

March 19th, 2026



ALASKA VILLAGE ROADS GUIDE

Suggested Roadway Geometrics and Design
Considerations for Alaska Villages with Mixed Use

Alaska Village Roads Guide

Ultra-Low-Volume Roads (<100 ADT)

Standards/guidelines that provide more flexibility than existing resources with specific consideration of needs in rural Alaska communities.



Billy Connor, Director
Alaska Infrastructure
Development Center
bgconnor@alaska.edu
(907) 474-5552



Dr. Nathan Belz
Associate Professor
CGEE Department, UAF
npbelz@alaska.edu
(907) 474-5765

Acknowledgements

Adam Larsen,
FHWA

Dan Breedeman,
Bristol

Ronald Eck,
WVU

Supported by the Center for Safety Equity in Transportation through the US
Department of Transportation University Transportation Centers Program CSET

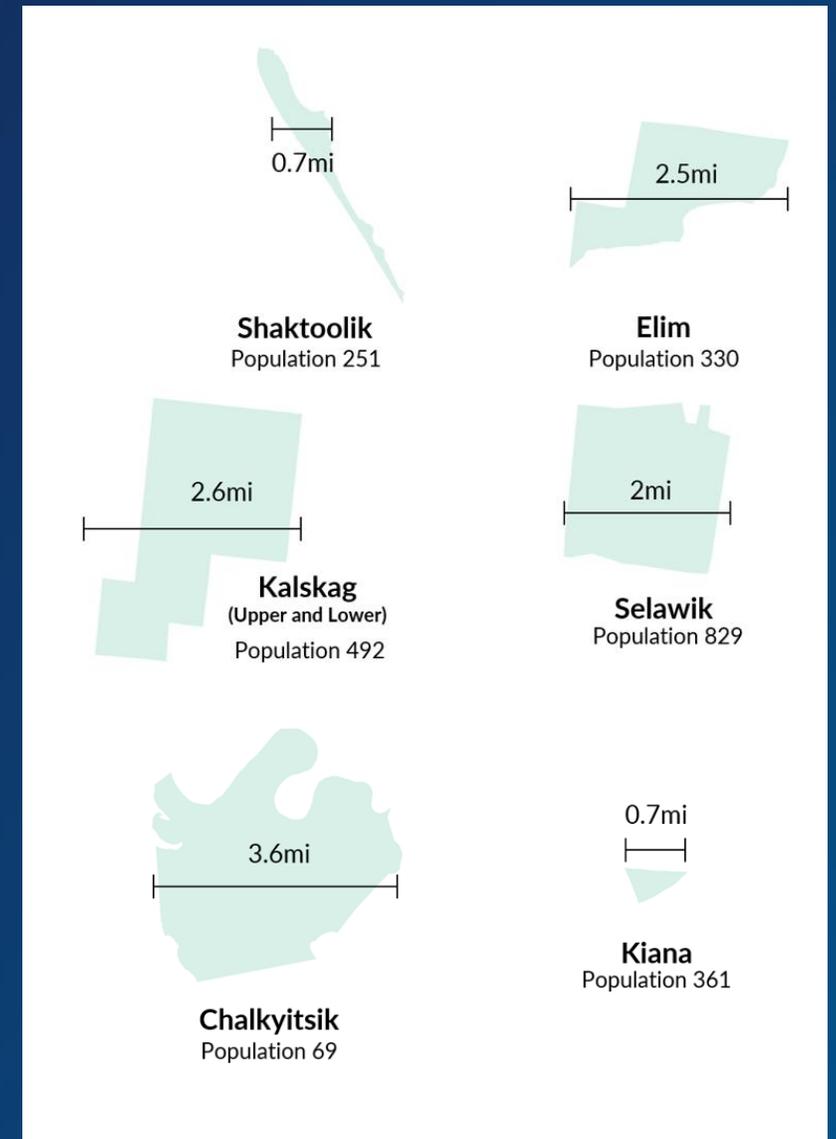
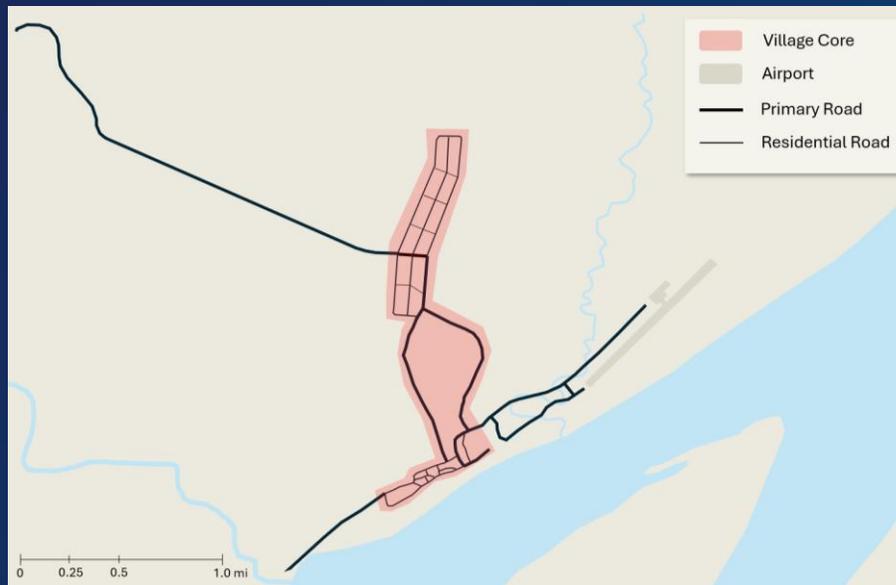
Purpose of This Guide

- Support safe, practical road design in Alaska villages
- Address mixed-use (ATVs, pedestrians, trucks, maintenance equipment)
- Balance safety, cost, and constructability



Context: Alaska Villages

- Isolated, limited road connectivity
- Trips typically <1 mile (core), <3 miles (non-core)
- Air and barge transport dominate



Design Philosophy

- Safety, efficiency, affordability
- Flexibility over strict standards
- Adapt to local materials and capabilities



Planning Considerations

- Community goals and tribal rules
- Vehicle mix and driver behavior
- Enforcement limitations
- Local environmental conditions



Planning Considerations

- Short travel distances
- High pedestrian interaction
- Gravel surface considerations
- Match design to function



Primary Modes of Travel

- ATVs (year-round dominant mode)
- Snowmobiles (winter)
- Limited pickup truck use
- Freight often via trailers



Road Surface Conditions

- Primarily gravel or native materials
- Lower friction vs. pavement
- Impacts stopping distance and design
- Limited Maintenance



Functional Classification

- Non-Core Roads
- Core Roads: Primary Streets
- Core Roads: Residential Streets



	Non-Core Roads	Core Roads	
		Primary	Residential
Function	Connect Core to nearby facilities such as the airport, landfill, gravel sources, etc.	Connect residential areas to school, village store, post office, community hall, village/tribal offices, etc.	Provide access to residential areas
Defining Characteristics	Higher speed, longer travel distances, higher design standards, often state ownership	High pedestrian traffic, unimpeded two-way traffic, access to private and public business facilities, higher speeds	Access to homes, high pedestrian traffic, children playing in the streets, often narrower requiring turnouts, low speed

Non-Core Roads

- Connect to airports, landfills, materials sites
- Higher speeds and design standards
- Longer travel distances



Core Roads – Primary Streets

- Connect key community destinations
- Mixed-use (pedestrians, ATVs, equipment)
- Moderate speeds



Core Roads – Residential

- Access to homes
- High pedestrian presence (children)
- Low speeds, narrower widths



Source: Anchorage Daily News

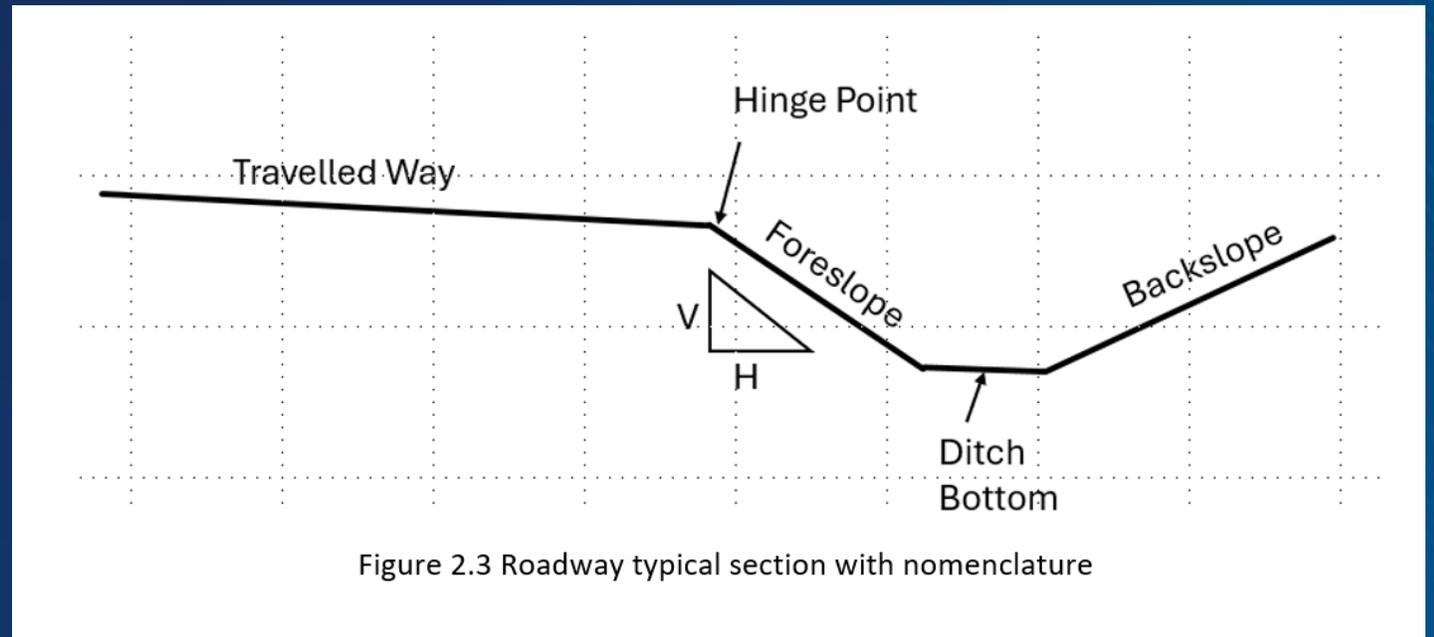
Design Speeds

- Based on function, width, terrain
- Typically 25–40 mph range
- Posted speeds often absent
- Design \approx 5 mph above expected behavior



Typical Roadway Sections

- Flexible cross-sections
- Ditches not always required
- Context-sensitive design



Roadway Width

- 14–24 ft typical range
- Influenced by pedestrians, vehicles, parking
- Wider for higher speeds and heavy vehicles

Table 2.2 Suggested Design Speed and Minimum Roadway Width

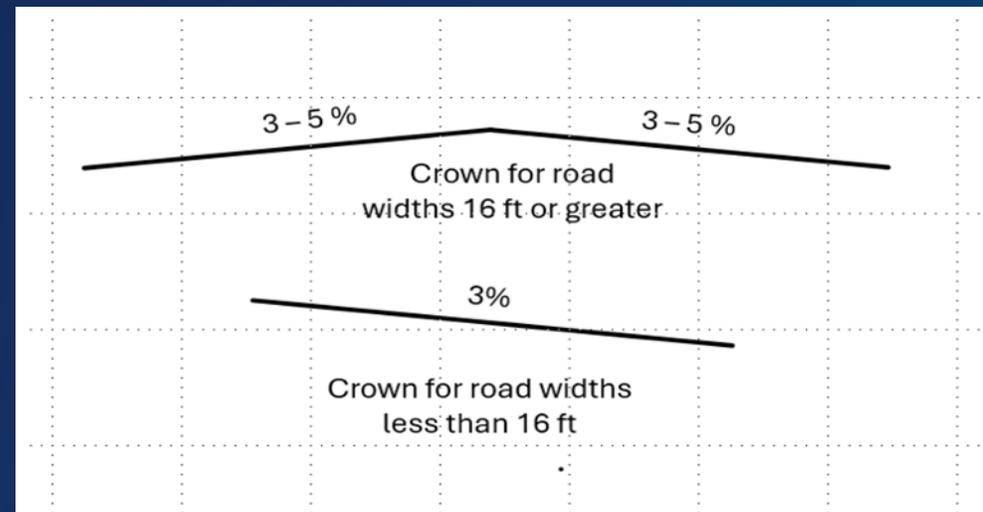
	Core		Non-Core			
	Primary	Residential	Airport	Landfill	Materials Source	Cemetery
Suggested Design Speed	30	25	40	35	30	30
Minimum Width	18	14	24	18	20	18

Grades

- Preferred: $\leq 6\%$
- $\leq 3\%$ at intersections
- Adjust for terrain and heavy vehicles

Crowns

- 3-5% for gravel roads
- $\leq 4\%$ for silty materials
- One-way slope for very narrow roads (under 16 ft)



Turnouts and Widening

- Used on narrow roads for passing
 - Typical: 6 ft x 25 ft
 - Spacing ≤ 500 ft
 - Include tapers and sight distance
- Home access
 - 15-20 ft

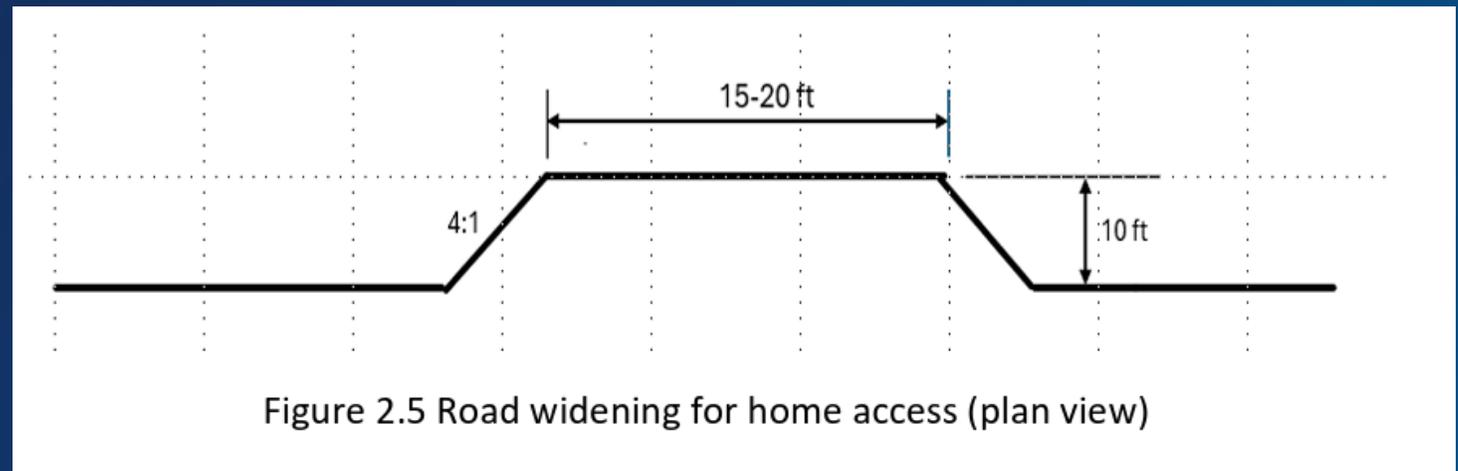


Figure 2.5 Road widening for home access (plan view)

Roadside Design Overview

- Limited shoulders common
- Balance safety with practicality
- Avoid overdesign



Clear Zones

- Typically 7–10 ft
- Increase on curves
- Flat, recoverable slopes preferred



Barriers & Guardrails

- Generally avoided
- Use only when warranted
- Consider cost and maintenance



Source: Alaska Municipal League

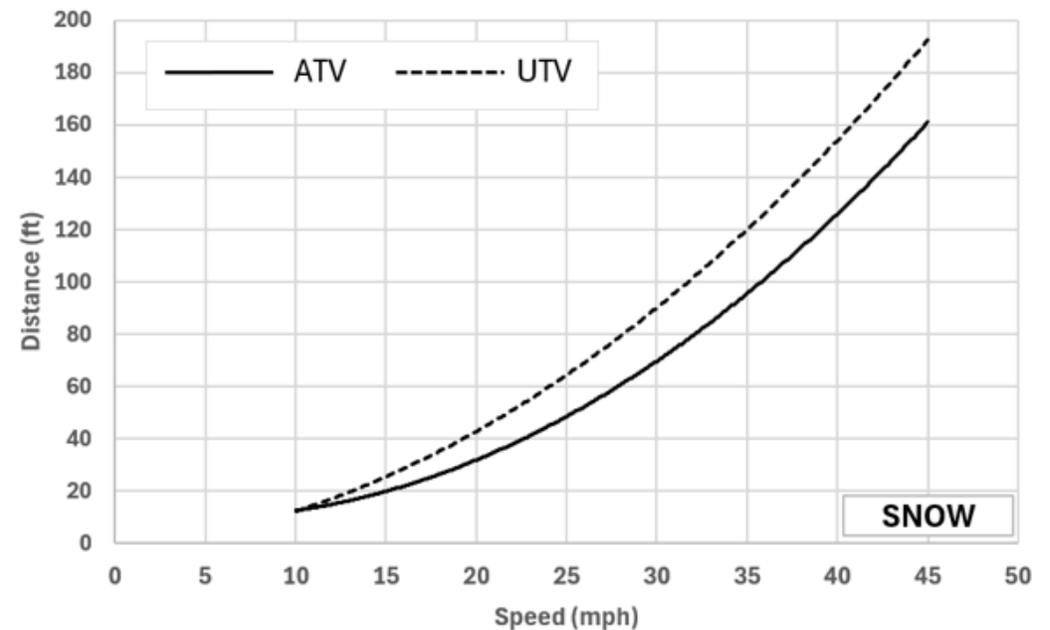
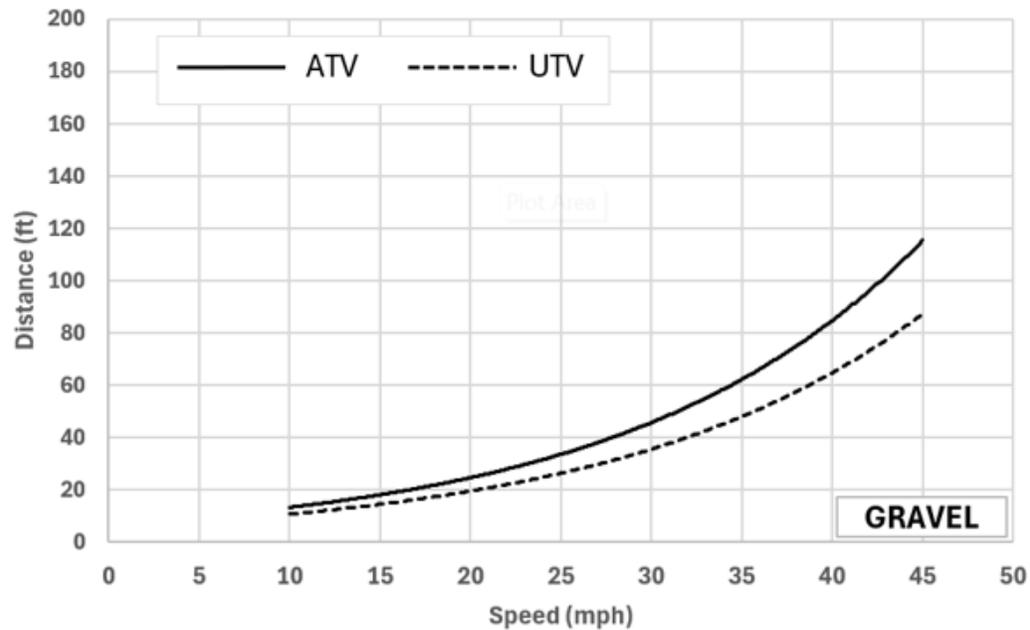
Drainage

- Critical for longevity
- Ditches, culverts, and grading
- Coordinate with permitting agencies



Stopping Sight Distance

- Adjusted for ATVs/UTVs
- Longer distances on gravel/snow
- Critical for safety



Horizontal Alignment

- Minimize curves where possible
- Use simplified radius design

Table 2.3 Equations for Horizontal Curves

Equations for Horizontal Curves	
Estimated friction demand for horizontal curves, f	$f = (V^2 / 15R) - 0.01e$ <p>Where f = side friction factor V = Vehicle speed (mph) R = Radius of curve (ft) e = rate of roadway superelevation (%)</p>
To find minimum radius of a curve, R_{min}	$R_{min} = V^2 / 15(0.01e_{max} + f_{max})$ <p>Where R_{min} = minimum curve radius (ft) V = Vehicle speed (mph) f_{max} = maximum side friction factor e_{max} = maximum superelevation rate (%)</p>
To find minimum radius of a curve, R_{min} with 0% superelevation	$R_{min} = V^2 / 15f_{max}$ <p>Where R_{min} = minimum curve radius (ft) V = Vehicle speed (mph) f_{max} = maximum side friction factor $e_{max} = 0$</p>

Curve Design Considerations

- Avoid superelevation if possible
- Use friction-based design
- Reduce speed for tighter curves

Table 2.4 F_{max} and R_{min} Values by Design Speed (Ref. Alaska Preconstruction Manual)

F _{max} and R _{min} Values by Design Speed				
Design Speed (mph)	F _{max} paved	F _{max} unpaved	R _{min} (ft) paved	R _{min} (ft) unpaved
15	0.175	0.27	85	60
20	0.175	0.23	150	120
25	0.165	0.20	255	210
30	0.170	0.17	355	355
35	0.155	0.15	530	545



Horizontal Curve Sight Distance

- Maintain clear inside offsets
- Use middle ordinate concept
- Remove obstructions

$$m = R(1 - \cos(28.65S / R))$$

Where

m = middle ordinate (ft)

R = radius (ft)

S = Sight distance (ft)

Table 2.8 Horizontal Sightline Offset for Select Design Speeds and Curve Radii

Design speed (mph)	Stopping sight distance (ft)	Width on inside of curve clear of sight obstructions (ft)						
		Radius of curvature (ft)						
		50	100	200	500	1000	2000	5000
15	80	15	8	4	2	1	0	0
20	100	23	12	6	2	1	1	0
25	130	37	20	10	4	2	1	0
30	160	51	30	15	6	3	2	1
35	200	71	46	24	10	5	2	1

Vertical Curves

- Smooth, gradual transitions
- Ensure adequate sight distance
- Use reduced-speed solutions if constrained

Design speed (mph)	Stopping sight distance (ft)	Rate of vertical curvature, K K = L/A (Length of curve L per percent algebraic difference in intersecting grades, A)	
		Calculated	Design
15	65	2.0	2
20	90	3.8	4
25	115	6.1	7
30	135	8.4	9
35	170	13.4	14

Intersections

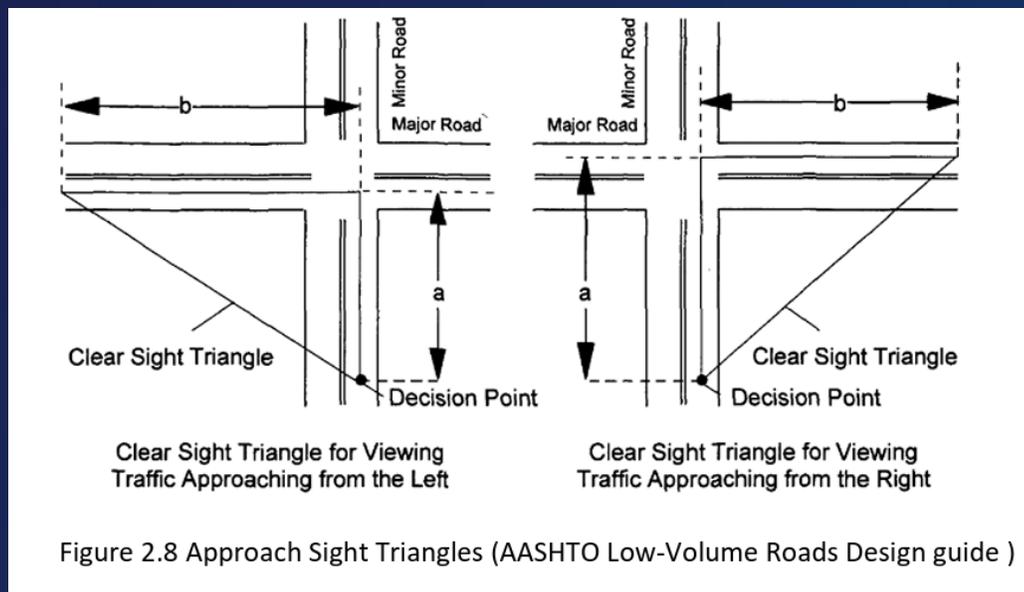
- Often low-control environments
- Rely on sight distance
- Use STOP/YIELD selectively



Photo Credit: Vlad Sokhin

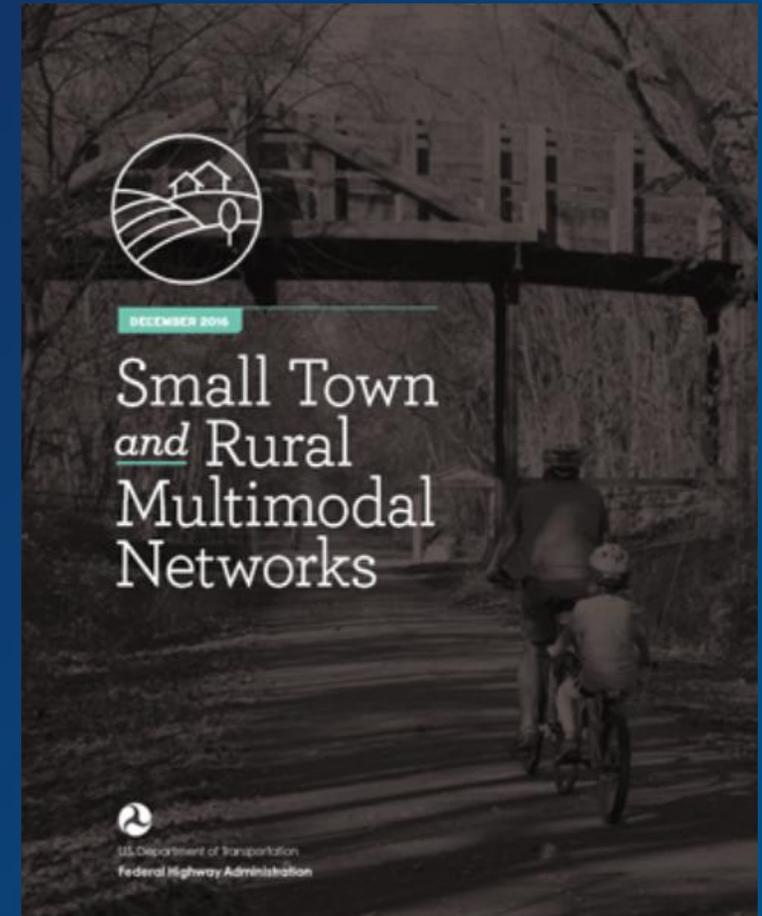
Clear Sight Triangles

- Ensure visibility at intersections
- Approach and departure triangles
- Adjust for land use



Multimodal Considerations

- Shared space common
- Limited separation
- Design width accommodates pedestrians



Bridges

- Match roadway width where possible
- Provide pull-offs for one-lane bridges
- Use warning signage



Bridge Widths by Roadway Type			
Roadway type	Paved roadway (travel way and shoulder)	Unpaved roadway and/or shoulder	One-lane bridge
Bridge width	Total roadway width	Total width of the traveled way plus 2 ft.	12-16 ft., intervisible pull-offs at each end

Signage

- Follow MUTCD Part 5 (low-volume roads)
- Use minimum practical sizes
- Enhance conspicuity as needed



Lighting

- Important due to long darkness periods
- Focus on high pedestrian areas
- Improves safety and visibility



Source: CBS News / AP Photo – Gregory Bull

Key Takeaways

- Design for context, not standards alone
- Prioritize safety of mixed users
- Flexibility is essential
- Local conditions drive decisions



Questions / Comments

Billy Connor, Director
Alaska Infrastructure Development Center
bgconnor@alaska.edu
(907) 474-5552

Dr. Nathan Belz
Associate Professor
CGEE Department, UAF
npbelz@alaska.edu
(907) 474-5765

