diameter
- V. Grades and Cross Slopes

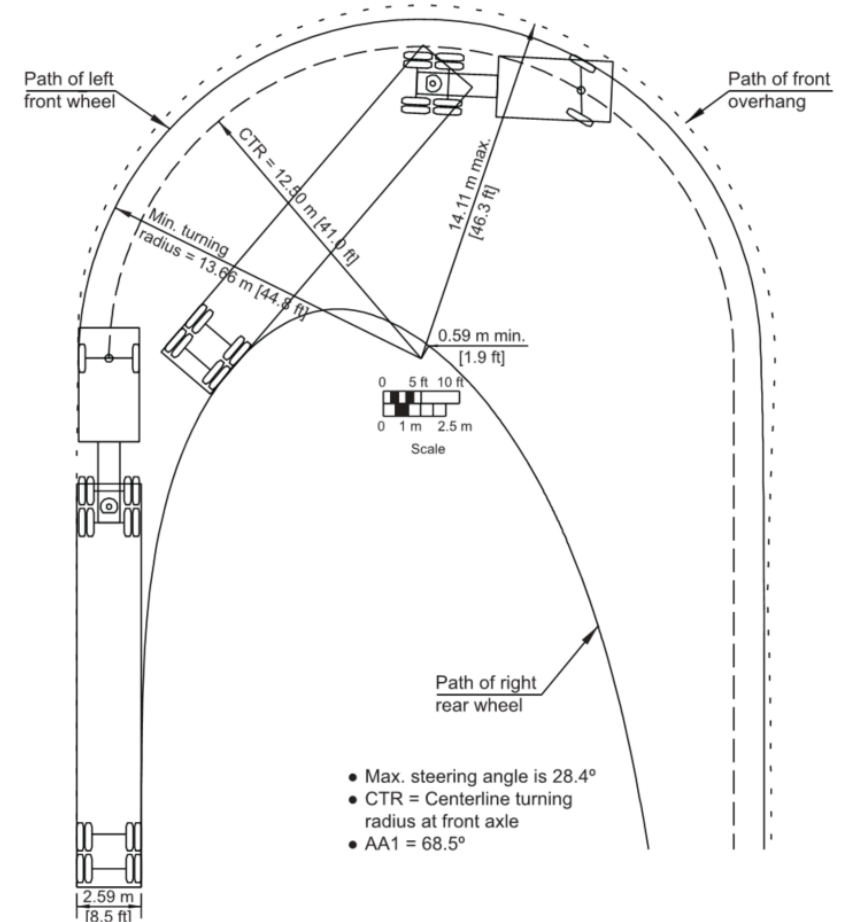
I. Large Vehicles Compete with Speed Control

Roundabout design balances two main factors:

- Design Vehicles
- Fastest Paths



Source: FHWA Roundabouts: An Informational Guide



Source: AASHTO Green Book 2011

Which Truck should be modeled?

- “I like roundabouts but there’s too much truck traffic”
- “Use a WB-67; it’s the largest in the AASHTO Green Book”
- “The truck percentage is low; Use a WB-50”
- “AutoTurn is ultra conservative”
- “The truck apron is never driven on”
- “There are 53’ trailers; Use a WB-67”
- “Use the largest vehicle that can currently physically make it”

Problem Statement:

Why doesn’t the modelled vehicle match what is observed in the field?

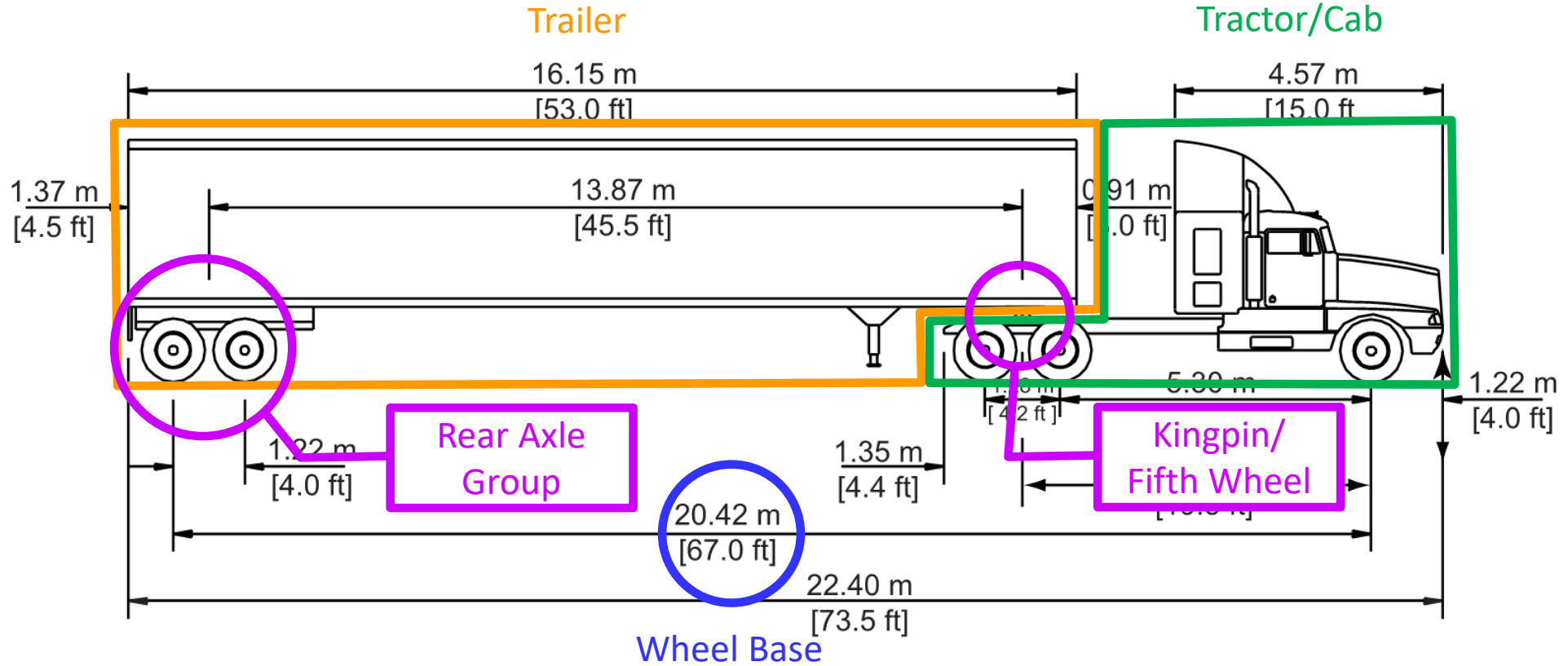
II. Design Vehicle

AASHTO Green Book 2018

Section 2.8.1 General Characteristics

- *“In the design of any roadway facility, the designer should consider **the largest design vehicle that is likely to use that facility with considerable frequency** or a design vehicle with special characteristics appropriate to a particular location in determining the design of such critical features at intersections and radii of turning roadways.”*
- *“For the purposes of geometric design, **each design vehicle has larger physical dimensions . . . than most vehicles in its class.**”*

Anatomy of a Truck



Trailer Length

Pennsylvania Vehicle Code

PA Title 75 Chapter 49 § 4923-b.1 Combinations -

*(1) The length of a single trailer being towed by a truck or truck tractor shall not exceed **53 feet**. Truck or truck tractors towing trailers equipped with a kingpin shall not be operated when the distance between the kingpin and the center line of the rear axle or rear axle group exceeds **41 feet** or, in the case of a trailer used exclusively or primarily to transport vehicles in connection with motor sports competition events, does not exceed 46 feet.*

AASHTO Green Book 2018

The WB-67 [WB-20] truck should generally be the minimum size design vehicle. . .

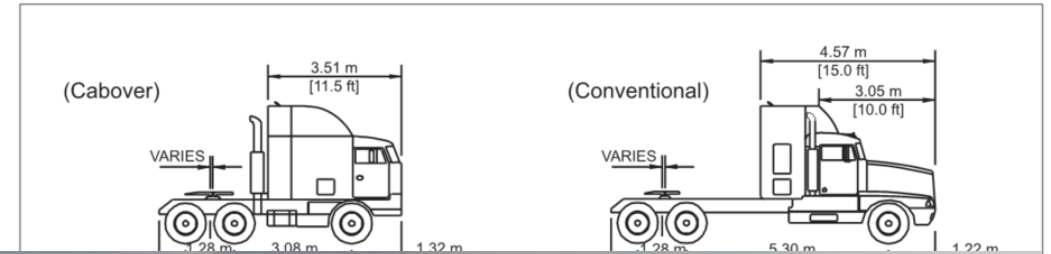
. . . In many cases, operators of WB-67 [WB-20] and larger vehicles pull the rear axles of the vehicle forward to maintain a kingpin-to-rear-axle distance of 41 ft [12.5 m], which makes the truck more maneuverable and is required by law in many jurisdictions. Where the practice is prevalent, the WB 62 [WB 19] may be used in design for turning maneuvers, but the WB-67 [WB-20] should be used in design situations where the overall length of the vehicle is considered, such as for sight distance at railroad-highway grade crossings.

Tractor/Cab

- Sizes vary based upon use
- Day cab vs night cab
- WB-62 and WB-67 is the most

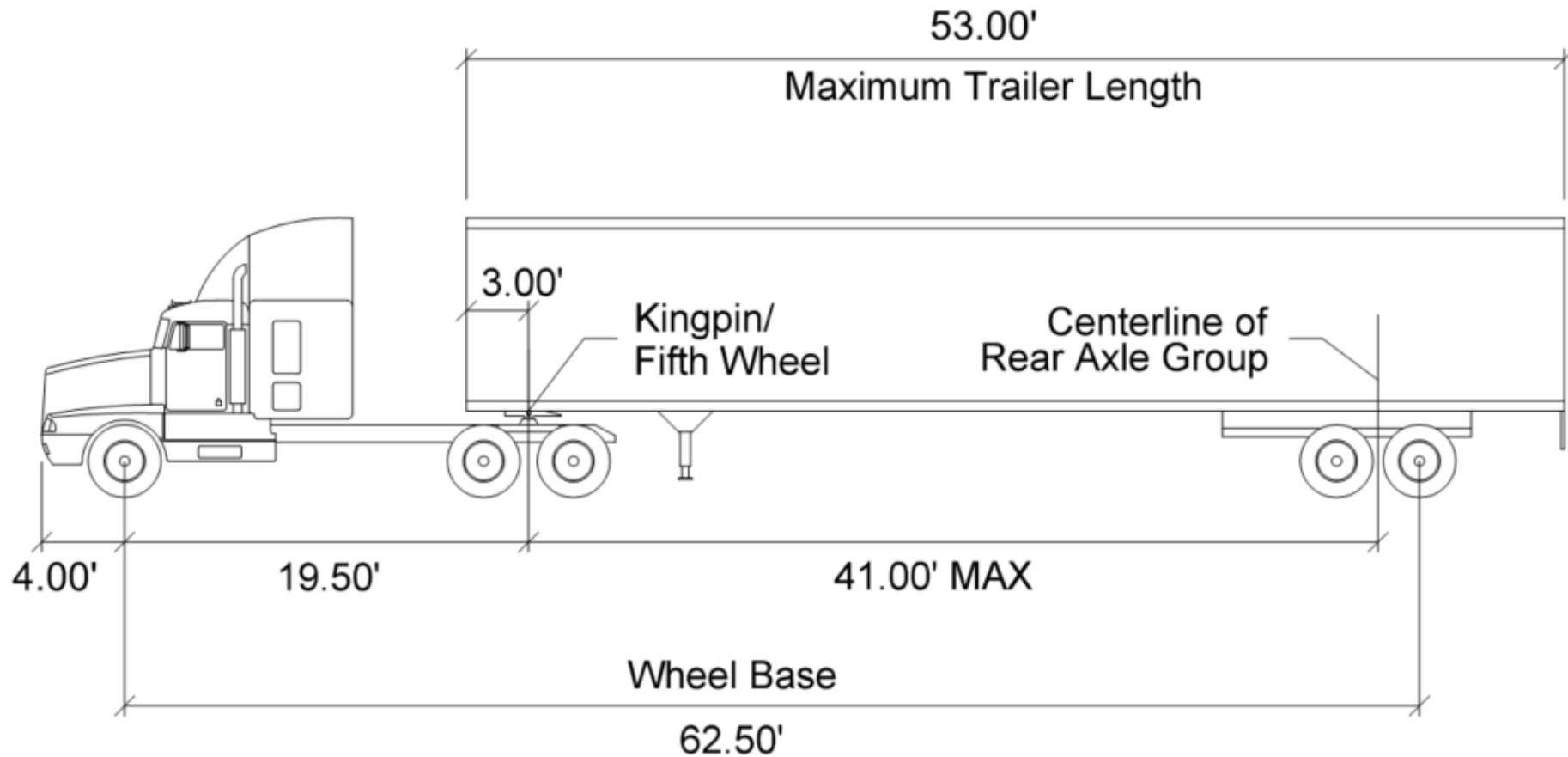


Creator: Petter Berg
Copyright: Photographer Petter Berg

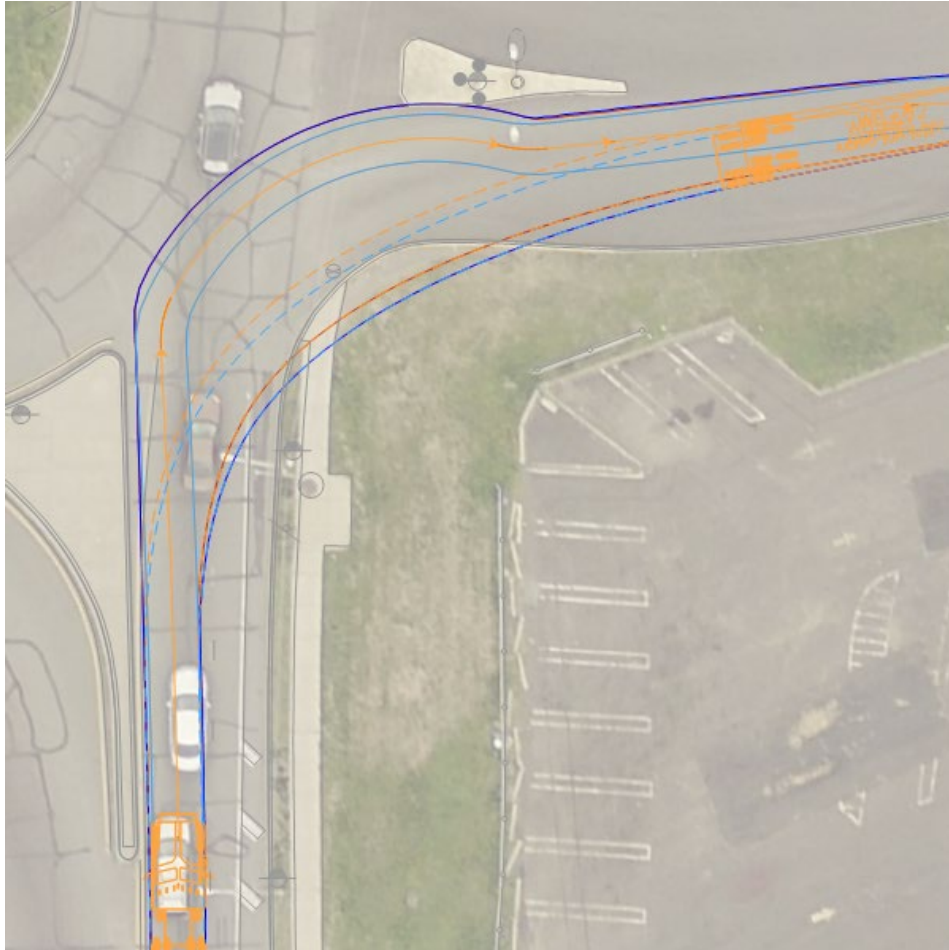


Courtesy of Nick Pugh/20th Century Fox

Modified WB-62



Confirming the use of a WB-62



Washington State DOT – Design Vehicles



Accommodating Tight Truck Turns



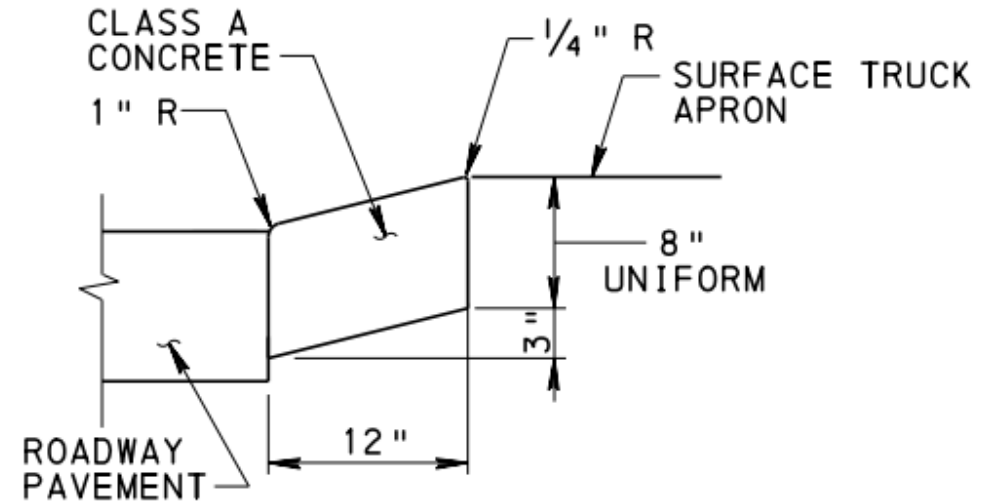
Outside Truck Aprons

- Use as a last resort
- Complicate modelling
- ADA concerns
- DWS placement
- Crosswalk ponding



III. Truck Aprons

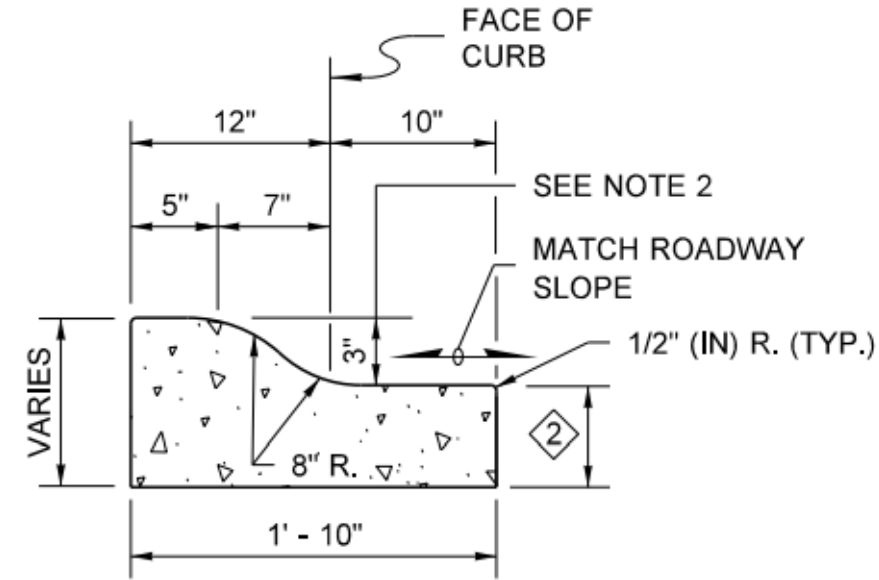
- Cross slope (1%-2%)
- Low boys and OSOW vehicles
- Address Overtipping/load shift concerns
- Discourage use by cars



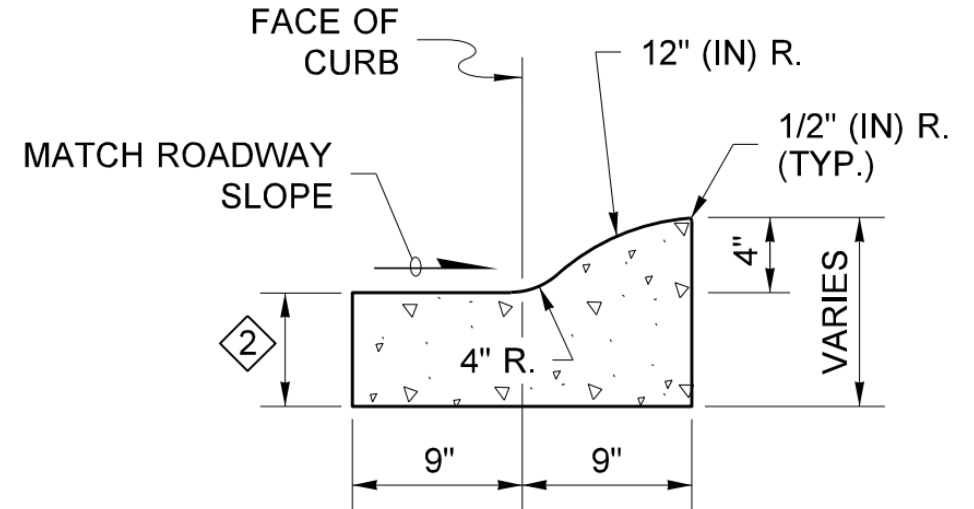
ROUNDBOUT TRUCK APRON CURB

Source: PennDOT RC-65M

Washington State DOT Mountable Curbs



CURB 1
ROUNDAABOUT TRUCK APRON
CEMENT CONCRETE CURB & GUTTER
 (ROLLED CURB)



CURB 2
(OUTSIDE, RIGHT SIDE OR SPLITTER ISLAND)
ROUNDAABOUT CEMENT CONCRETE
CURB AND GUTTER
 (ROLLED CURB)

Source: WSDOT Standard Plan F-10.18.01

Source: WSDOT Standard Plan F-10.18.01

IV. Inscribed Circular Diameter

- ICD determined by design vehicle
- Accommodate vs designed for

Roundabout Configuration	Typical Design Vehicle	Common Inscribed Circle Diameter Range*	
Mini-Roundabout	SU-30 (SU-9)	45 to 90 ft	(14 to 27 m)
Single-Lane Roundabout	B-40 (B-12)	90 to 150 ft	(27 to 46 m)
	WB-50 (WB-15)	105 to 150 ft	(32 to 46 m)
	WB-67 (WB-20)	130 to 180 ft	(40 to 55 m)
Multilane Roundabout (2 lanes)	WB-50 (WB-15)	150 to 220 ft	(46 to 67 m)
	WB-67 (WB-20)	165 to 220 ft	(50 to 67 m)
Multilane Roundabout (3 lanes)	WB-50 (WB-15)	200 to 250 ft	(61 to 76 m)
	WB-67 (WB-20)	220 to 300 ft	(67 to 91 m)

* Assumes 90° angles between entries and no more than four legs. List of possible design vehicles is not all-inclusive.

Source: NCHRP 672, 2nd Edition

Design Element	Mini ^[1]	Compact	Single-Lane	Multilane
Number of Lanes	1	1+	1	2+
Inscribed Circle Diameter ^[2]	45' – 80'	65' – 120'	80' – 150'	120' – 165'
Circulating Roadway Width	N/A	N/A	14' – 19'	29'
Entry Widths	N/A	N/A	16' – 18'	25'

Notes:

The “+” symbol used here means that a portion of the circulating roadway may have more than one lane.

[1] Reserved for urban/suburban intersections with a 25 mph or less posted speed.

[2] The given diameters assume a circular roundabout; adjust accordingly for other shapes. Some conditions may require ICDs outside ranges shown here.

Source: WSDOT Design Manual M 22-01.17 Chapter 1320

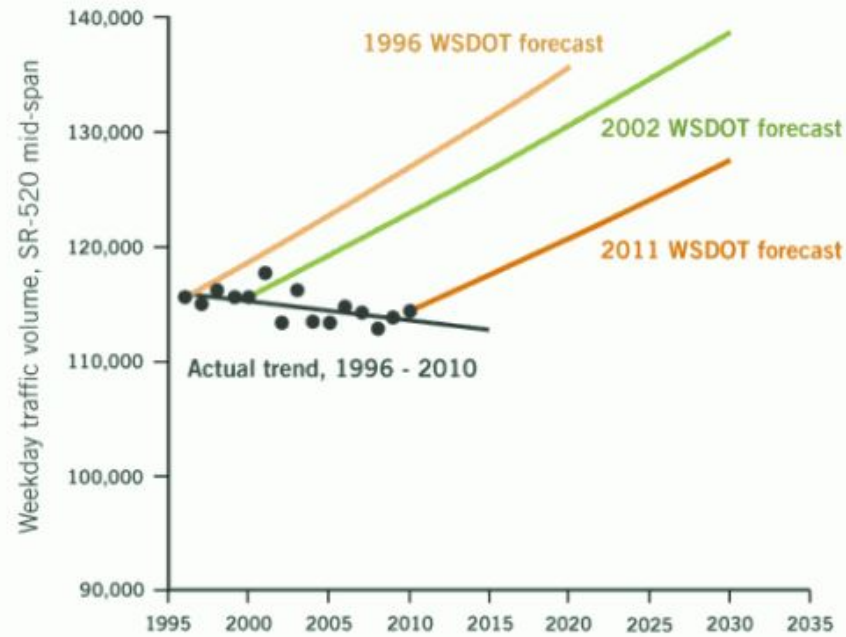
Roundabout Type	Typical Inscribed Circle Diameter ¹	Typical Daily Service Volume ^{2,3} (vpd) 4-leg roundabouts
Single-Lane	120 -160 ft (35 – 50 m)	less than 25,000
Multilane (2-lane entry)	160 - 215 ft (50 – 65 m)	25,000 to 45,000
Multilane (3 lane entry)	215 - 275 ft (65 – 85 m)	45,000 or more

Source: WisDOT Design Manual FDM 11-26

Planning and Growth

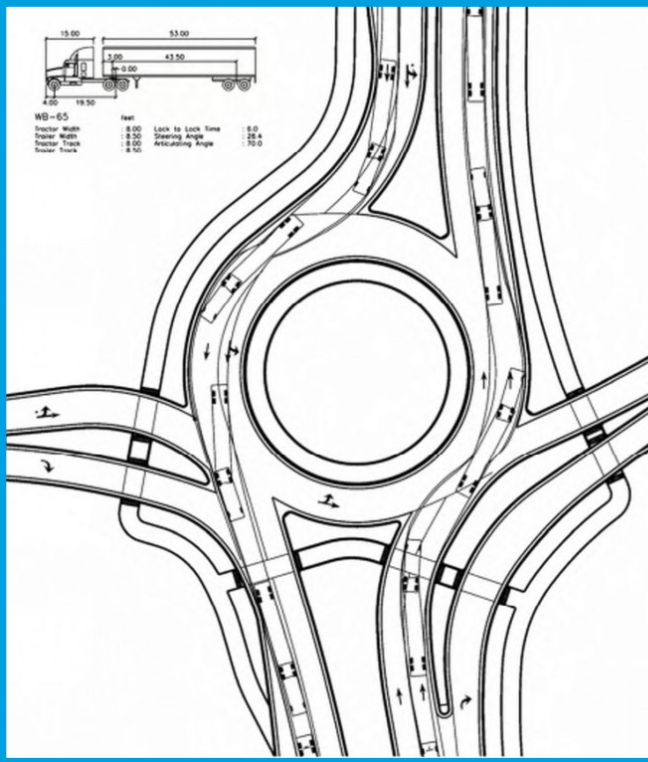
Should we trust WSDOT Traffic Projections?

Actual weekday traffic on SR-520 vs. WSDOT forecasts.

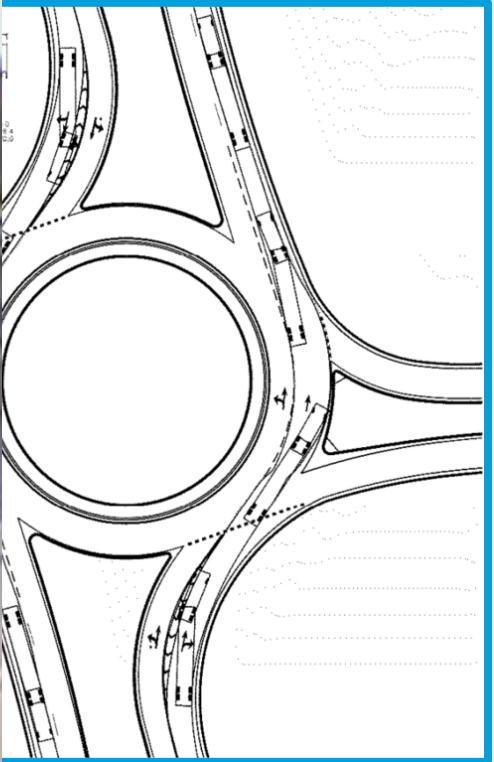


Sightline
INSTITUTE

Truck Cases



Case I

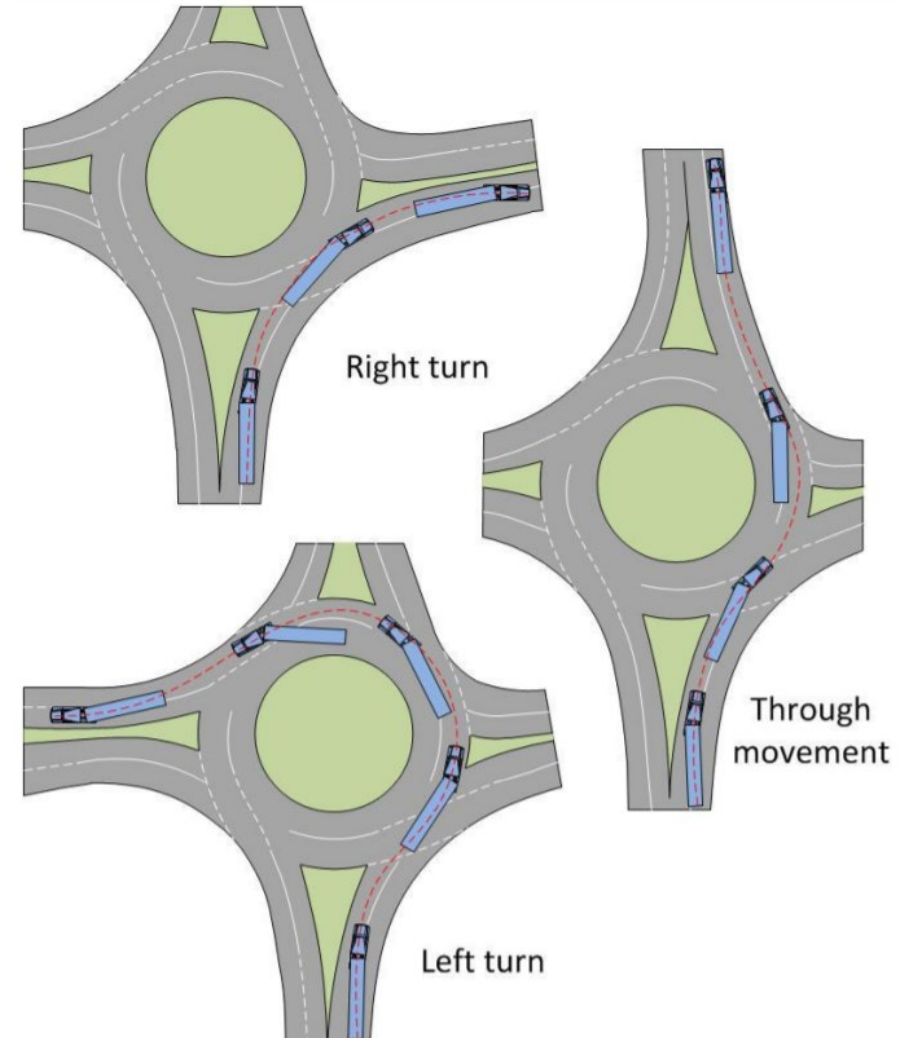


Case III

Source: WisDOT FDM 11-26 Roundabouts

WashDOT Trucks at Multilane Entrances

- Trucks take both lanes
- Box out each entrance
- Keep vehicles out of blind spot
- Avoid truck apron completely
- Simulate at ~5 mph



Source: WSDOT Design Manual M 22-01.17 Chapter 1320

V. Vertical Grades and Cross Slopes



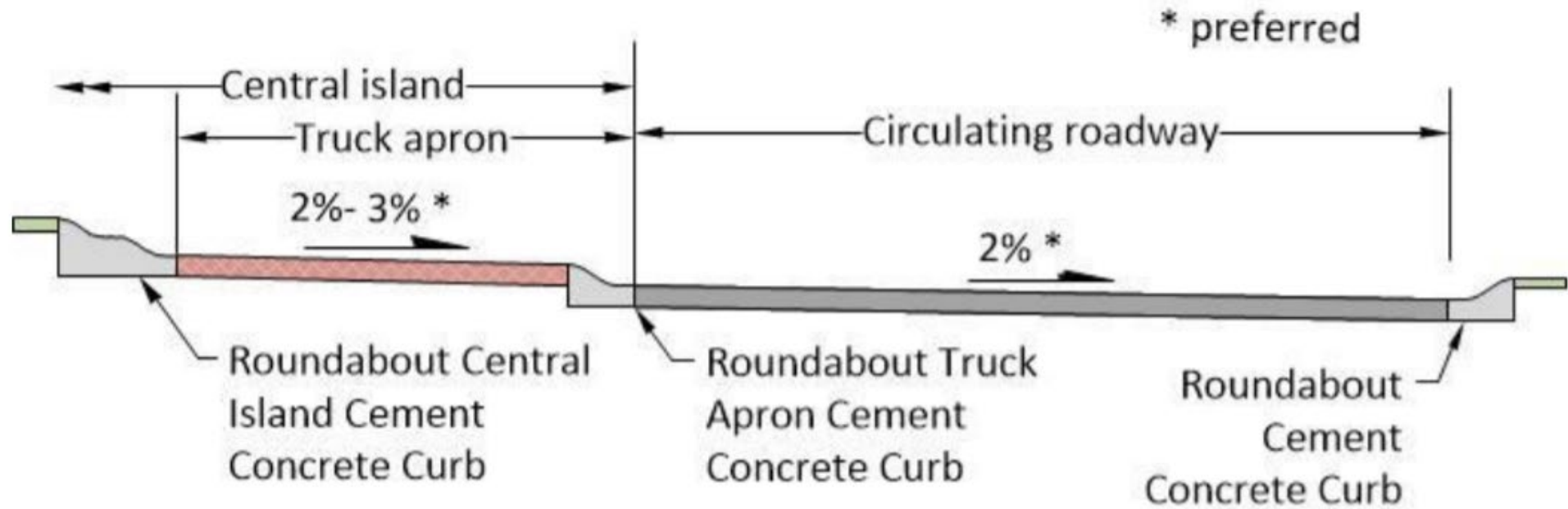
It is generally not desirable to place roundabouts in locations where grades through the intersection are **greater than 4%**, although roundabouts have been installed on grades of **10% or more**.

-NCHRP 672, 2nd Edition

Washington State DOT – Steep Profile



Cross Slopes



Source: WSDOT Design Manual M 22-01.17 Chapter 1320

WSDOT Lesson Learned



Thank you



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