

2016 Changes to Standards

Nebraska Administrative Code Title 428

Rules and Regulations of the
Board of Public Roads Classifications and Standards
(Administrative Host: Nebraska Department of Roads)

County Roads and Municipal Streets

<http://www.transportation.nebraska.gov/gov-aff/gov-aff-design-standards.html>

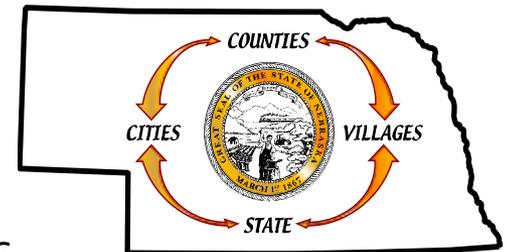


Boards - Liaison Services Section

Neb. Rev. Stat. 39-2113

Slide 1

1/19/2016





Learning Objectives



1. Know what has changed in new standards
2. New format for design standards tables
3. How to find the correct table
4. Present selected definitions (not all 39)
5. Understand the notes (all 22)
6. Understand 3R requirements
7. Application to One- and Six-Year Plan

Outline

1. Introduction: Overview, Relaxation of Standards
2. Minimum Design Standards: main elements, criteria
3. Finding the correct table: areas, functional classifications
4. Summary of Changes; Standards Limitations
5. Understanding Definitions and Notes
6. More notes
7. 3R Design Standards (part 1)
8. 3R Design Standards (part 2)
9. Bridges/Structures
10. Construction and Maintenance standards, and One- and Six-Year Plans
11. Roadside Design
12. ADA, Bicycles



What this is NOT

- a design course on roads and bridges
- a presentation on updated state highway standards
- a debate on the standards
 - Comments welcome, but need to get through the material
- for certification or qualification

Integrated System of Public Roads - Nebraska's Program Promotes:

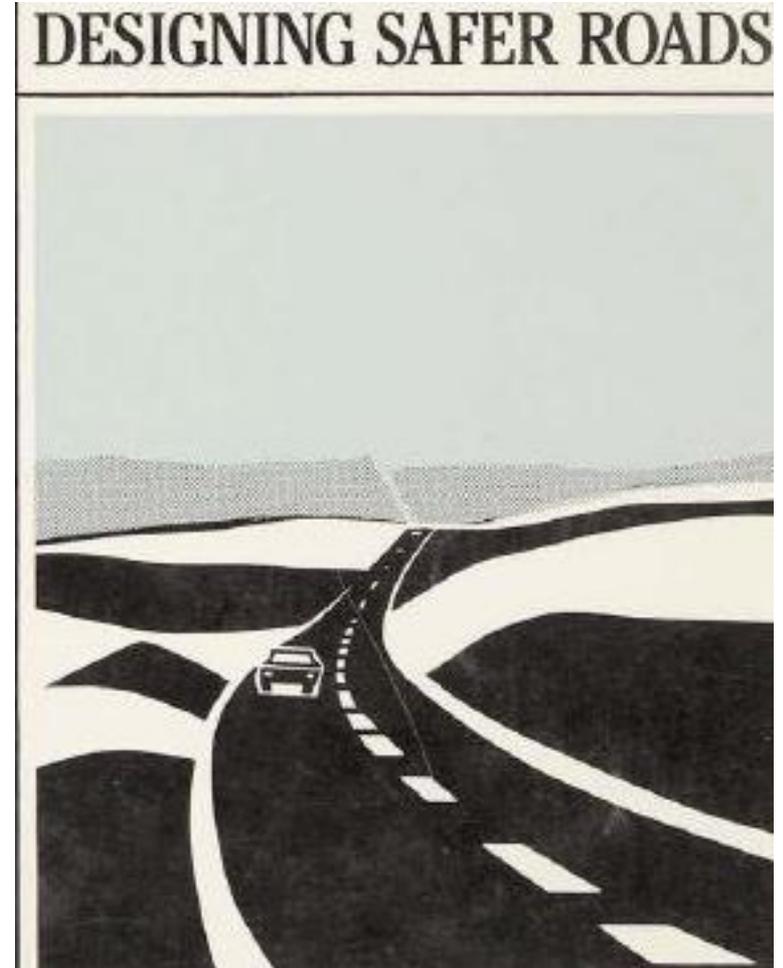
- Free flow of traffic
- Safer use of public roads
- Lower cost of motor vehicle operation
- Increase in property values
- Economic and social progress

Standards affect these

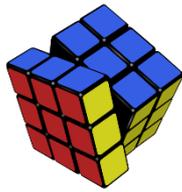
Why change the Standards?

- Allow 3R work and **provide 3R standards**
 - practical, cost-effective solutions
- **Consistency** with State Highway standards
 - criteria, terminology, format, align with AASHTO
- **Clarify** minimum maintenance standards
 - added activities
- **Reorganize** remote residential roads, minimum maintenance roads, and low-water crossings and fords standards
 - Much the same, just reorganized

Resurfacing Restoration Rehabilitation (3R)



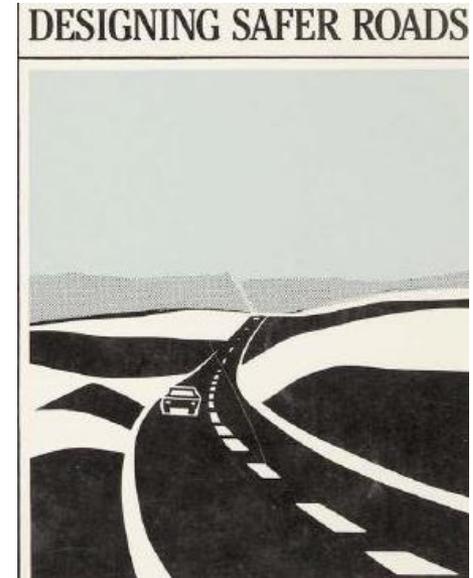
the major reason for updating
Minimum Design Standards



3R Standards

Flexibility

- Asset Preservation –
Extend Life
- Safety Conscious Design
- Cost Effective Analysis
- Safety Improvement if
 - Significant, Relevant
Crash History
 - Benefits greater than
Costs



References on Slides

County Roads and Municipal Streets

All changes are
within Chapter 2

Example: 428 NAC 2-001.03A6a

428 = Title Number

NAC = Nebraska Administrative Code

2 = Chapter 2

001 = Section 1

03 = Subsection 3

A = Part A

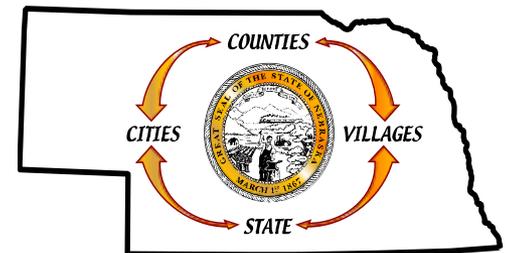
6 = Subpart 6

a = Division a



Boards - Liaison Services Section

Slide 9



Title 428 Changes – Quick Summary

<http://www.transportation.nebraska.gov/gov-aff/gov-aff-design-standards.html>

State Highway Design Standards
(428 NAC 2-001 **Part One**)

County Roads / Municipal Streets Design
Standards (428 NAC 2-001 **Part Two**)

- 3R Standards added
- New & Reconstructed – 13 criteria
- Minimum Maintenance Roads, Remote Residential Roads, and Low Water Crossings design moved to Section 001
 - Design Standards moved from 428 NAC 2-004 to 428 NAC 2-001
 - Minimum Maintenance standards moved from 428 NAC 2-003 to 428 NAC 2-001



Title 428 Design Standards Changes – Quick Summary

13 Design Criteria in the Tables

1. Design Speed
2. Lane Width
3. Shoulder Width
4. Horizontal Alignment (radius)
5. Superelevation
- 6. Vertical Alignment (K Values)**
7. Maximum Grade
- 8. Stopping Sight Distance**
- 9. Cross Slope**
- 10. Vertical Clearance**
11. Clear Bridge Width
12. Structural Capacity
- 13. Horizontal Clear Zone**



Bold Font – added
in 2016 standards

Title 428 Design Standards Changes – Quick Summary

To find design criteria, need to know:

- Location (Urban or Rural)
- Functional Classification
- Type of Work (N&R/3R/Maintenance)
- ADT
- %HT (3R)
- Surface – paved or unpaved (3R)
- Type of Section – curbed or non-curbed



Title 428 Design Standards Changes – Quick Summary

- 3R standards are in each Table alongside N&R standards
- Boundaries, between 3R and other standards, are defined
- Tables cover all ADT ranges
- Several criteria eliminated
 - Lighting for municipal streets, typical cross sections for rural roads, number of lanes, surfacing type, median width, design standard numbers



Title 428 Changes – Quick Summary



Construction Standards (428 NAC 2-002) fewer requirements

Minimum Maintenance standards (428 NAC 2-003) allow more activities

Relaxation of Standards (428 NAC 2-004) submittal requirements clarified

Title 428 Changes Today's Main Focus

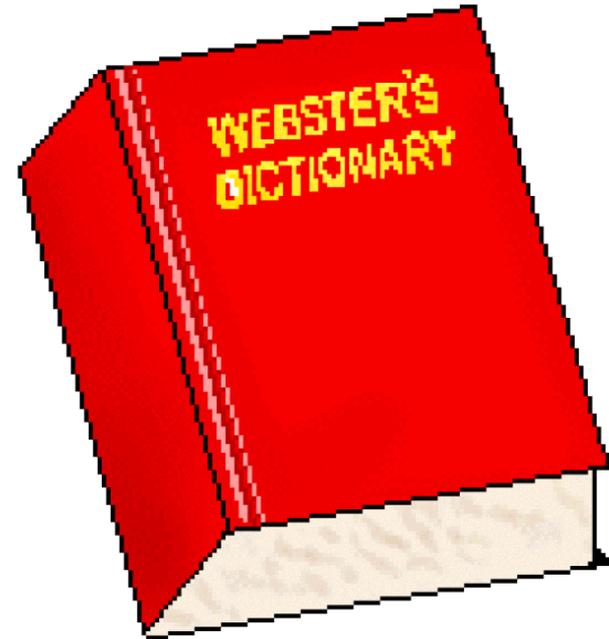


Minimum Design Standards (MDS)

428 NAC 2-001 Part Two

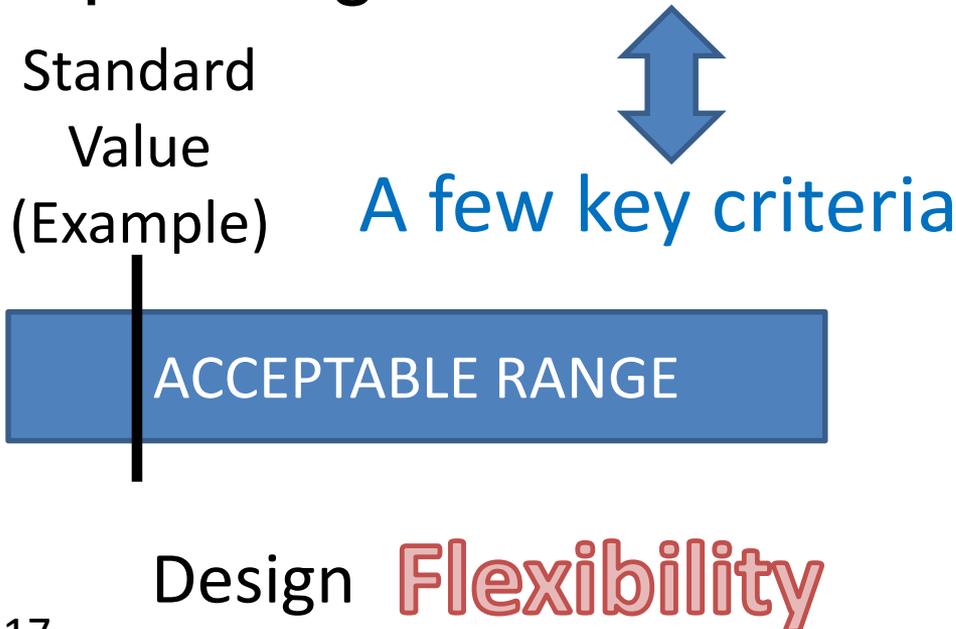
Terminology/Acronyms for this presentation

- NBCS = Nebraska Board of Public Roads Classifications and Standards
- Minimum Design Standards (MDS)
- Standards
- Neb. Rev. Stat.
- N&R = new and reconstructed
- NBS = non-buried structure
- Structure = bridge, NBS, culvert, low water crossing or ford
- Very Low-Volume Roads (≤ 400 VPD)



Minimum Design Standards are

Lowest limit to build a facility without requesting a relaxation of standards



Title 428 Chapter 2

Procedures for Standards

- **001 Minimum Design Standards**
 - Part One - State Highway System
 - Part Two – County Roads and Municipal Streets
- 002 Minimum Construction Standards
- **003 Minimum Maintenance Standards**
- **004 Relaxation of Standards**
- 005 Standard Compliance Inspection Procedures

Relaxation of Standards Design Exception

What is it?

A documented decision that has NBCS approval to design, construct or maintain an element or segment of a highway, street or road that **does not meet minimum criteria, values or ranges** established by the NBCS.

Relaxation of MDS Required When . . .

Title 428 – BOARD OF PUBLIC ROADS CLASSIFICATIONS AND STANDARDS

Note 1 (new)

A standard value or range or requirement in

- Tables
- Notes (requirements in **bold font**)

cannot be met due to a special hardship.

ards (Continued)

ICTED / RESURFACING, RESTORATION AND REPAIRS IN URBAN AREAS – COUNTY ROAD AND MUNICIPAL

National: Minor Arterial, Local, Collector or Other Arterial
Urban Areas (Notes 1, 2, 3, 4, 7)

Width & Reconstructed	3R (Note 1)
30 MPH (45 MPH)	
11 ft	<u>ADT (VPD), %HT</u> ≥ 750, ≥ 10% ≥ 750, < 10% 400 - 749, ≥ 10% 400 - 749, < 10%

Relaxation of Standards Why Needed?

- Many reasons, or combinations of reasons
 - **Impacts** to the natural environment
 - Social or right-of-way impacts
 - Preservation of historic or cultural resources
 - Sensitivity to context
 - Sensitivity to community values
 - Construction or right-of-way **costs**



NBCS Expects Few Relaxation of Standards Requests

- Unusual circumstances, constrained situations
- Potential to adversely affect
 - Safety
 - Operations

Special Hardship



New NBCS Requirements for Relaxation of Standards Requests

- Changes define better what NBCS expects in a request submittal
- Thorough analysis and documentation
- If granted, relaxation becomes the minimum standard for roadway segment or bridge, until circumstances change

NBCS Requirements for Relaxation of Standards Requests - Summary

- Project Design
- Degree of reduction in standards
- Effect on operations
- Consideration of adjacent segments
- Crash History analysis
- Costs – full standards v. proposed
- Mitigating features
- Future improvements
- Environmental impacts
- Other factors

Title 428

How it is Organized

Chapter 1 Procedures for Classifications

Chapter 2 Procedures for Standards

Chapter 3 One- and Six-year Plans

Chapter 4 Standardized System of Annual Reporting

Chapter 5 Hearing Practice and Procedure of the NBCS

Title 428 Chapter 2

Procedures for Standards

How it is Organized

- **001 Minimum Design Standards**
 - Part One - State Highway System
 - **Part Two – County Roads and Municipal Streets**
- **002 Minimum Construction Standards**
- **003 Minimum Maintenance Standards**
- **004 Relaxation of Standards**
- 005 Standard Compliance Inspection Procedures



#2
MDS: main
elements,
controlling criteria



Title 428 Chapter 2

Procedures for Standards

- **001 Minimum Design Standards**
 - Part One - State Highway System
 - **Part Two – County Roads and Municipal Streets**
- 002 Minimum Construction Standards
- 003 Minimum Maintenance Standards
- 004 Relaxation of Standards
- 005 Standard Compliance Inspection Procedures

State Highway Standards

428 NAC 2-001 Part One

Parallel Update

- coordination with county roads and municipal streets standards update
- format consistency
- verbiage consistency
- meshing values

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Minimum Design Standards Separate Standards

State Highway Standards
428 NAC 2-001 **Part One**



County Roads and Municipal
Streets Standards
428 NAC 2-001 **Part Two**



What is a Design Standard?

- Definition of “Standard”
 - a basis for comparison; a reference against which other things can be evaluated
 - criterion: the ideal in terms of which something can be judged
 - i.e. foot, Pound, Station



Design Standards

County Roads and Municipal Streets

Attributes established as
acceptable by NBCS



Design Standards - Scope

County Roads and Municipal Streets

Only the more important criteria –
for safe and efficient operation

- Impractical to set standards for every possible design element



Design Standards

County Roads and Municipal Streets

Main Elements

1. Definitions (39)
2. General Notes (22)
3. Tables (15)



Design Standards

County Roads and Municipal Streets

Main Elements

1. Definitions (39)
2. General Notes (22)
3. Tables (15)



Learning Objectives

1. Know what has changed
- 2. New format for design standards**
3. How to find the correct table
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7. Application to one- and six-year plan

2010 Design Standards

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Title 428 — BOARD OF PUBLIC ROADS CLASSIFICATIONS AND STANDARDS

Chapter 2 — Procedures for Standards (Continued)

3 Tables

Pages 21, 22 and 23

MINIMUM DESIGN STANDARDS - PART TWO LOCAL ROADS AND STREETS

001.15 MINIMUM DESIGN STANDARDS — MUNICIPAL STREETS ⁽¹⁾

(2) State Functional Classification	(3) Design Year Traffic	(4) Design Speed (mph)	(5) Maximum Horizontal Curve (Degree)	Maximum Grade (Percent)	(6) Number of Lanes	(7) Lane Width (Feet)	Median Width (Feet)	Non-Curbed Section Shoulder Width (Feet)	(8) Fixed Obstacle Clearance (Feet)	Lighting	New and Reconstructed Bridge Design Loading
Other Arterial	—	30	15	8	2	11	0 - As Required	8	—	Full	HL93
Collector	—	25	20	10	2	11	None	6	—	Desirable	HL93
Local	—	25	30*	10	2	11	None	6	—	Desirable	HL93

Title 428 — BOARD OF PUBLIC ROADS CLASSIFICATIONS AND STANDARDS

Chapter 2 — Procedures for Standards (Continued)

001.16 MINIMUM DESIGN STANDARDS — RURAL ROADS ⁽¹⁾

(2) Roadway Classification	Design Number	(3) Current Year ADT	(4) Design Speed (mph)	(5) Maximum Horizontal Curve (Degree)	(6) Maximum Grade (Percent)	(7) Number of Lanes	(8) Lane Width (Feet)	Shoulder Width (Feet)	(9) Fixed Obstacle Clearance (Feet)	(10) Now and Reconstructed Bridges		(11) Bridges to Remain in Place (100 Feet and Under in Length)	New and Reconstructed Bridge Design Loading	(12) Surfacing Type
										(100 Feet and Under in Length) Roadway Width	(Over 100 Feet in Length) Roadway Width	Roadway Width		
Other Arterial	ROA1	401 - 750	50	7.5	7	2	12	6	12	30'	28'+	24'	HL93	Aggregate or Paved
	ROA2	251 - 400	50	7.5	7	2	11	4	10	30'	28'	22'	HL93	Aggregate or Paved
	ROA3	51 - 250	50	7.5	7	2	10	4	10	28'	28'	20'	HL93	Aggregate or Paved
	ROA4	0 - 50	40	8.0	8	2	10	3	8	26'	26'	20'	HL93	Aggregate*
Collector	RC1	251 - 400	50	7.5	7	2	11	4	10	30'	28'	22'	HL93	Aggregate or Paved
	RC2	51 - 250	50	7.5	7	2	10	4	10	28'	28'	20'	HL93	Aggregate or Paved
	RC3	0 - 50	40	10.0	9	2	10	3	5	24'	24'	20'	HL93	Aggregate*
Local	RL1	251 - 400	50	7.5	7	2	11	4	8	26'	26'	22'	HL93	Aggregate or Paved
	RL2	51 - 250	50	7.5	7	2	10	4	8	24'	24'	20'	HL93	Aggregate or Paved
	RL3	0 - 50	30	23.0	10	2	10	3	5	20'+	20'+	20'	HL93	Aggregate*
Scenic-Recreation	**	**	**	**	**	**	**	**	**	**	**	**	**	**
Remote Residential	***	***	***	***	***	***	***	***	***	***	***	***	***	***
Minimum Maintenance	***	***	***	***	***	***	***	***	***	***	***	***	***	***

2016 Design Standards

15 Tables

4 – Urban

4 – Rural

4 – Scenic-Recreation

1 – Low Water Crossings and Fords

1 – Minimum Maintenance Roads

1 – Remote Residential Roads

2016 Standards

County Roads and Municipal Streets

- 4 Tables each for Urban, Rural and Scenic-Recreation
2016 MDS
organized by
NATIONAL
FUNCTIONAL
CLASSIFICATION
2010 MDS
organized by
State
Functional
Classification
- 3 other tables - Low Water Crossings and Fords, Remote Residential Roads, and Minimum Maintenance Roads

001.03C NEW AND RECONSTRUCTED / RESURFACING, RESTORATION AND REHABILITATION (3R) IN URBAN AREAS – COUNTY ROAD AND MUNICIPAL STREET SYSTEMS

National: Minor Arterial
State: Local, Collector or Other Arterial
 Urban Areas (Notes 1, 2, 3, 4, 7)

Functional Classification (Note 5)		
Design Criteria	New & Reconstructed	3R (Note 6)
Design Speed (DS) (Note 8)	30 MPH (45 MPH) Posted Speed Limit	
Lane Width (Note 9)	11 ft.	ADT (VPD), %HT
		≥ 750, ≥ 10% Paved Unpaved
		≥ 750, < 10% 11 ft. 11 ft.
		400 - 749, ≥ 10% 10 ft. 11 ft.
		400 - 749, < 10% 10 ft. 10 ft.
< 400 10 ft. 10 ft.		
Shoulder Width (Note 11)	Curbed Sections: Not Applicable ADT ≥ 2,000 VPD: 8 ft. ADT 400 - 1,999 VPD: 6 ft. ADT < 400 VPD: 4 ft.	Paved Traveled Way
		ADT ≥ 2,000 VPD: 5 ft. ADT < 2,000 VPD: 2 ft.
	Unpaved Traveled Way:	Existing
Horizontal Alignment	(Note 12)	(Note 12)
Superelevation (maximum)	Paved: e _{max} = 4% Unpaved: e _{max} = 6%	Existing
Radius (based on e _{max})	Paved	Existing
	DS 30 MPH: 250 ft. DS 45 MPH: 711 ft.	
	Unpaved	Existing
	DS 30 MPH: 231 ft. DS 45 MPH: 643 ft.	
Vertical Alignment		(Note 13)
Crest K Value	DS 30 MPH: 19 DS 45 MPH: 61	Existing
Sag K Value	DS 30 MPH: 37 DS 45 MPH: 79	Existing
Grade (maximum) (Note 14)	DS 30 MPH 8% Level, 9% Rolling DS 45 MPH 6% Level, 7% Rolling	Existing
Stopping Sight Distance (Note 13)	DS 30 MPH: 200 ft. DS 45 MPH: 360 ft.	Existing

Controlling Criteria



Mitigation Strategies for Design Exceptions

- Publ. Number FHWA-SA-07-011 *July 2007*
- 23 US 625: Design Standards for Highways

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- **Changes - Potentially**
 - **Federal Register Vol 80 No 194**
 - **NCHRP Report 783**



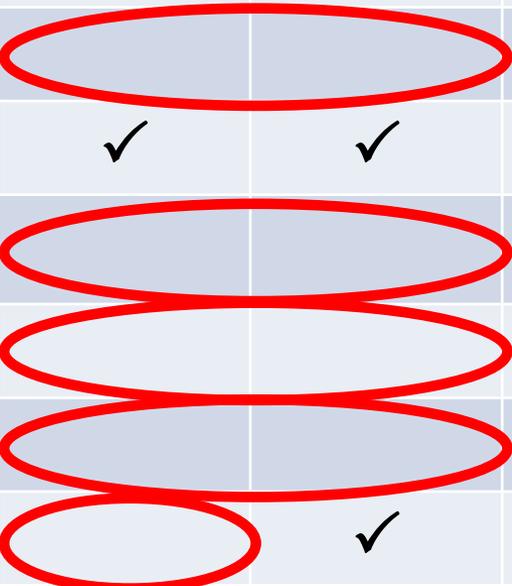
Controlling Criteria (13)

- Design Speed
- Lane Width
- Shoulder Width
- Horizontal Alignment
- Superelevation
- **Vertical Alignment**
- Maximum Grade
- **Stopping Sight Distance**
- **Cross Slope**
- ~~Lateral Offset to Obstruction~~
- **Vertical Clearance**
- Bridge Clear Width
- Structural Capacity



Criteria Comparison

12 Controlling Criteria in Standards	2010 Standards		2016 Standards	
	Municipal Streets	Rural Roads	Urban Areas	Rural Areas
Design Speed	✓	✓	✓	✓
Lane Width	✓	✓	✓	✓
Shoulder Width	✓	✓	✓	✓
Horizontal Alignment (radius)	✓	✓	✓	✓
Superelevation	✓	✓	✓	✓
Vertical Alignment (K Values)			✓	✓
Maximum Grade	✓	✓	✓	✓
Stopping Sight Distance			✓	✓
Cross Slope			✓	✓
Vertical Clearance			✓	✓
Clear Bridge Width		✓	✓	✓
Structural Capacity	✓	✓	✓	✓



Criteria in Standards (13)

- 1. Design Speed**
- 2. Lane Width**
- 3. Shoulder Width**
- 4. Horizontal Alignment (Radius)**
- 5. Superelevation**
- 6. Vertical Alignment**
- 7. Maximum Grade**
- 8. Stopping Sight Distance**
- 9. Cross Slope**
- 10. Horizontal Clear Zone**
- 11. Vertical Clearance**
- 12. Bridge Clear Width**
- 13. Structural Capacity**

Geometric Design Objectives

1. Optimize: **Traffic Operations and Safety**
2. Minimize: **Cost and Environmental Damage**



Many complex tradeoffs

Design: achieve a balance



#3

Finding the correct
table: areas,
classifications



Learning Objectives

1. Know what has changed
2. New format for design standards
- 3. How to find the correct table**
4. Understand the notes
5. Present selected definitions
6. Understand 3R requirements
7. Application to one- and six-year plan

2016 Standards

County Roads and Municipal Streets

- 4 Tables each for Urban, Rural and Scenic-Recreation
 - Minor Arterial
 - Major Collector
 - Minor Collector
 - Local
- 3 other tables - Low Water Crossings and Fords, Remote Residential Roads, and Minimum Maintenance Roads

How to find the right table for my road or street?

Finding the Appropriate Table



1. In what **Area** is the road?
 - a. Urban or Rural

2. What is the **National Functional Classification** of the road?
 - a. Minor Arterial
 - b. Major Collector
 - c. Minor Collector
 - d. Local

State Functional Classification
Local
Minimum Maintenance
Remote Residential

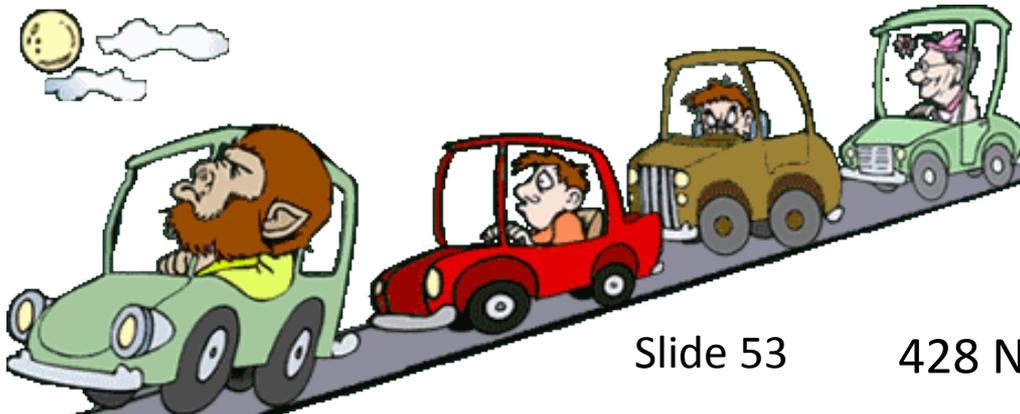
High Speed – Urban Areas



Rural Area standards required when posted speed limit is anticipated to be 50 MPH or greater

Urban-like Roads in Rural Areas

- Allows use of urban standards in rural areas
 - Residential and commercial areas
- Possible applications:
 - Cities of the Second Class
 - Villages
 - Within the zoning jurisdiction of the above*
 - Sanitary Improvement Districts (SIDs)

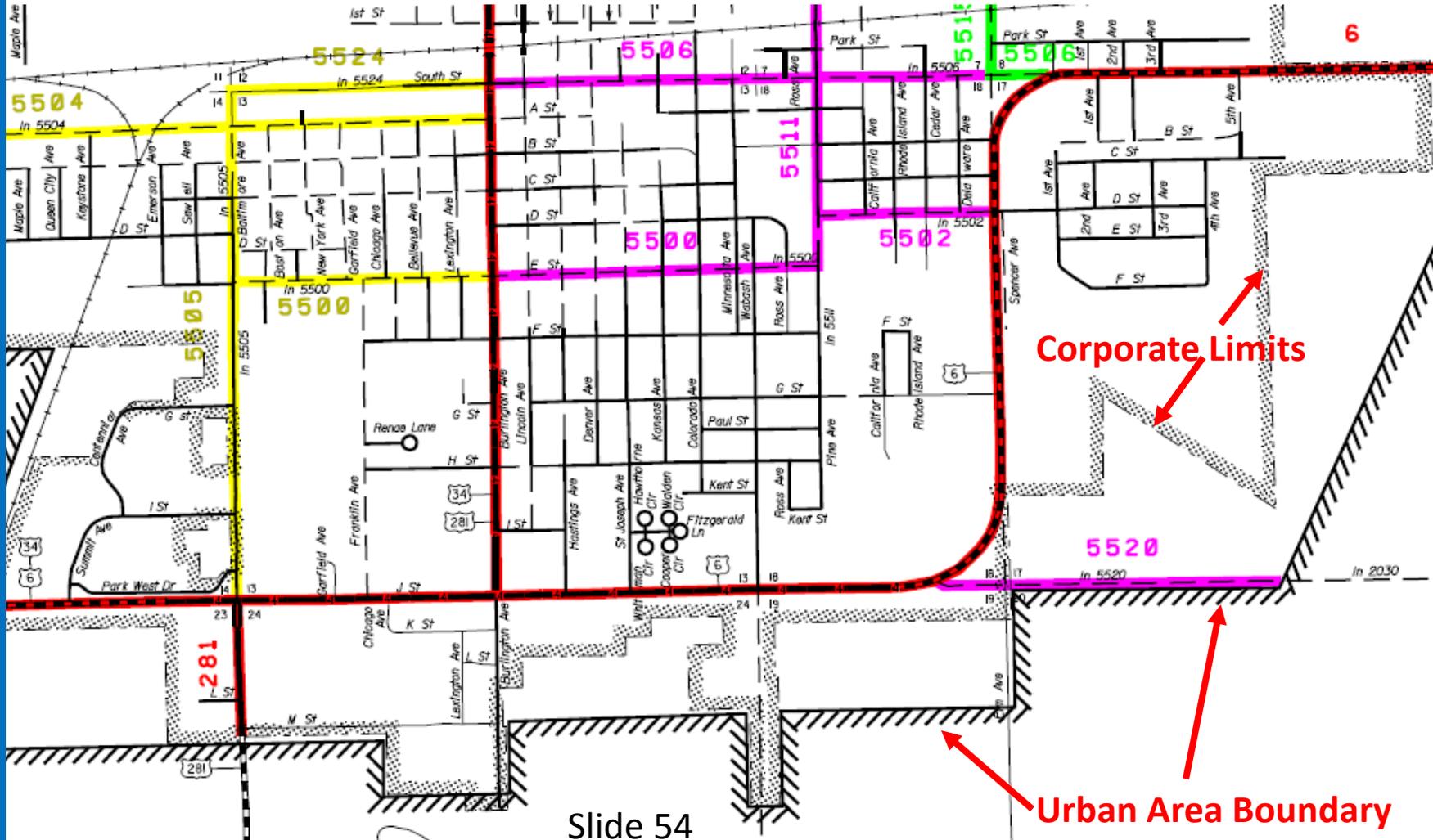


* 2010 Standards: needed to meet the higher of the two standards.

Urban or Rural Area – NDOR Maps

<http://www.transportation.nebraska.gov/maps/func-class/nat-cty-cnty/nfc Adam County Cities.pdf>

Urban Area - Example



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Area

Urban

- Dense development
- Determined by census
- Populations 5,000 and more
- Local and State officials decide, US Secretary of Transportation approves
- NOT always the same as corporate limits

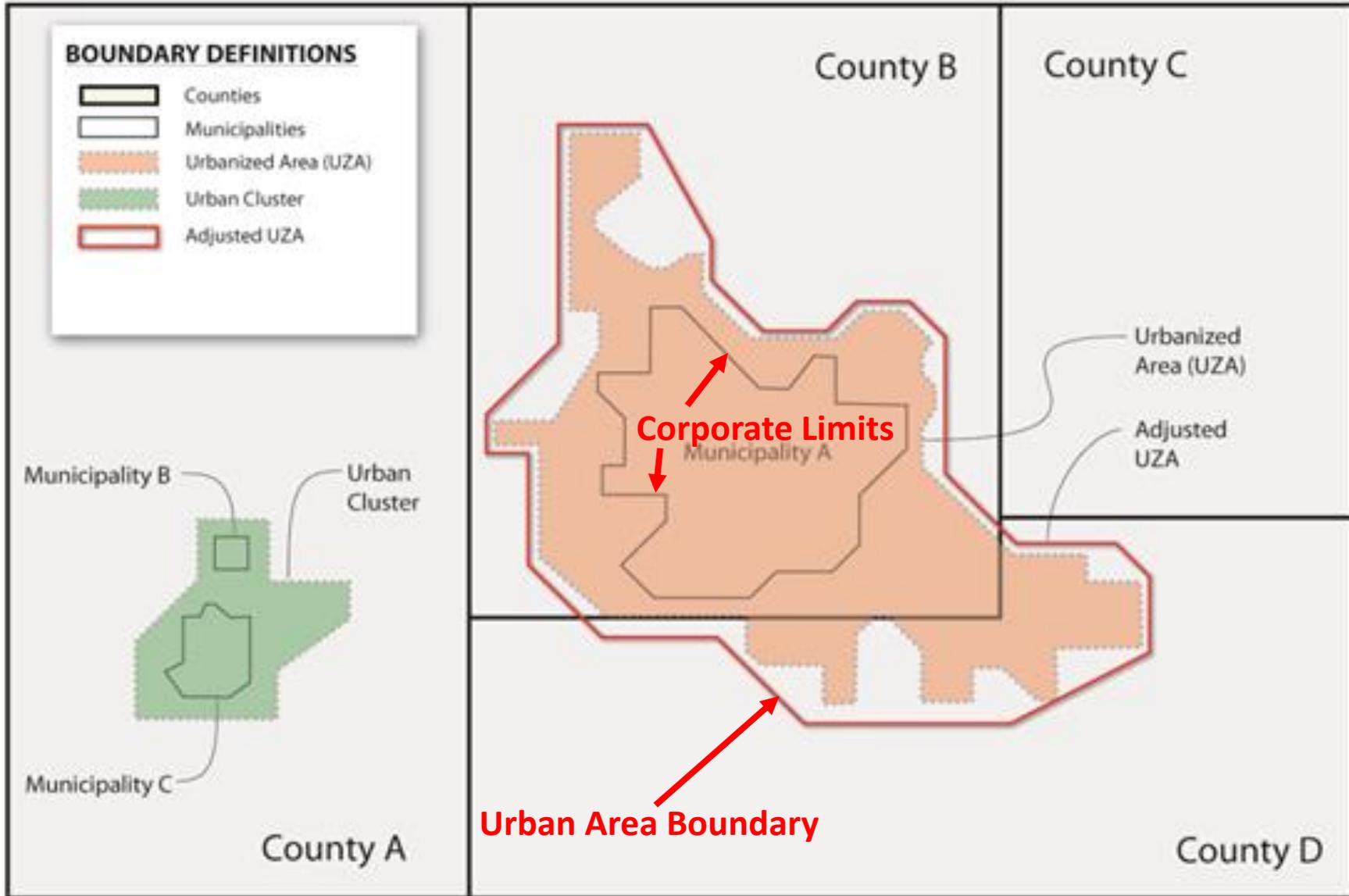
2010 Standards
based on
corporate limits

Rural

- Sparse development
- All areas not designated Urban

Definitions - Area

Area



Area –Maps on NDOR Website

<http://www.transportation.nebraska.gov/>

Trans - Portal
Work Zone Safety - It's Year-Round
Activity Book for Kids



Build Nebraska Act | Roundabouts

Highway Projects | Maps: Highway, Traffic Count, & More
Meetings & Hearings | News Releases

FAQ's & Frequently Requested Information

Ask a Question or Report a Highway Concern
Rate Nebraska Rest Areas

Build Nebraska Act | Roundabouts

Highway Projects | Maps: Highway, Traffic Count, & More
Meetings & Hearings | News Releases

FAQ's & Frequently Requested Information



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Finding Urban Area

TIP

Area –Maps on NDOR Website

<http://www.transportation.nebraska.gov/maps/>

Official Nebraska Government Website



NDOR Quick Links

[NE City Maps](#)
[NE County Maps](#)
[Main NDOR Page](#)
[Map Order Form](#)

NDOR Map Library

[Text Only](#)
[Questions/Comments](#)

- [Legislative Maps per Statute 39-1311](#)
- [State AND National Functional Classification Maps by COUNTY](#)
- [Functional Classification Maps Cities WITHIN Counties - Both State and National](#)
- [Reclassification Guides](#)

- [County Maps](#)
- [Current - State Highway Map \(pdf\)](#) - these are large files sizes - allow extra time to download/open - This is the most current map available.
 - [Front of Map](#)
 - [Back of Map](#)
- [Legislative Maps per Statute 39-1311](#)
- [State AND National Functional Classification Maps by COUNTY](#)
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- [Reclassification Guides](#)
- [National Highway System Maps](#)
- [Traffic Volume Maps, Traffic Flow Maps & Info](#) Includes Average Daily Traffic Count
- [Highway Beautification & Control System](#)

- [USGS National Interactive Map](#)
- [USGS Earth Resource Observation Systems \(EROS\)](#)
- [National Interactive Atlas](#)
- [NE Geodetic Survey Advisors](#)
- [Google Maps](#)
- [Google Earth](#)
- [Maps on Other Web Sites](#)
- [MapQuest](#)
- [University of Nebraska CALMIT map & data server](#)
- [Miscellaneous Categories](#)
- [Town and County Index](#) (List of Nebraska towns and cities with counties and NDOR districts)

Area –Maps on NDOR Website

<http://www.transportation.nebraska.gov/maps/func-city-by-cnty-maps.htm>

  NDOR Quick Links Main Maps Page 	Adams	Cuming	Greeley	Loup	Sarpy
	Antelope	Custer	Hall	Madison	Saunders
	Arthur	Dakota	Hamilton	McPherson	Scotts Bluff
	Banner	Dawes	Harlan	Merrick	Seward
	Blaine	Dawson	Hayes	Morrill	Sheridan
	Boone	Deuel	Hitchcock	Nance	Sherman
	Box Butte	Dixon	Holt	Nemaha	Sioux
	Boyd	Dodge	Hooker	Nuckolls	Stanton
	Brown	Douglas	Howard	Otoe	Thayer
	Buffalo	Dundy	Jefferson	Pawnee	Thomas
	Burt	Fillmore	Johnson	Perkins	Thurston
	Butler	Franklin	Kearney	Phelps	Valley
	Cass	Frontier	Keith	Pierce	Washington
	Cedar	Furnas	Kearney	Platte	Wayne
	Chase	Gage	Kimball	Polk	Webster
	Cherry	Garden	Knox	Red Willow	Wheeler
	Cheyenne	Garfield	Lancaster	Richardson	York
	Clay	Gosper	Lincoln	Rock	
	Colfax	Grant	Logan	Saline	

Adams	Cuming	Greeley	Loup	Sarpy
Antelope	Custer	Hall	Madison	Saunders

Functional Classification

- State Neb. Rev. Stat. 39-2101, 39-2102, Title 428 Chapter 1
- National Publication Number FHWA PL-13-026



State v. National

- not an exact correlation
- most 2016 design standards based on: AASHTO's 2011 *A Policy on Geometric Design of Highways and Streets*, 6th Edition (**Green Book**)
- 2016 MDS organized by area and **national** functional classification, similar to the **Green Book**

National Functional Classification (NFC)

("Highway Functional Classification Concepts, Criteria and Procedures" 2013 Edition, Pub. No. FHWA PL-13-026)

- Interstate
- Other Freeways and Expressways

- **Other Principal Arterial**
- **Minor Arterial**
- **Major Collector**
- **Minor Collector**
- **Local**

NFC (not SFC)
is used to
find the
correct table
(Urban, Rural
and Scenic Rec)

State Functional Classification

Neb. Rev. Stat. 39-2103, 39-2104

Rural Highways

Neb. Rev. Stat. 39-2105 (2)

- interstate
- expressway
- major arterial
- **other arterial**
- collector
- local
- scenic-recreation

- **minimum maintenance**
- **remote residential**

Major Arterial Streets

Neb. Rev. Stat. 39-2105 (3)

- interstate
- expressway
- major arterial
- **other arterial**
- **collector**
- **local**

SFC still in State Statutes and used in 428 NAC!

Standards

County Roads and Municipal Streets

- 4 Tables each for Urban, Rural and Scenic-Recreation
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 - Major Collector
 - Minor Collector
 - Local

What about OTHER PRINCIPAL ARTERIAL and higher classifications?
- 3 other tables - Low Water Crossings and Fords, Remote Residential Roads, and Minimum Maintenance Roads

Other Principal Arterial (OPA)

Use Applicable State Highway Standards

428 NAC 2-001 (Part One)

- **Other Principal Arterial**

- Minor Arterial

- Major Collector

- Minor Collector

- Local

428 NAC 2-001
(Part Two)

Functional Classification

Neb. Rev. Stat. 39-2110

- Design must meet standards of functional classification
- Work with NDOR to verify or establish functional classification
 - Dave Brokaw 402-479-4896
 - Mark Osborn 402-479-4443
- Online maps
 - <http://www.transportation.nebraska.gov/maps/>
- Reclassification guides - formal process
 - <http://www.transportation.nebraska.gov/maps/#class>

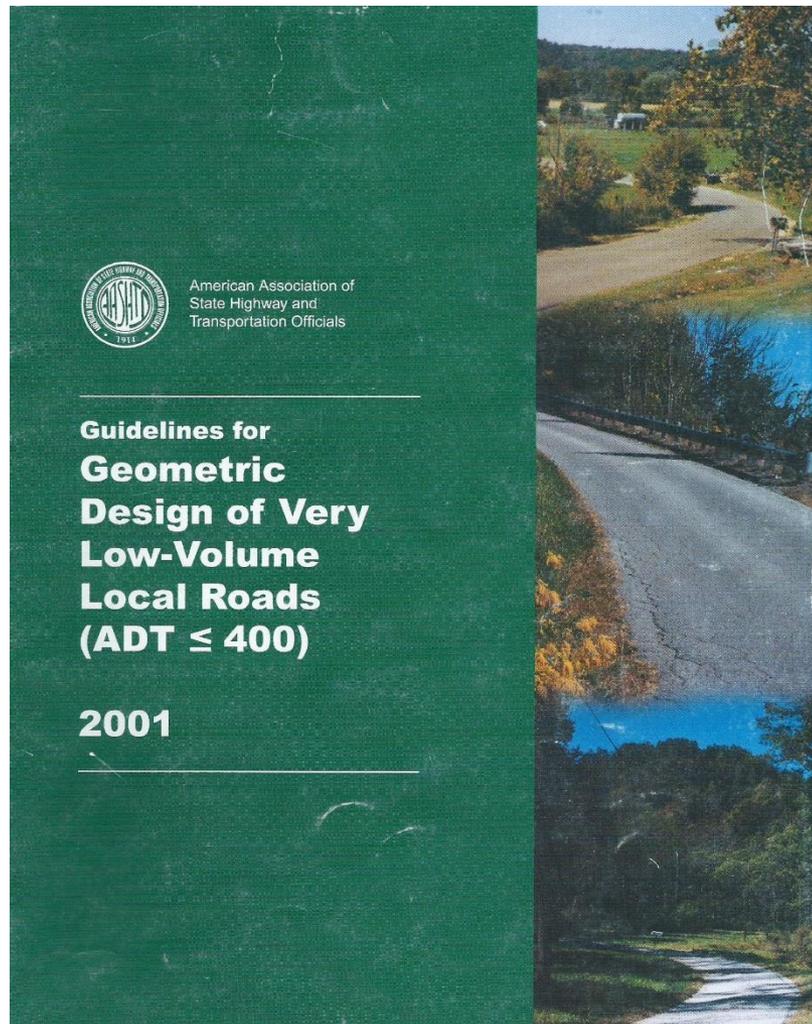
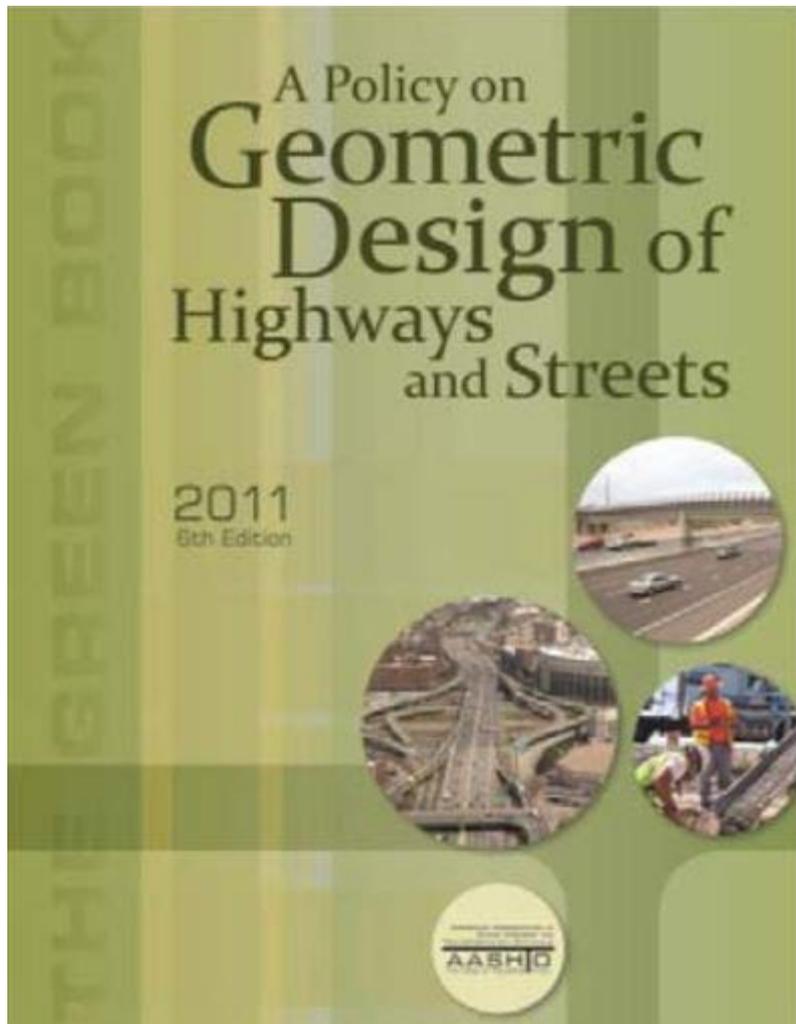


Finding the Appropriate Values

knowing the Area, NFC and Scope

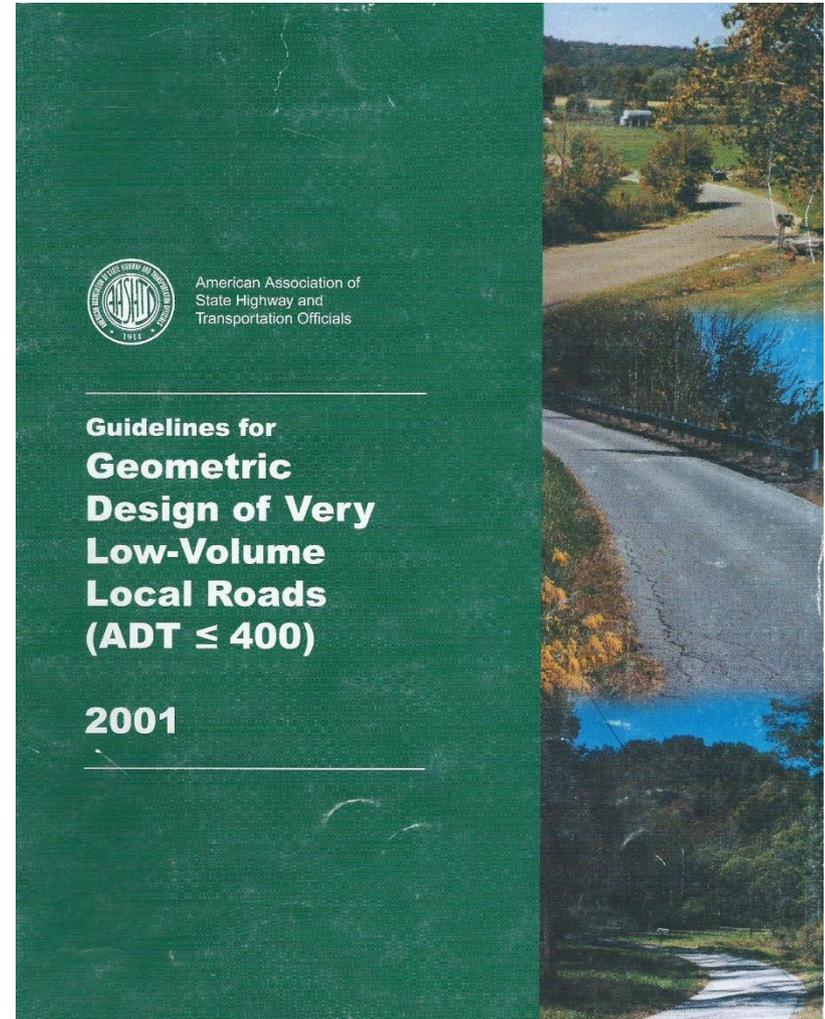
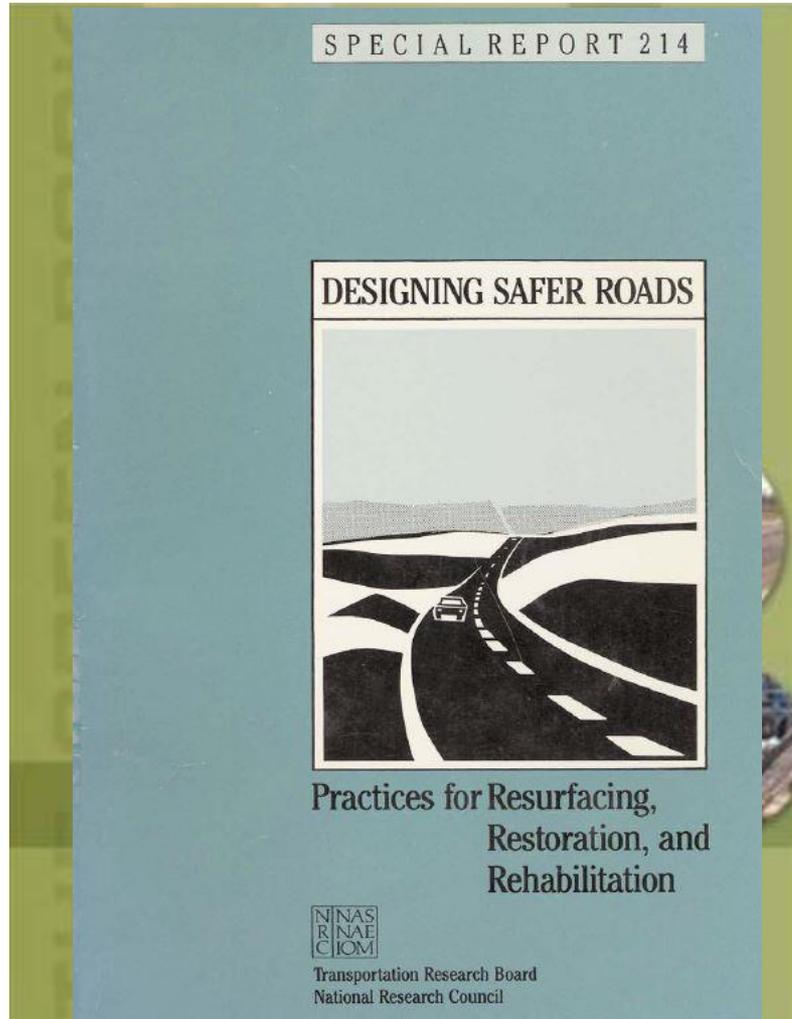
- What is the scope of work (3R or New and Reconstructed)?
- What is the selected Design Speed (New & Reconstructed standards)?
- What is the traffic volume? %HT?
- Paved or Unpaved?
- Curbed or Non-curbed?
- Rolling or Level terrain?

Basis of Values New & Reconstructed



Basis of Values

3R





#4
Summary of
Changes;
Limitations



Learning Objectives

1. Know what has changed
2. New format for design standards
3. How to find the correct table
4. Understand the notes
5. Present selected definitions
6. Understand 3R requirements
7. Application to one- and six-year plan

New & Reconstructed **Lower*** Standards - Examples

- Some lane and shoulder widths decrease – lower classifications and lower volumes (most system mileage)
- Horizontal curve radii decreases
- Maximum grade increases for municipal streets
- Rural clear bridge widths decrease in several ADT categories

* Less restrictive, less demanding

Slide 73

New & Reconstructed Higher* Standards - Examples

- Some lane and shoulder widths increase for Minor Arterials
- Some maximum grade decreases for Minor Arterial and Major Collector county roads
- Some rural clear bridge widths increase (including 24 ft. minimum requirement)
- Horizontal Clear Zone (ADT \geq 400 VPD) – replaces fixed obstacle clearance

* More restrictive, more demanding

Slide 74

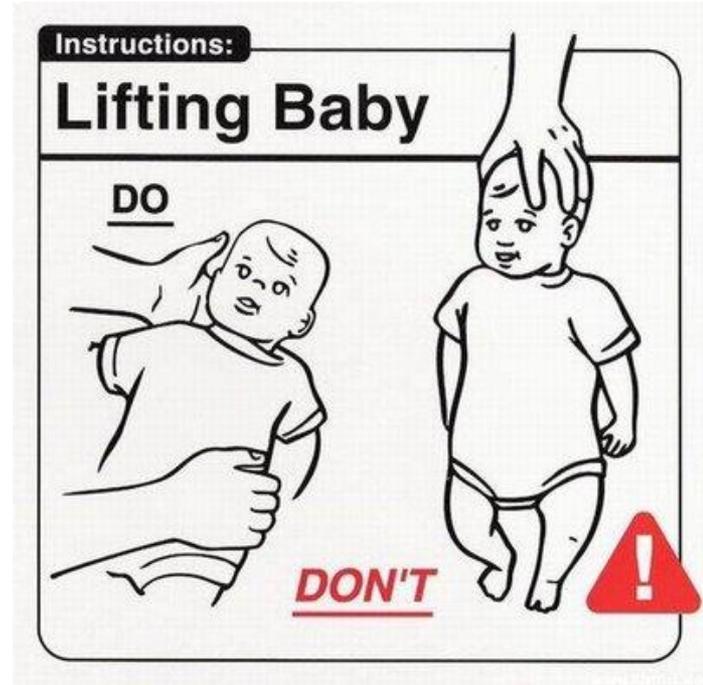
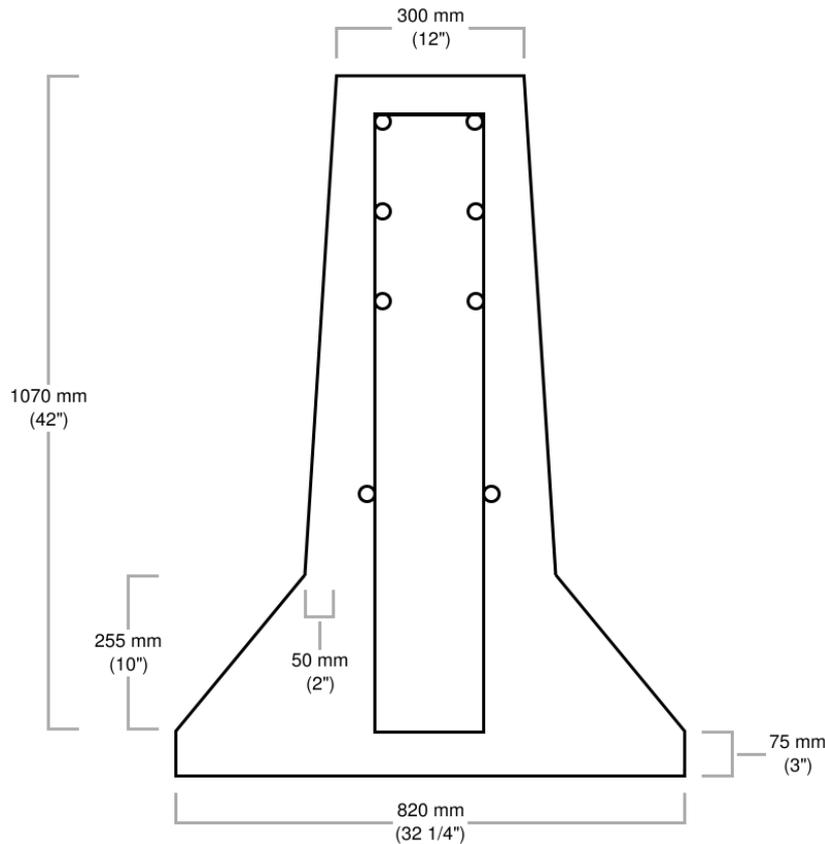
428 NAC 2-001, Part Two

New & Reconstructed Standards **Eliminated** - Examples

- Lighting for Municipal Streets
- Median Width
- Number of Lanes
- Typical Cross Sections
- Type of Surfacing
- Design Standard Numbers (RL1, RL2, etc.)

MDS are NOT

- A design manual
- Specifications



Possible Misconception

Must design to the values in the standards – no more, no less.

**WRONG
WAY**



In specific circumstances, designer may need to choose values

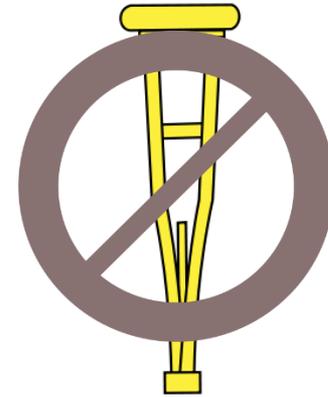
- greater than standard minimum values, or
- less than standard maximum values (requires Relaxation)





Examples: May Need to Exceed Standards

1. High heavy truck percentage
2. Off-tracking – wider lane
3. Simultaneous curves
4. Sight distance
5. Surface type – friction
6. Rehabilitated bridge (Note 18)
7. Horizontal Clear Zone (curves, N-R slopes, treating obstacles)



Criteria MDS do **not** include

- Lateral Offset to Obstruction
- Design Flood
- Barrier Crashworthiness
- Pavement Service Life



MDS does not address

- Signing and Marking
- Level of Service
- Pavement Edge Drop-off



MDS do **not** include requirements for

- Intersections
- Alleys, driveways
- Lighting ¹
- Medians ¹
- Number of Lanes ¹
- Surfacing Type ¹
- Americans with Disabilities Act
 - Federal law - must be followed



Surfacing Type Caution

- Friction factors
- Standard values based on gravel, crushed aggregate and paved surfaces
- Other surfaces?
 - Earth



Standards Do Not

- cover every possible situation
- cover all Federal requirements
- guarantee a high quality, high-performing road or street

Then why have standards?

Why Design Standards?

- Safer design, driver expectations, reliability
- A primary means to achieve a high-quality product
- Required by Authority
 - 23 CFR 625
 - Neb.Rev.Stat. §39-2113
 - Local Ordinance



Required by Authority



- Why Standards?

- Neb.Rev.Stat. §39-2113

(1) . . . Board of Public Roads Classifications and Standards shall develop minimum standards of design, construction, and maintenance for each functional classification set forth in sections 39-2103 and 39-2104. Except for scenic-recreation road standards, . . . to assure that each segment of highway, road, or street will satisfactorily meet the requirements of the area it serves and the traffic patterns and volumes which it may reasonably be expected to bear.



#5

Understanding
Definitions and
Notes



Learning Objectives

1. Know what has changed
2. New format for design standards
3. How to find the correct table
4. Understand the notes
- 5. Present selected definitions**
6. Understand 3R requirements
7. Application to one- and six-year plan

Design Standards

County Roads and Municipal Streets

Main Elements

1. Definitions (39)
2. General Notes (22)
3. Tables (15)

Standards

County Roads and Municipal Streets

- **Definitions** **TERMINOLOGY USED**
- General Notes **IN STANDARDS**
- 15 Tables
 - 4 Urban
 - 4 Rural
 - 4 Scenic-Recreation
 - Low Water Crossings and Fords in Rural Areas
 - Minimum Maintenance in Rural Areas
 - Remote Residential Roads in Rural Areas



Six Categories of Definitions

- 001.03A1 – Types of Work:
 - New
 - Reconstructed
 - 3R
- 001.03A2 – Areas:
 - Urban
 - Rural
- 001.03A3 – Traffic Volume
 - ADT
 - Heavy Trucks
- 001.03A4 – The Roadway
- 001.03A5 – Structures and Crossings
- 001.03A6 – Design Criteria

New, Reconstructed, 3R, Maintenance

New – build on new alignment

Reconstruction – rebuild on existing alignment

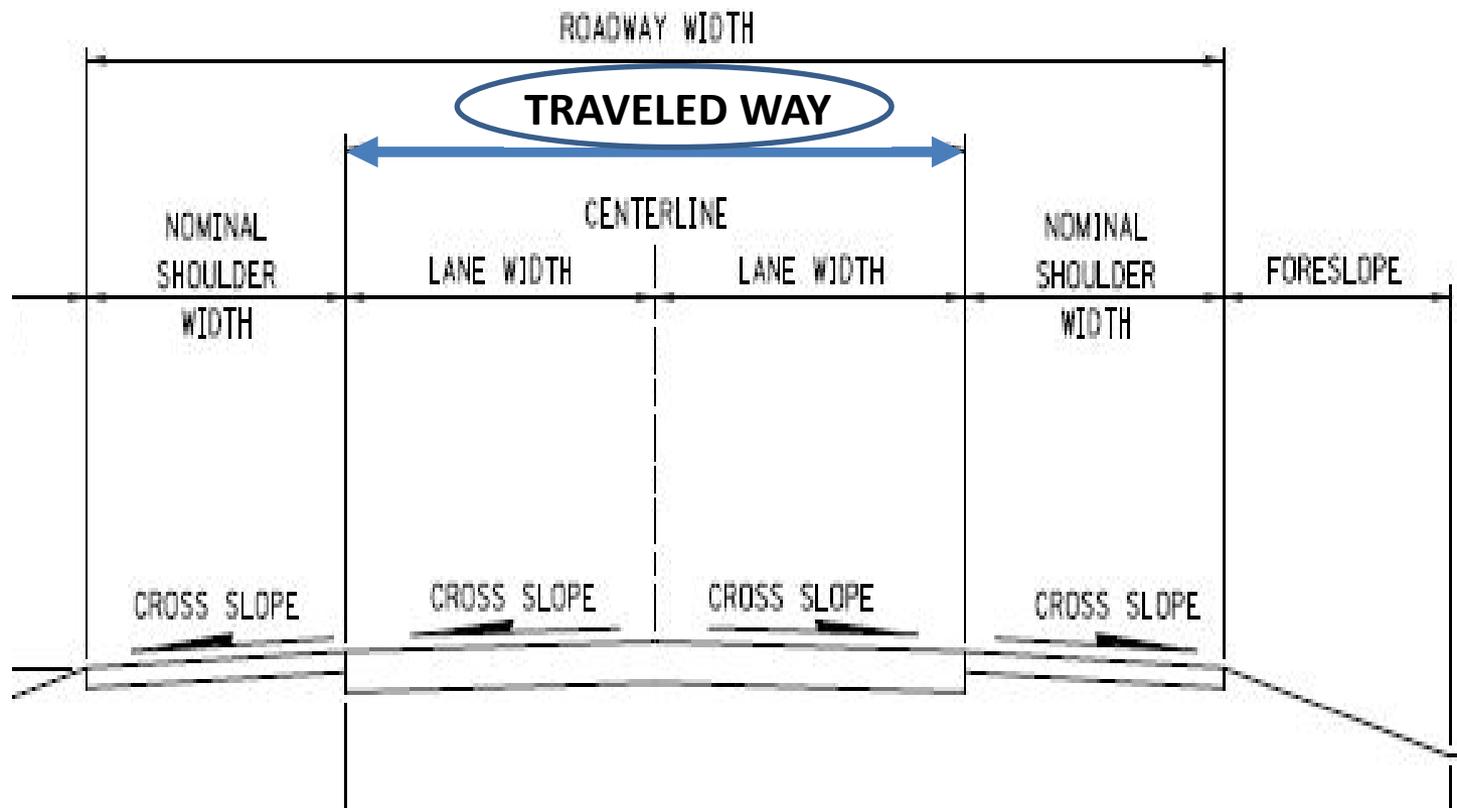
3R – asset preservation

Maintenance – definition did not change

Boundaries between each – see 3R slides

Traveled Way

- For the thru movement of vehicles
- Does not include shoulders or bicycle lanes



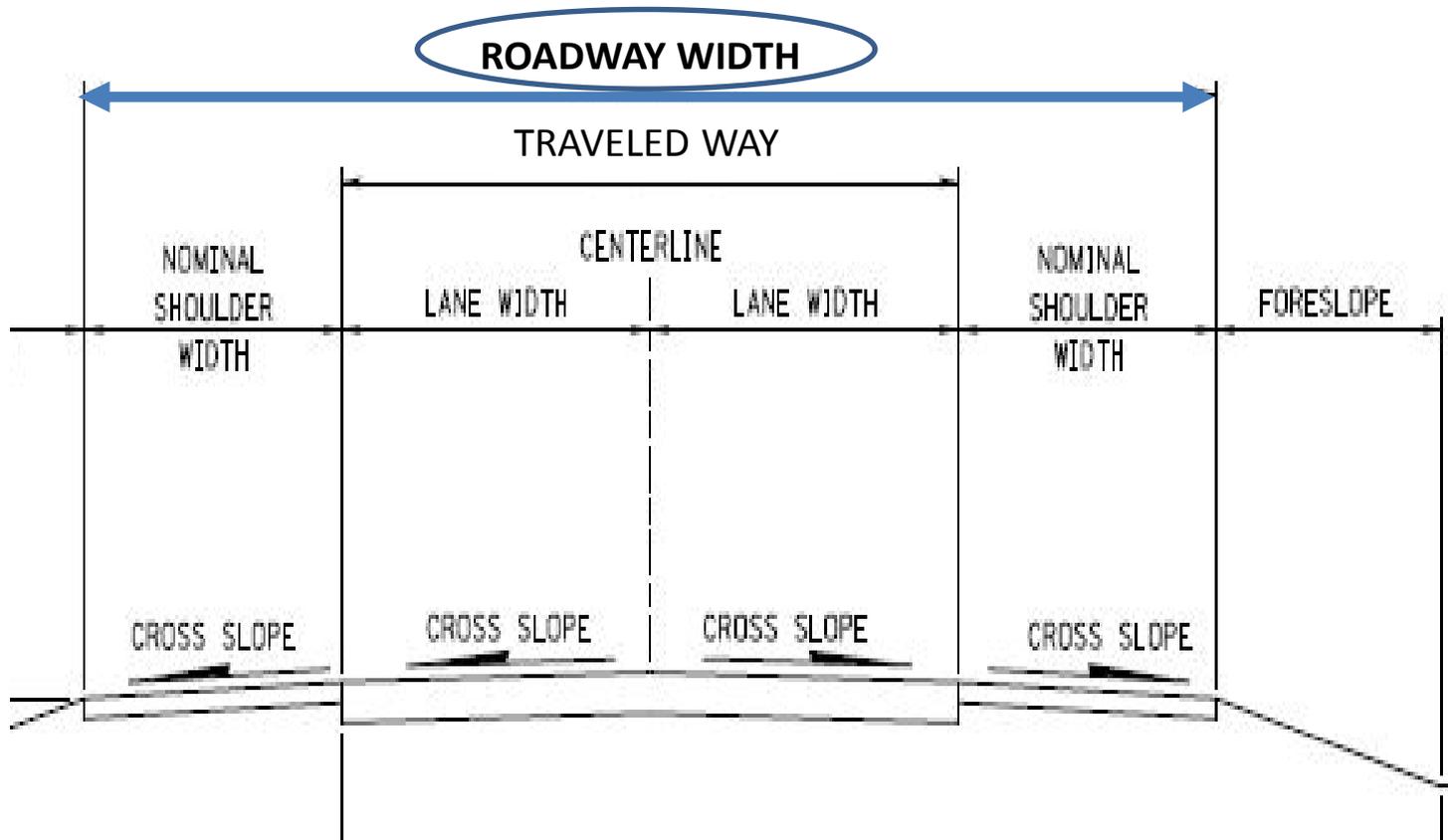
Traveled Way

- For the through movement of vehicles
- Does not include shoulders or bicycle lanes



Roadway

Traveled Way Plus Shoulders



Roadway

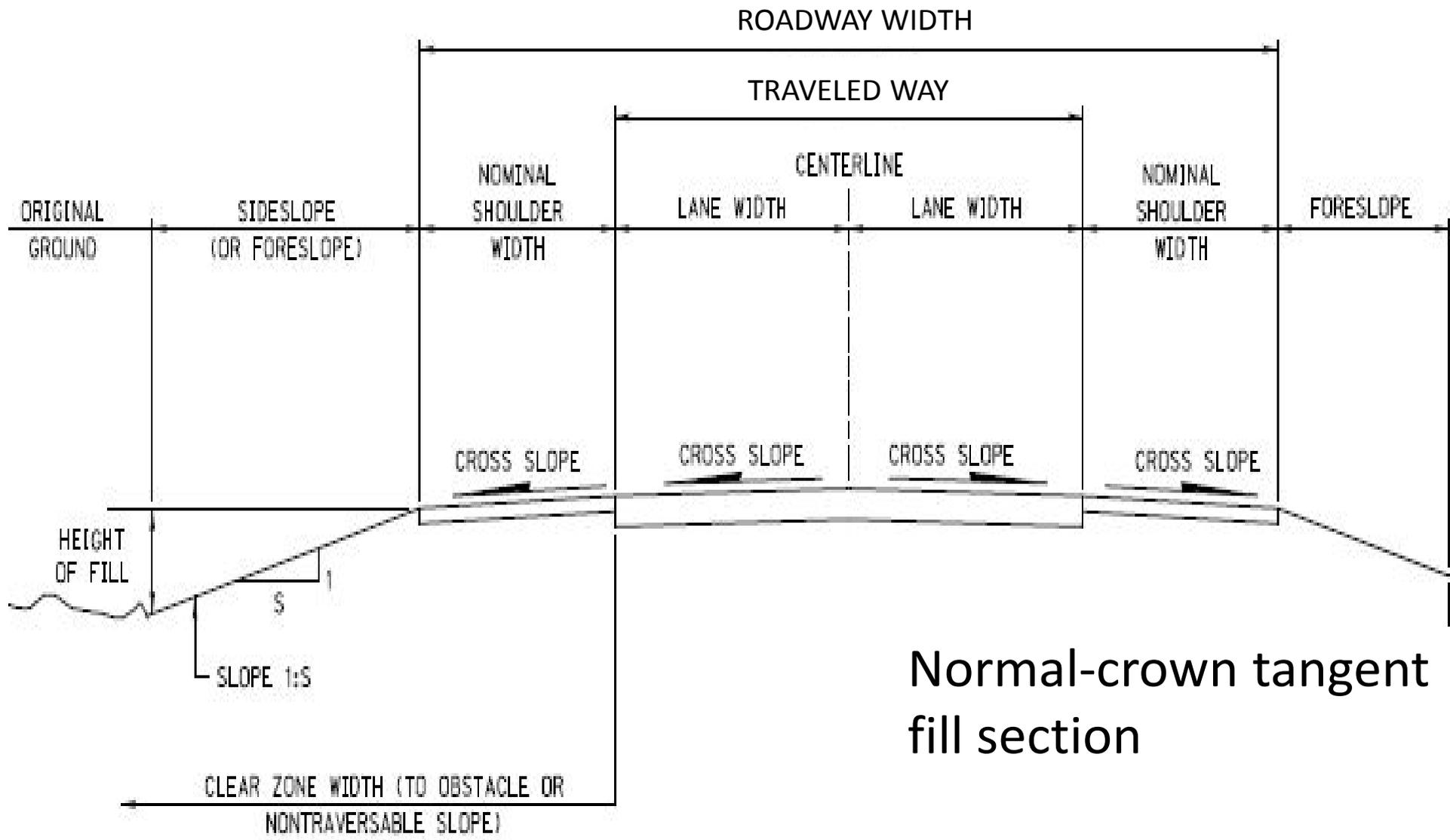


- That portion of a highway, road or street including shoulders for the use of vehicles
- Traveled Way plus Shoulders

Auxiliary Lanes

- Portion of the roadway adjacent to the traveled way for speed changes, turning, weaving, truck climbing, etc.
- Examples:
 - bicycle lanes
 - turn bays
 - RT/LT lanes
 - TWLT lanes
 - bus lanes





Normal-crown tangent fill section

Learning Objectives

1. Know what has changed
2. New format for design standards
3. How to find the correct table
- 4. Understand the notes**
5. Present selected definitions
6. Understand 3R requirements
7. Application to one- and six-year plan

Design Standards

County Roads and Municipal Streets

Main Elements

1. Definitions
- 2. General Notes**
3. Tables

Standards

County Roads and Municipal Streets

- Definitions
- **General Notes**
- 15 Tables
 - 4 Urban
 - 4 Rural
 - 4 Scenic-Recreation
 - Low Water Crossings and Fords in Rural Areas
 - Minimum Maintenance in Rural Areas
 - Remote Residential Roads in Rural Areas

REFERENCED IN
MDS TABLES

Standards

County Roads and Municipal Streets

- Definitions
- **General Notes**
- 15 Tables
 - 4 Urban
 - 4 Rural
 - 4 Scenic-Recreation
 - Low Water Crossings and Fords in Rural Areas
 - Minimum Maintenance in Rural Areas
 - Remote Residential Roads in Rural Areas

**GROUPED BY
SUBJECT**

Notes

- Referenced in Standards Tables
- Each note addresses one topic or subject
- Ordered similar to Standards Tables criteria – top to bottom

Types of Statements in Notes

1. Mandatory requirements
2. Lower requirements, with conditions
3. Permissive statements (i.e. not required)
4. Guidance (recommended or desired but not mandatory)
5. Information (instructions, clarifications, context, etc.)



Notes

Appropriate Relaxation Requests

1. **Mandatory requirements**
2. **Less restrictive requirements, with conditions**
3. Permissive statements (i.e. not required)
4. Guidance (recommended or desired but not mandatory)
5. Information (instructions, clarifications, context, etc.)



Notes – Quick Summary

1. Relaxation of Standards
2. Rural tables (high speed)
3. Urban tables outside UZA
4. Other Principal Arterial → State Hwy Standards
5. Functional Classification
6. 3R safety conscious design
7. Traffic Volume
- 8. Design Speed**
- 9. Lane Width**
10. Sandhills Soils
- 11. Shoulder Width**

12. Horizontal Alignment

13. Vertical Alignment

14. Grade

15. Cross Slope

16. Horizontal Clear Zone

17. Vertical Clearance

18. Clear Bridge Width

19. Structural Capacity

20. Timber Bridges

21. Low Water Crossings/Fords

22. Roadway adjacent to
structure replacements

2010 NOTES ELIMINATED (15 = Municipal Streets/Urban Areas, 16 = County Roads/Rural Areas)

Current Para (Note)	Subject	Comments
001.15(6) 001.16(7)	Number of lanes	
001.16(11)	Bridges over 100 feet long	Clear bridge widths in tables apply to bridges 4 ft. and longer.
001.16(12)	Paving previously graded roads	The NBCS decided to not include grandfathering these cases.
001.16(★★)	Scenic-Recreation Roads	Separate tables are provided for Scenic-Recreation roads. Also refer to notes G-3, G-7, G-8a, G-8b, G-12, G-16, G-18 and G-23 for other Scenic-Recreation requirements.
001.16(★★★)	Remote Residential Roads	Separate tables are provided for Remote Residential roads. Also refer to notes G-3, G-7, G-8a, G-8b, G-12, G-16 and G-23 for other Remote Residential requirements.
001.16(+) 001.16(++)	Desired Clear Bridge Widths	Clear bridge widths are included in tables for all traffic volumes and they apply to all bridge lengths.

Standards

County Roads and Municipal Streets

- Definitions
 - **General Notes**
 - 15 Tables
 - 4 Urban
 - 4 Rural
 - 4 Scenic-Recreation
 - Low Water Crossings and Fords in Rural Areas
 - Minimum Maintenance in Rural Areas
 - Remote Residential Roads in Rural Areas
- KNOW THE NOTES –
THEY HAVE MINIMUM
REQUIREMENTS NOT
MENTIONED IN TABLES**



#6

More notes



Slide 110

Traffic Volumes

- Current ADT < 750 VPD, use ADT based on Year of Initial Construction (open to traffic)

- Current ADT \geq 750 VPD, use ADT based on design year* of the work

* 10 – 20 years based on expected life of project



Traffic Volumes

Standards are Minimum Requirements

- growth anticipated
- pulling plans off the shelf
- federal funds involved
- life cycle of bridges
- within 10% - rule of thumb



Traffic Volumes

2010 Standards

- Referred to AASHTO Green Book for
 - All traffic volumes (Municipal Streets)
 - ADT \geq 750 VPD (Rural Roads)

Lane Width

12 ft for ADT 400-750 VPD

11 ft for ADT 750-1,500 VPD

2016 Standards

- Covers all ranges



Traffic Volumes – Assistance *

NE-LTAP

402-472-5748

- Portable traffic counting equipment is available for public employees (city and county staff)
- Generates only raw counts (not ADT).

NDOR

402-479-4520

- **Don Butler**, Traffic Analysis Supervisor
- Historical data (if available)
- Technical advice – how to convert raw counts to ADT



* For Cities, Counties and their Consultants

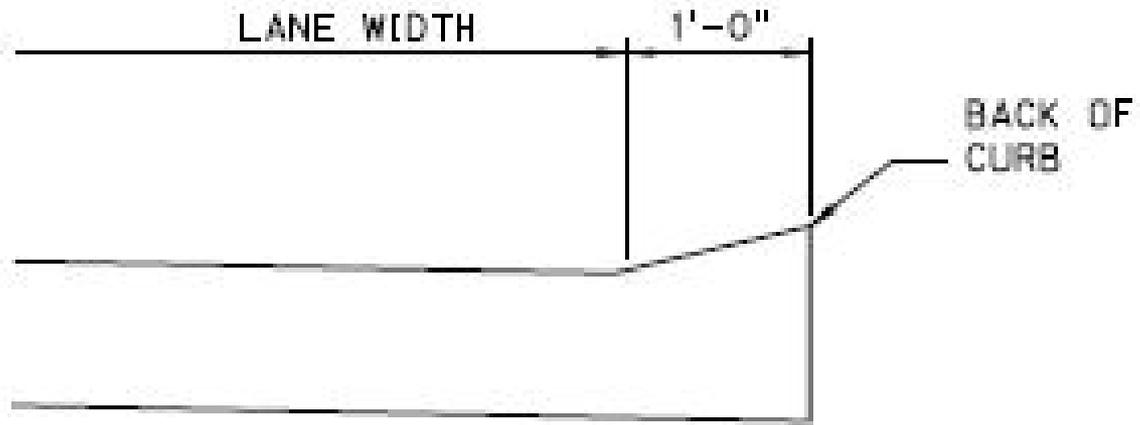
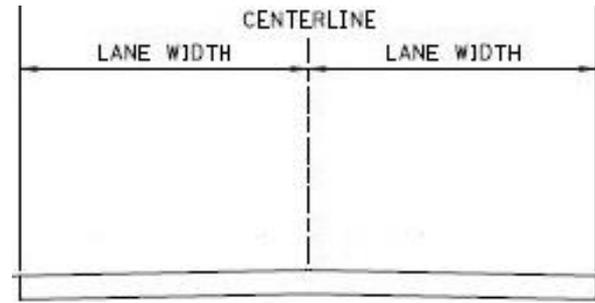
Design Speed

- Key Controlling Criteria
 - Many criteria calculated based on design speed
- Urban Tables
 - Design speed between values shown in table
- Rural and Scenic-Recreation Tables
 - 50 MPH and 55 MPH
 - ADT < 50 VPD, Constrained Situations
 - ROW and Environmental Impacts, Terrain and Costs
 - Refer to notes 12, 13 and 14

Design Speed New and Reconstructed Work

Design Speed \geq Posted Speed Limit (Anticipated)

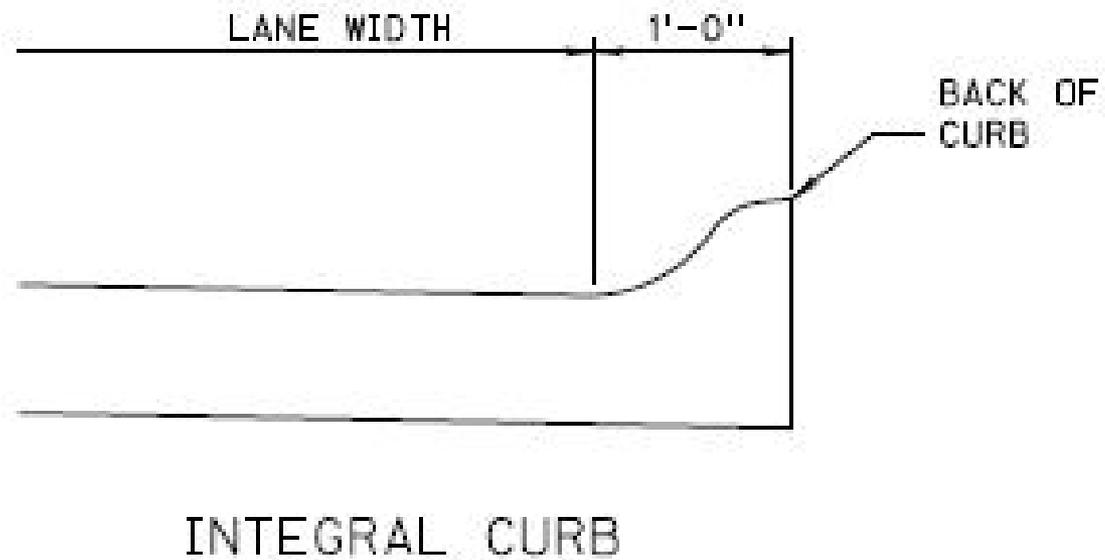
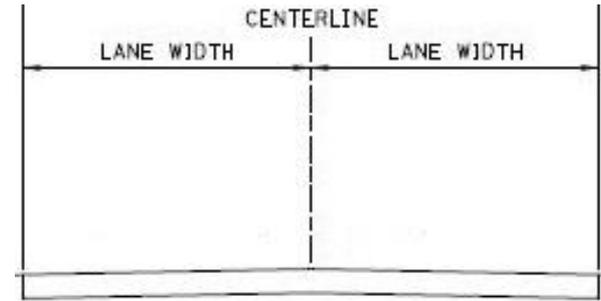
Lane Width



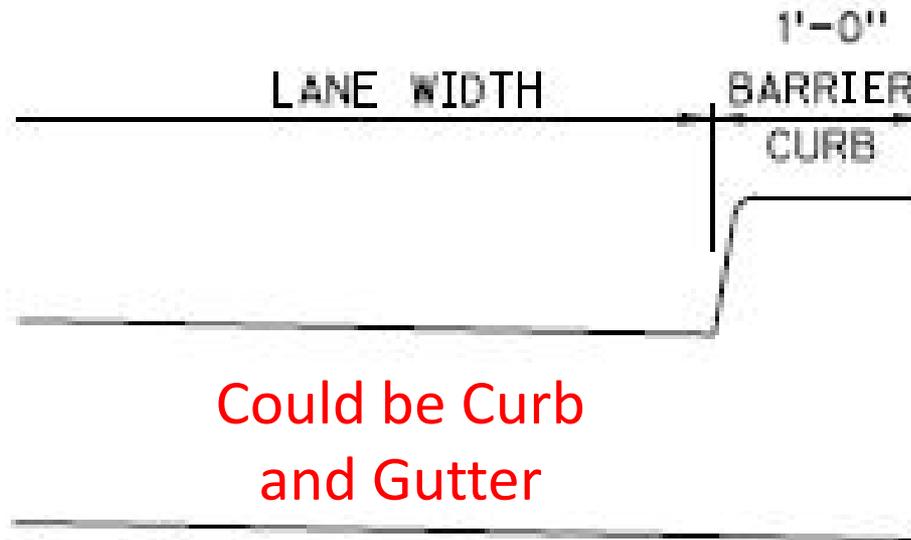
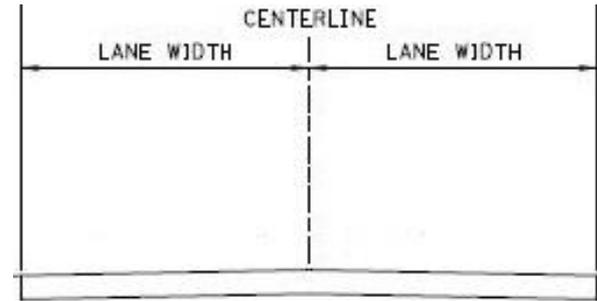
SLOPING CURB

Traveled Way or Auxiliary Lane

Lane Width



Lane Width



Could be Curb
and Gutter

BARRIER CURB

Sandhills Soils

- Light, granular soils
- May require paving
- Full two-lane section
- One paved (or aggregate) lane is allowed if
 - ADT < 50 VPD and
 - Minor Collector or Local classification



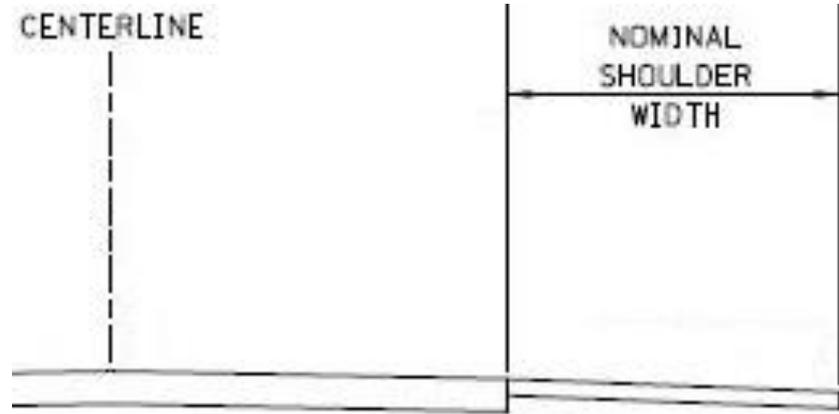
Conformance - Measuring



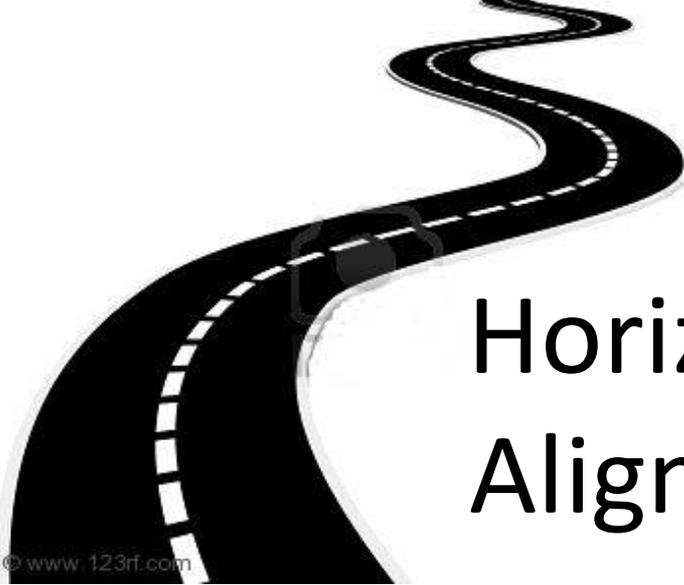
“For purposes of these standards, road or street paint striping shall not be used to determine”

- Lane width (edge of lane)
- Shoulder width
- Horizontal clear zone width (edge of traveled way)

Shoulder Width

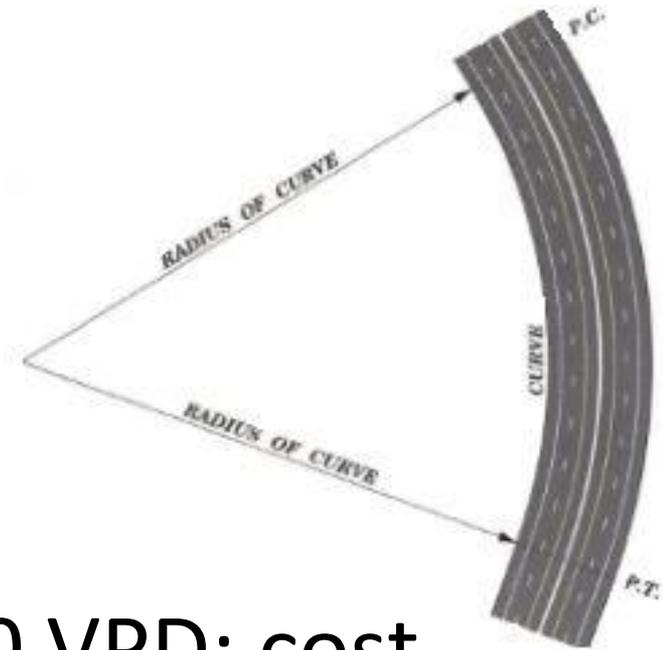


- Values in tables are for **2-lane** roads and streets
- Note provides minimums for **multi-lane** roads and streets



© www.123rf.com

Horizontal Alignment



- 3R Work, ADT < 750 VPD: cost effective analysis not required
- 100 ft radius in Urban Areas
 - NFC: Local
 - Design speed \leq 30 MPH



Horizontal Alignment

New and Reconstructed Work

- Can reduce design speed to 40 MPH if
 - Constrained situation (next slide)
 - **Rural Unpaved** Roads
 - Includes roads paved due to Sandhills soils
 - NFC Local and Minor Collector
 - Excludes Minimum Maintenance and Remote Residential
 - **ADT < 50 VPD*** * 250 VPD for Scenic-Recreation Local or Minor Collector.

Constrained Situation

A site-specific condition such as

- terrain
- right-of-way
- social impact
- environmental impacts
- cost

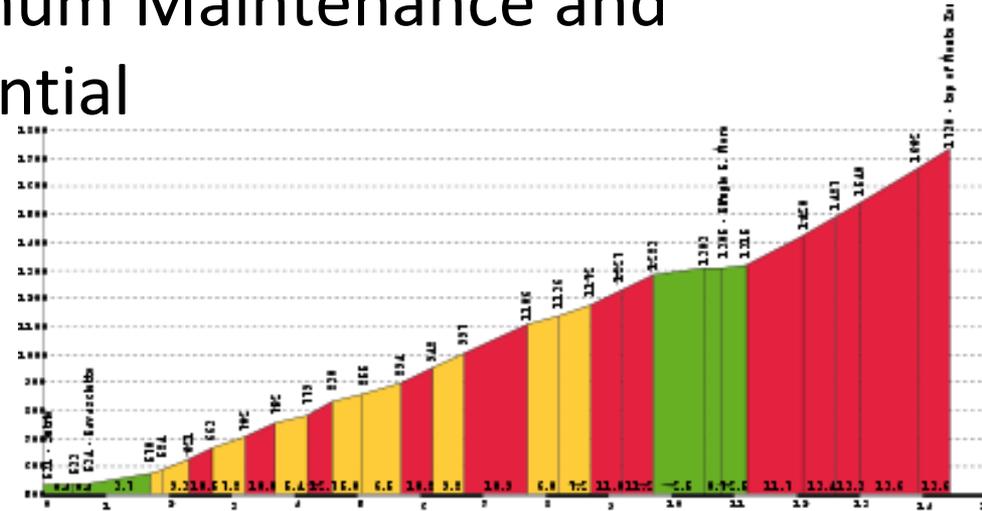
that may make meeting a design standard impractical

Vertical Alignment

New and Reconstructed Work

- Can reduce design speed to 40 MPH
 - if constrained situation
 - **Rural Unpaved Roads**
 - Includes roads paved due to Sandhills soils
 - NFC Local or Minor Collector
 - Excludes Minimum Maintenance and Remote Residential
 - ADT < 50 VPD*

* 250 VPD for Scenic-Recreation Local or Minor Collector



Grade

New and Reconstructed Work



- 1% steeper* for tangents < 500 ft
 - 2% steeper* for ADT < 400 VPD

* Relative to value in table

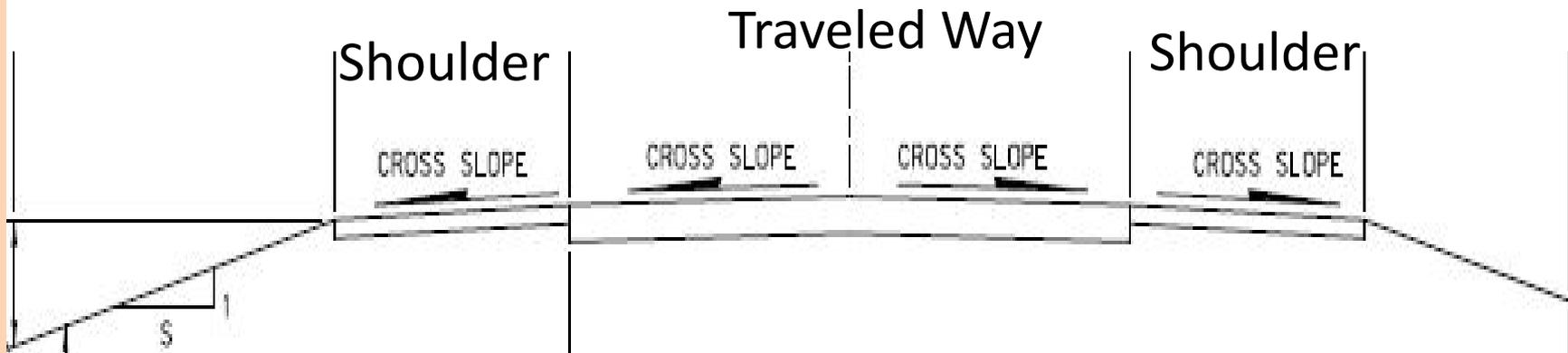
Grade

New and Reconstructed Work



- 10% @ 40 MPH or 9% @ 45 MPH
 - constrained situation
 - Rural Unpaved Roads
 - Includes roads paved due to Sandhills soils
 - NFC Local or Minor Collector
 - Excludes Minimum Maintenance and Remote Residential
 - ADT < 50 VPD*
 - 2% steeper OK for tangents < 500 ft
- * 250 VPD for Scenic-Recreation Local or Minor Collector

Cross Slope



- Does not apply to superelevated roads
- More than 2 lanes inclined in same direction - increase allowed (0.5%-1% up to 3%)
- 2 ft turf shoulders adjacent to paved surface
- Unpaved roads - mid-range is desirable

- Values in tables: at underpasses
- Other structures Table Value + 1 ft
 - Overhead Sign Structure
 - Pedestrian and Bicycle Structures
- Entire roadway width



Notes for Bridges Later



#7

3R Design Standards

(part 1)



Learning Objectives

1. Know what has changed
2. New format for design standards
3. How to find the correct table
4. Understand the notes
5. Present selected definitions
- 6. Understand 3R requirements**
7. Application to one- and six-year plan

Resurfacing, Restoration and Rehabilitation

3R

Design Standards

the major reason for updating
Minimum Design Standards

3R – what is it?

Resurfacing, Restoration, Rehabilitation

- Asset Preservation, Extension of Service Life
- Work scope beyond maintenance, but less than reconstructed
- Safety conscious design
- In State highway standards since 1985

Roadways - Current Standards

State Highways	County Roads	Municipal Streets
Maintenance	Maintenance	Maintenance
(3R) Resurfacing, Restoration, Rehabilitation	X	X
New & Reconstructed	New & Reconstructed	New & Reconstructed
Construction (NDOR Standard Specifications)	Construction (NDOR Standard Specifications) except those classified as Local	Construction (NDOR Standard Specifications) except those classified as Local

Bridges - Current Standards

State Highways	County Roads	Municipal Streets
Maintenance	Maintenance	Maintenance
Remain in Place	Remain in Place	X
Rehabilitated (i.e. replace superstructure)	X	X
New	New & Reconstructed	New & Reconstructed
Construction (NDOR Standard Specifications)	Construction (NDOR Standard Specifications) except those classified as Local	Construction (NDOR Standard Specifications) except those classified as Local

Lack of 3R Standards

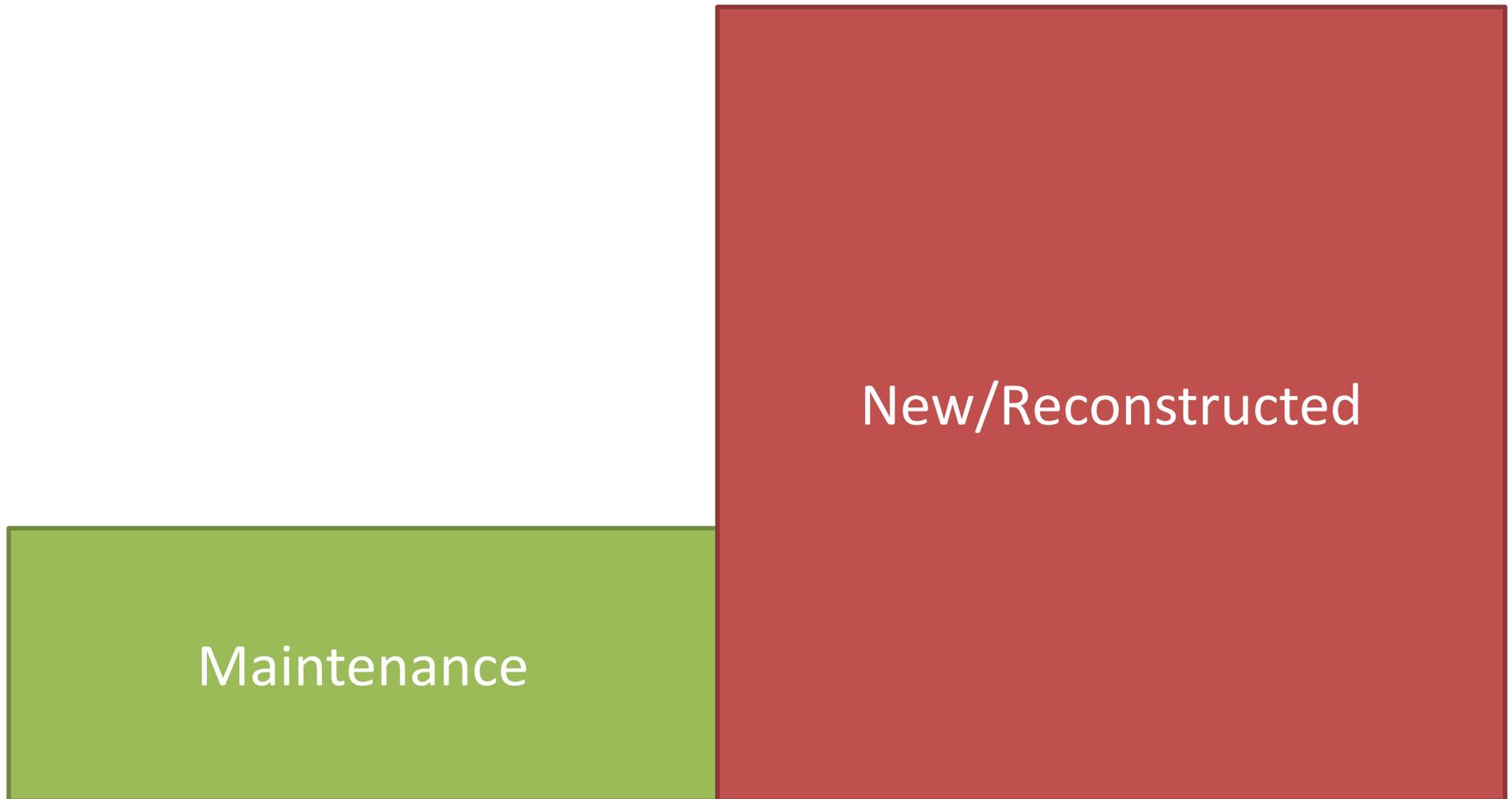
- Public funds
- Public safety
- Relaxation of standards requests
- Consistency – industry and state standards
- Compliance
- One- and six-year plans

Current Standards

Maintenance

New/Reconstructed

Current Standards Relative Scope & Costs



Proposed Standards Relative Scope and Costs



Proposed Standards



**Quick, Short-term,
low cost**



**Longer lasting,
higher cost**

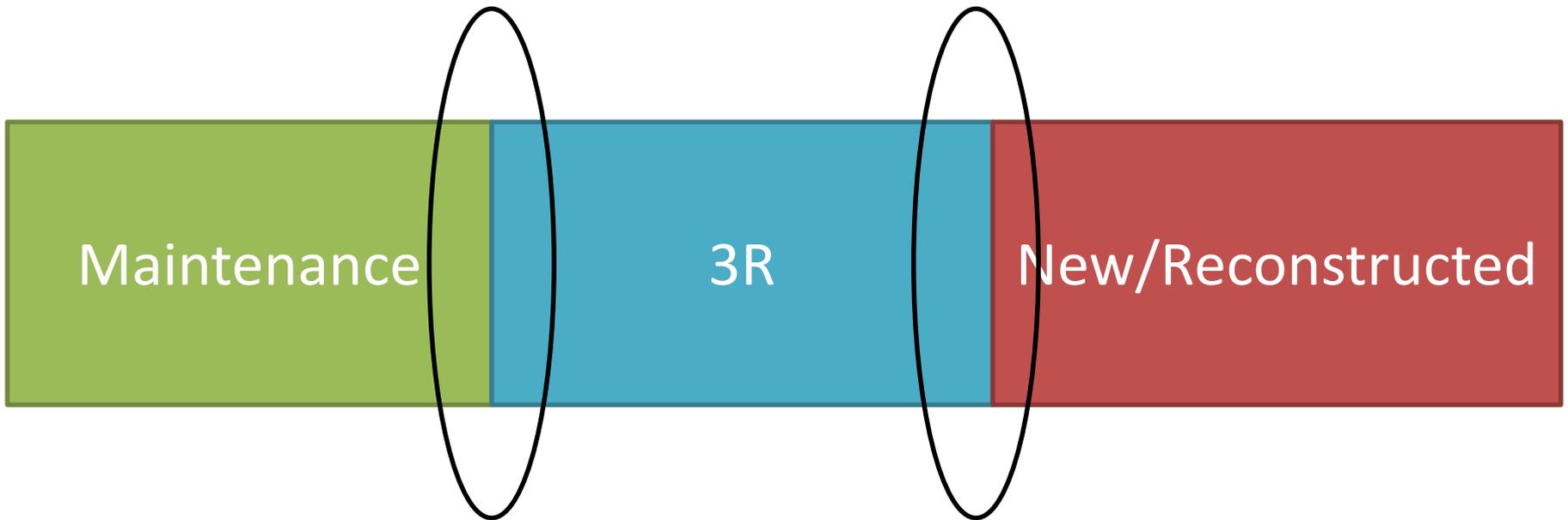


Economic Cost Effectiveness
Reasonable Repairs
Being smart with public money

3R standards

- what is the boundary between 3R and Maintenance standards?
- What is the boundary between 3R and New and Reconstructed?

3R Boundaries



3R Boundaries

Defined By Scope of Work for:

- Base
- Pavement Strategy
- Bridges*
- Unpaved Roads

* Covered later in Bridges segment

Traveled Way: Existing Base

Quick, Short-term, low cost  Longer lasting, higher cost

Maintenance

- Replace unsuitable base materials in patching operations
- Nothing extensive or costly

3R

- **Remove surface structure down to base**
- **Minor base repairs**
- **Recycling strategies which incorporate road structure into base**

Reconstructed

- Replacement of entire existing base



Traveled Way: Existing Paved Surfaces

Quick, Short-term, low cost



Longer lasting, higher cost

Maintenance

- Resurfacing, 2 inches or less ACET*
- Patching, repairing
- Surface treating
- Joint filling
- Nothing extensive or costly

3R

- **Resurfacing, more than 2 inches ACET* up to and including 6 inches ACET***

Reconstructed

- More than 6 inches ACET*



* Asphalt Concrete Equivalent Thickness (ACET)

3R Boundaries - Pavement



ACE or PCC
Thickness,
ACET*



Quick, Short-term, low cost



Longer lasting, higher cost

Maintenance

3R

Reconstruction

$\leq 2''$

2(+)" to 6"

$> 6''$

* Asphalt Concrete
Equivalent Thickness (ACET)

Overlay over existing
paved surfaces

Maintenance

2" or Less Hot Mix Asphalt
(HMA) or Equivalent



Asphalt Concrete Equivalent
Thickness (ACET)

Equivalent Thickness (Strength)

a ratio of 1" HMA = 4" Recycle

Example 1.5" HMA + 0.5 = 2" Equivalent HMA



=



1.5

$2 * (1/4) = 0.5$

2.0

Maintenance (2" or less)

2" New HMA

1.5" New HMA

2" Hot In Place
Recycle

3R (>2" to 6")

2.5" New HMA

6" New HMA

6" PCC

over existing
HMA

New & Reconstruction (>6")

6.5" New HMA
over existing
HMA

8" Doweled PCC

Subgrade
Preparation

3R Boundaries - Unpaved

Quick, Short-term, low cost



Longer lasting, higher cost

Maintenance

- Scarifying, reshaping, and restoring material losses
- Applying dust palliatives
- Nothing extensive or costly

3R

- **Add or modify guardrail**
- **Minor adjustments to vertical and/or horizontal alignment**

Reconstructed

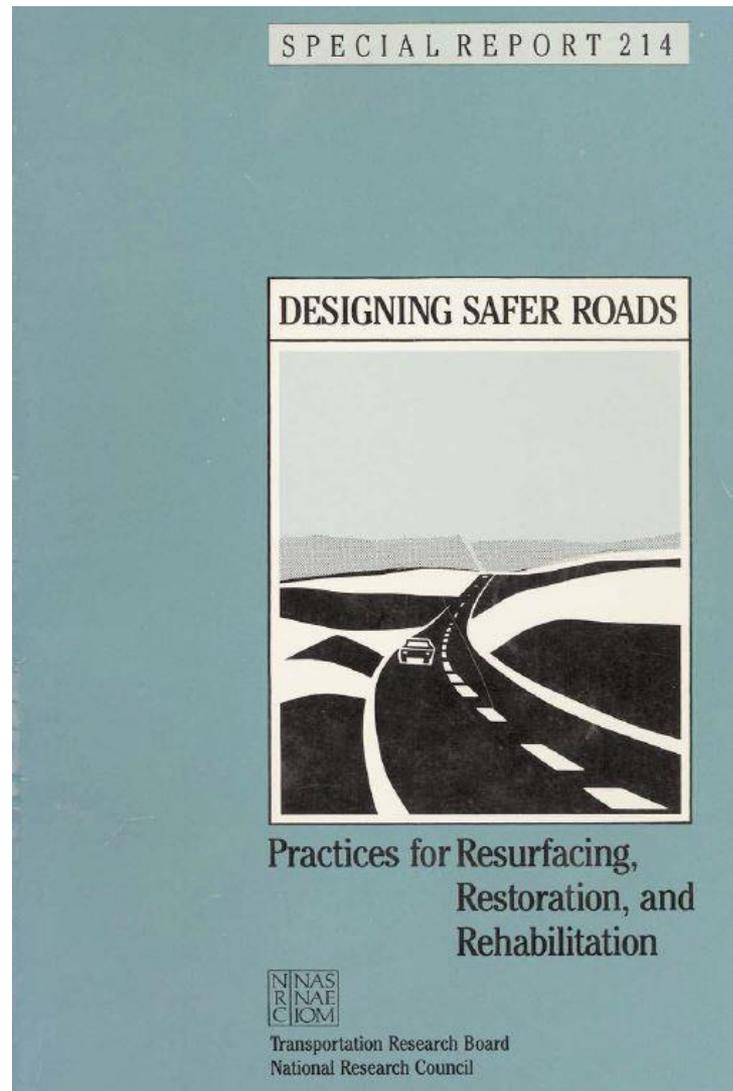
- Replacement of entire existing base



3R Work Scope Examples

- Resurfacing 2(+)"-6"
- Lane widening
- Shoulder widening
- Curves – Minor or “Spot” Corrections
 - Vertical
 - Horizontal
 - Superelevation
- Roadside obstacles removal or protection
- Guardrail and bridge rail upgrade
- Superstructure replacement
- Bridge widening
- Bridge thin bonded PCC overlay
- Culvert extension

Primary Source for 3R Standards



Design
Criteria and
Values -
Chapter 7

3R Standards

Safety Conscious Design

- Systematically consider safety improvements
- Safety is an integral part of design, not a secondary objective

3R Standards

Safety Conscious Design

- Cost Effective Analysis
- Safety Improvement if
 - Significant, Relevant Crash History
 - Benefits greater than Costs

Safety Conscious Design Process

- Assess current conditions
- Determine project scope
- Document the design process
- Review the design

Assess Current Conditions Affecting Safety

- Identify specific safety problems
 - Analyze crash (and travel) data
- Site Inspection
- Verify existing geometry
- Determine prevailing speeds at key locations (stopping-sight issues)

Determine the Project Scope

- Pavement repairs
- Geometric improvements
- Safety enhancements
 - Intersections
 - Increase sight distance, Reduce vehicle conflicts
 - Roadside
 - Remove obstacles, Upgrade bridge rail and guardrail, Flatten slopes, Regrade
 - Traffic control
 - New and improved signing, pavement markings
 - Other

Document the Design Process

Safety and Design Report

- Existing features, ADT, speeds, crash history
- Applicable design standards
- Specific safety problems
 - Or concerns raised by the public
- Design options for correcting problems
 - Costs, safety and other relevant impacts
- Any proposed Relaxation of Standards
- Design Proposal.

Review the Design Before Final Approval

- Traffic and Safety Engineers
- Augmented Staff (Consultants)
 - For most municipalities and counties

3R – an Interim Measure

Neb. Rev. Stat. 39-2101 – Legislative intent

- 1969 law
- Objective: bring roads and bridges up to new and reconstructed standards over a 20-year period.
- Intent: to provide “reasonable” financing and more equitable distribution of revenue.
 - Law assumed adequate financing going forward!

Why 3R Standards?

- Preserve and improve existing roadway, bridge and roadside features
- Extend the life of the facility
- Potential for Safety Improvements

WITHOUT cost of full reconstruction

WITHOUT requesting a Relaxation of Standards

A Good Use of Public Funds



#8 3R Design
Standards (part 2)



Resurfacing



Thicker Layers for
Longer Lifespan

2010 Standards

New & Reconstructed

2016 Standards

3R, if the base is not removed, replaced, reconstructed or strengthened. Minor base repair is allowable under 3R.

Add an Auxiliary Lane



2010 Standards

New & Reconstructed

2016 Standards

3R, unless something else drives the project to New & Reconstructed.

Minor Widening - Lanes and Shoulders



2010 Standards

New & Reconstructed

2016 Standards

3R, unless something else drives the project to New & Reconstructed

Minor Alterations - Grades and Curves



2010 Standards

2016 Standards

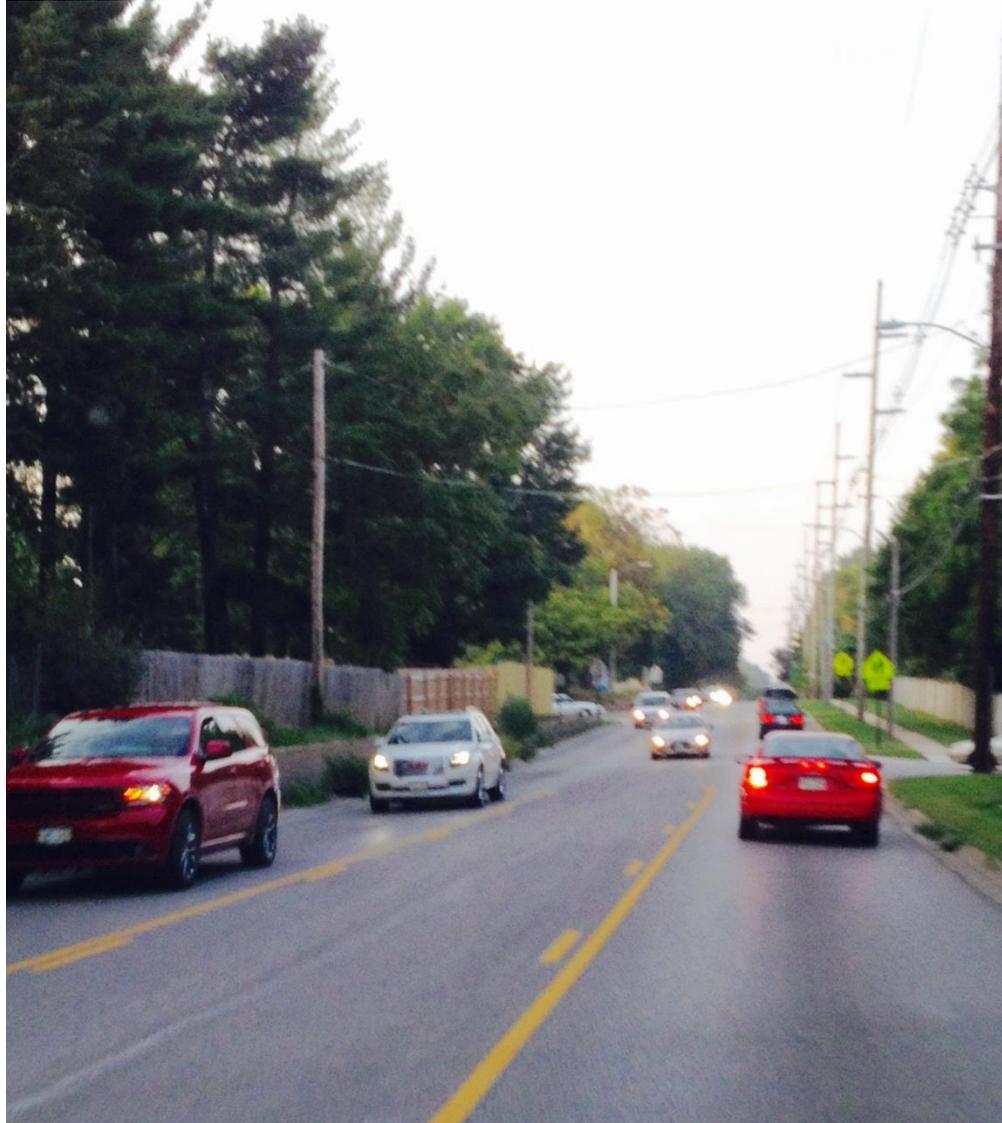
New & Reconstructed

3R, unless something else drives the project to New & Reconstructed

Rehabilitation - Before



Rehabilitation - After



Change to
2-lane with
TWLTL and
Resurface

Bridge Re-decking



2010 Standards

New & Reconstructed

Slide 175

2016 Standards

3R, unless something else drives the project to New & Reconstructed.

- Must meet 3R bridge width and original design loading.
- Can remain load-posted if ADT < 400 VPD

Widen Substructure and Superstructure



2010 Standards	2016 Standards
New & Reconstructed	3R, unless something else drives the project to New & Reconstructed. <ul style="list-style-type: none">• Must meet 3R bridge width and original design loading.• Can remain load-posted if ADT < 400 VPD

Update Bridge Rail and/or Guardrail



2010 Standards

New & Reconstructed

2016 Standards

3R, unless something else drives the project to New & Reconstructed

- Must meet 3R bridge width and original design loading.
- Can remain load-posted if ADT < 400 VPD

Example of 3R Work Add or Upgrade Guardrail

- Must meet **all** 3R standard criteria for that segment of roadway



Single-Span Steel Girder Bridge

Functional Classification = Local

Traveled Way Width = 20 ft.

200 Vehicles Per Day

Problem:

Rapid asphalt deterioration (excessive flexure)

Current Standards: **Replace the Bridge
or request a Relaxation of Standards**



Single-Span Steel Girder Bridge

Functional Classification = Local

Traveled Way Width = 20 ft.

200 Vehicles Per Day

Solution:

Add a bent, or re-build deck (concrete w/studs)

Proposed Standards: **Fix it (3R Stds)**

Slide 181



Bridge Rail

06.27.2013 10:49



Approach Slab

3R – Allowed Scope of Work

08.05.2013 10



Pier Cap Work

Urban Bridge

Not 3R

- Maintenance work 001.03A1c
- Do not by themselves require application of 3R or N&R standards:
 - curb ramps
 - sidewalks
 - trails
- New & Reconstructed work

Application of Standards



Mill 4" Fill 4"
3R Standards

Replace Culvert
New & Reconstructed
Standards

Mill 2" Fill 2"
Maintenance Standards

3R Standards in Tables

- Numerical values for:
 - Design Speed (Posted)
 - Lane Width
 - Shoulder Width
 - Clear Bridge Width
 - Structural Capacity
- All other values are “Existing”

Horizontal Alignment (Superelevation and Radius)

Vertical Alignment, Grade

Stopping Sight Distance, Cross Slope

Horizontal Clear Zone, Vertical Clearance

“Existing” in the Tables

- Means **Existing Design Feature**
- Not the same as whatever is out there (not a free pass)
- Maintenance Standards still apply
- Consider risks

Cost Effective Analysis

Applicable Notes

Note 6 – 3R work – applies to all criteria in tables

- ADT thresholds for two criteria:
 - Horizontal Alignment – 750 VPD – **Note 12**
 - Vertical Alignment – 1,500 VPD – **Note 13**
- Other criteria has no ADT thresholds



If ADT is less, no cost effective analysis is required by 428 NAC 2

Cost Effective Analysis

- Specifically for 3R work
- Purpose: see if a safety improvement should be considered
- Crash History analysis
 - “Significant” (number and severity)
 - “Relevant” (link to criterion)
- User benefits: crash cost reductions
- User benefits v safety improvement costs

Cost Effective Analysis – 3R

- Document and place in project file **DO NOT SEND TO NBCS**
- Process in a nutshell 
 - No crash history? Document it, you're done
 - Significant, relevant crash history related to a criterion? Do a Benefit/Cost Analysis.

Crash History Relates to 3R Criteria in Standards

1. Design Speed
2. Lane Width
3. Shoulder Width
4. Horizontal Alignment (Radius)
5. Superelevation
6. Vertical Alignment
7. Maximum Grade
8. Stopping Sight Distance
9. Cross Slope
10. Horizontal Clear Zone
11. Vertical Clearance
12. Bridge Clear Width
13. Structural Capacity

Bold Black font – items that have “Existing” as a value in the tables

Crash History Duration

- 3 Years minimum is customary for many roads, mostly higher traffic volumes
- 5 years or even 10 years may be more appropriate
 - Lower volume roads
 - Some spot locations (bridge icing, etc)

MDS is silent on crash history duration

Crash History Info



- Co-NECTAR
 - http://www2.dor.state.ne.us/conectar/NE_Crash_Locations.html
- NDOR Highway Safety office contacts for public agencies and its contractors
 - **Alan Brown 402-479-4665**
 - Sean Owings 402-479-4628
 - Bob Grant 402-479-4645
- General public must contact NDOR Communication Division

Crash History Analysis

- Summary
- Overall Numbers and Types
- Trends*
- Clusters*

* May not be possible for very low-volume roads

Crash History

Protection of Data

- 23 USC 409 (Federal) – not discoverable
- No similar Nebraska law?
- Neb. Rev. Stat. 84-712 Public Records Act
- 004.01A12 Sufficient Crash History Analysis.

Identify Crash:

- Rate
 - Optional: compare to similar routes
- Types
- Clusters
- Trends

**Contact your city or
county attorney!**

Cost Effective Analysis

- What is the cost of a Safety Improvement?



- What does a crash cost society, a community?



- A Benefit/Cost B/C Analysis identifies costs of safety improvements with benefits compared to costs.

Cost Effective Analysis – Example

This is only one method!

1. Determine ADT at location

- ADT – Average DAILY Traffic
- Highway Capacity Manual (HCM)
- NE-LTAP has counters to loan



2. $ADT * 365 \text{ days/year} = \text{vehicles per year}$

- $\div 1,000,000 = \text{million vehicles per year (MV/yr)}$

Cost Effective Analysis - Example

3. Determine economic cost NDOR uses crash type instead of injury type
- Mitigated (m) crashes – crashes type expecting to decrease
 - Societal Costs of NE Traffic Crashes—
 - Resource: NDOR Traffic Highway Safety Office for crash cost data (see Crash History slide)
 - Mitigated crash type cost * m crashes at location
 - total all m crash costs for a given location
4. Determine average cost per mitigated crash
- total m crash cost ÷ total m crashes = \$/m crash

Cost Effective Analysis - Example

5. Determine mitigated (m) crash rate per MV
 - $m \text{ crashes} \div \text{years of crashes analyzed} = m \text{ crashes/year}$
 - $m \text{ crashes/year} \div \text{MV/yr} = m \text{ crashes/ MV}$
6. Determine savings resulting from safety improvement
 - $m \text{ crashes/MV} * \text{MV/yr} * \text{safety improvement service life} * \$/m \text{ crash} * \text{crash modification factor} = \text{safety improvement savings} (\$)$
 - Crash modifications may be obtained with assistance from Crash Modification Factors Clearinghouse;
<http://www.cmfclearinghouse.org>
 - Reference Highway Safety Manual (HSM)

Cost Effective Analysis - Example

7. Determine Benefit/Cost for the safety improvement
 - Safety improvement savings ÷ safety project costs = B/C of safety project

Refer to Note 6. If the Benefit/Cost is >1, include the safety improvement in the scope of work.

Request Relaxation of Standards Only if . . .

- Relevant, significant crash history and
- Benefits > Costs and
- Safety improvement would be a special hardship

Other Special Analyses

Applicable Notes

Note 16 – engineering study for obstacles (other than those in the list of exceptions) in the HCZ, benefits v. cost

Note 22 – Bridge (or non-buried structure or culvert) Replacement project on road with ADT < 400 VPD, cost effective analysis, applies to certain criteria



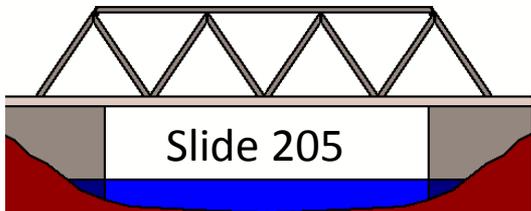
#9 Bridges/Structures



Bridges

Issues with 2010 Standards

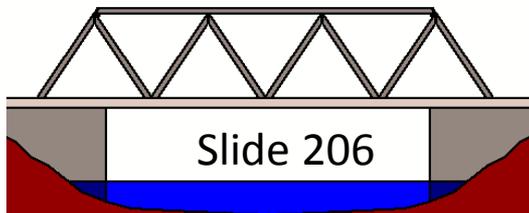
- Bridge: no definition
- Scope more than Maintenance: must replace, or request a relaxation of standards (no 3R Stds)
- Municipal Streets: no width standards
- County Roads:
 - 20 ft minimum width does not meet AASHTO recommendations
 - ADT > 750 VPD: refers to AASHTO Green Book
 - Under 20 ft long: not addressed?



All of these issues are addressed in the 2016 MDS

Bridge

- Federal definition (23 CFR 650.305)
- Structures longer than 20 ft Along center of roadway
- Includes
 - Bridges
 - NBS
 - Culverts
 - Multiple pipes



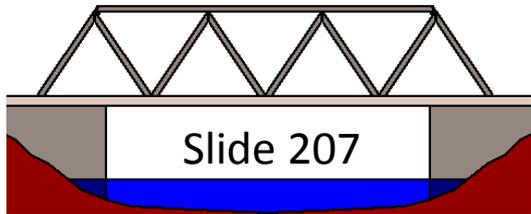
Non-buried Structure

2016 Standards address
4 ft - 20 ft* structures

* Along center
of roadway



Definitions



What about
structures less
than 20 ft long?

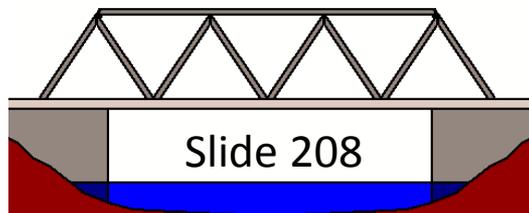


Non-buried Structure

- Definition similar to Bridge, covers the shorter lengths (20 ft* or less)
- Can include
 - Concrete, steel and timber structures
 - Concrete slab structures
 - Culverts
 - Pipes

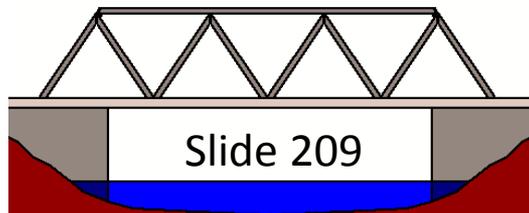
**SHORT
BRIDGES**

* Along center
of roadway



Non-buried Structure

2 feet or less fill or pavement on top



3R Boundaries - Bridges

Maintenance

- Clean, replace, repairing
- Replacement (essentially same design) of rails, floors, stringers, piling and beams
- In-kind replacement of walls
- Nothing extensive or costly

3R

- **More than Maintenance, up to and including Rehabilitation (Replace entire superstructure)**
- **Widen**
- **Redeck**
- **Bridge rail (updated design)**
- **Culvert Extensions**

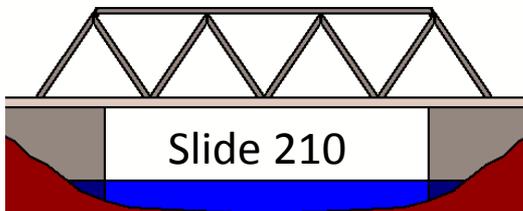
Reconstructed

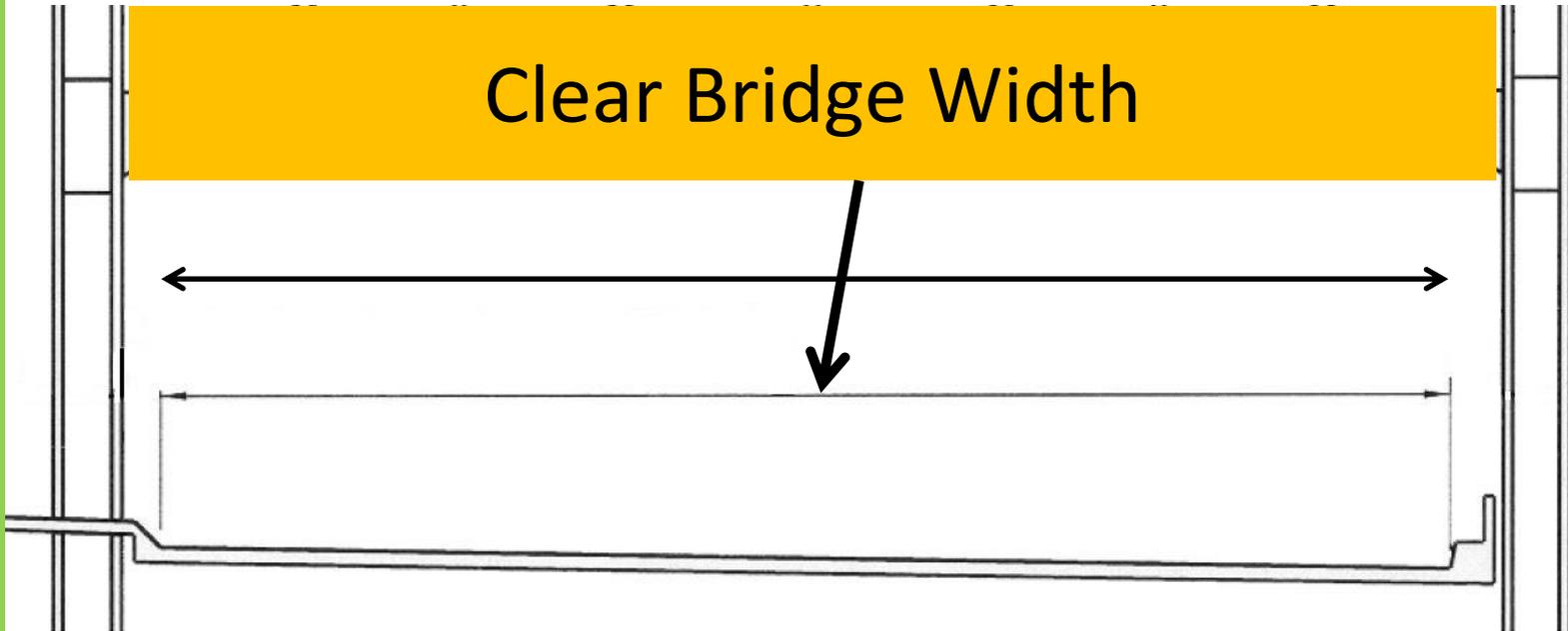
- Replacement of bridge, non-buried structure, or culvert

Quick, Short-term, low cost

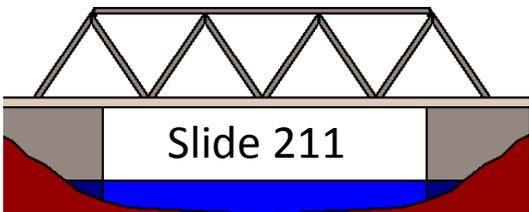


Longer lasting, higher cost





- New & Reconstructed Bridges Widths Based on AASHTO Green Book formulas
- Bridges to Remain in Place Based on TRB SR-214 formulas

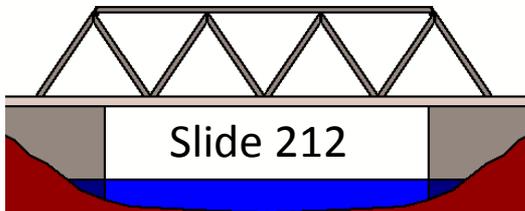


Clear Bridge Width (CBW)

Measured from Face-of-Curb?



Yes



428 NAC 2-001, Part Two, Note 18
428 NAC 2-001.03A6i, CBW Definition

Note 18 (new)

Structures

Clear Bridge Width (CBW)

Measured from Face-of-Curb?

Definitions

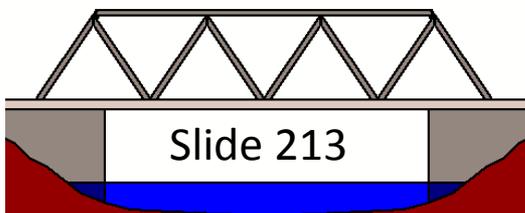
Structures



Full approach curbed section carried across structure

No

Urban Area



428 NAC 2-001, Part Two, Note 18

428 NAC 2-001.03A6i, CBW Definition

Clear Bridge Width (CBW)

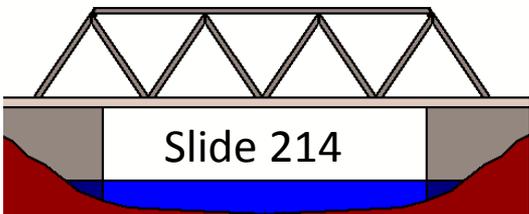
Minimum Design Standards

structures



Outer Bridge Rail
Median Bridge Rail

1.5 ft clearance
minimum to edge of
traveled way



Outer Bridge Rail
Curbed Median

Clear Bridge Width (CBW) Tables

Design Criterion

New and Reconstructed

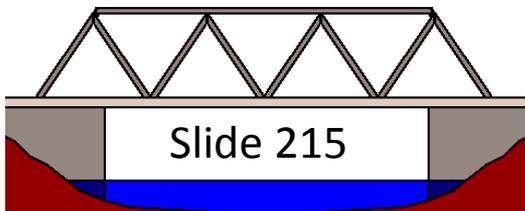
3R

Urban

Bridges (Notes 18, 20, 21)	(letters within parentheses refer to formulas in Note 18)	
Clear Bridge width Curbed Sections	ADT \geq 400 VPD: 25 ft. (E) ADT < 400 VPD: 23 ft. (E)	ADT \geq 400 VPD: 23 ft. (G) ADT < 400 VPD: 21 ft. (G)
Clear Bridge Width Non-Curbed Sections	ADT \geq 2,000 VPD: 38 ft. (A) ADT 400 - 1,999 VPD: 28 ft. (C) ADT < 400 VPD: 24 ft. (D)	ADT \geq 4,000 VPD: 28 ft. (C) ADT 2,000 - 3,999 VPD: 26 ft. (D) ADT 750 - 1,999 VPD: 24 ft. (F) ADT 400 - 749 VPD: 22 ft. (H) ADT < 400 VPD: 20 ft. (H)
Structural Capacity	HL93 (Note 19)	(Note 19)

Rural

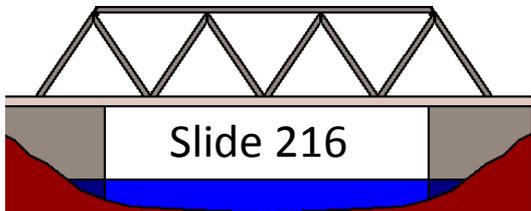
Bridges (Notes 18, 20, 21)	(letters within parentheses refer to formulas in Note 18)	
Clear Bridge Width	ADT \geq 2,000 VPD: 40 ft. (A) ADT 1,500 - 1,999 VPD: 30 ft. (B) ADT 400 - 1,499 VPD: 28 ft. (C) ADT < 400 VPD: 24 ft. (D)	ADT \geq 4,000 VPD: 30 ft. (C) ADT 2,000 - 3,999 VPD: 28 ft. (D) ADT 750 - 1,999 VPD: 24 ft. (F) ADT 400 - 749 VPD: 22 ft. (H) ADT < 400 VPD: 20 ft. (H)
Structural Capacity	HL93 (Note 19)	(Note 19)



Clear Bridge Width (CBW) Formulas, Minimums

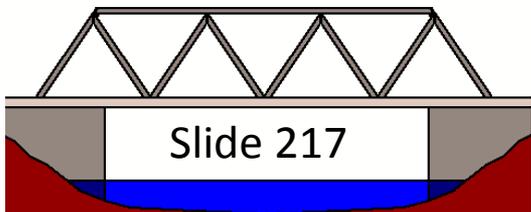
Basis of Values in Tables

- Minimum Lane Width (from Tables)
 - N&R lane width for replacements
 - 3R lane width for 3R work
- Two-lane road or street
- **Calculated by Formula**



Clear Bridge Width (CBW) Formulas, Minimums

- A. Approach traveled way width plus shoulder widths
- B. Approach traveled way width plus 4 ft. (each side)
- C. Approach traveled way width plus 3 ft. (each side)
- D. Approach traveled way width plus 2 ft. (each side)
- E. Approach traveled way width plus 1.5 ft. (each side)
- F. Approach traveled way width plus 1 ft. (each side)
- G. Approach traveled way width plus 0.5 ft. (each side)
- H. Approach traveled way width



Traveled Way

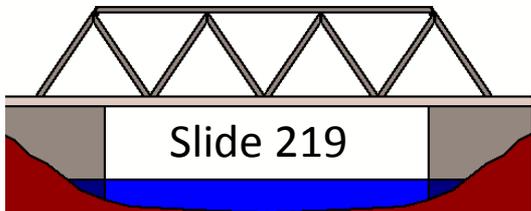
- For the through movement of vehicles
- Does not include shoulders or bicycle lanes



Clear Bridge Width (CBW) Formulas, Minimums

Planned Width

Use the planned traveled way width and planned shoulder width, not the existing widths



Clear Bridge Width (CBW)

Formulas – Basis – Rural N&R Work

U.S. Customary		
Design Volume (veh/day)	Minimum Clear Roadway Width for Bridges ^a	Design Loading Structural Capacity
400 and under	Traveled way + 2 ft (each side)	HL 93
400 to 2000	Traveled way + 3 ft (each side)	HL 93
over 2000	Approach roadway width ^b	HL 93

Note 18
Formulas

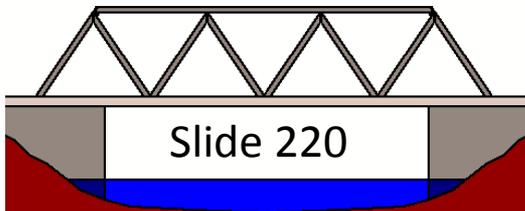
(D)

(C)

(A)

Structures

Minimum Design Standards



AASHTO Green Book
Table 5-6, Rural Local

Clear Bridge Width (CBW)

Formulas – Basis

Rural 3R Work

*Design Year
Volume (ADT)*

Usable Bridge Width (ft)^a

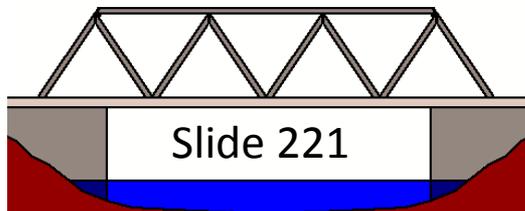
Note 18
Formulas:

0–750	Width of approach lanes	(H)
751–2,000	Width of approach lanes plus 2 ft	(F)
2,001–4,000	Width of approach lanes plus 4 ft	(D)
Over 4,000	Width of approach lanes plus 6 ft	(C)

TRB SR-214

Recommendation 9

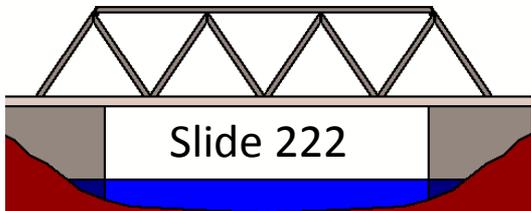
Page 199



Clear Bridge Width (CBW) Rural 3R Work

2016 Minimum Clear Bridge Widths:

Very similar to 2010 Bridges Remain
in Place Roadway Widths



Clear Bridge Width (CBW) Formulas – Basis

Urban N&R Work (Replacement) Curbed Section

Formula E: 1.5 ft each side

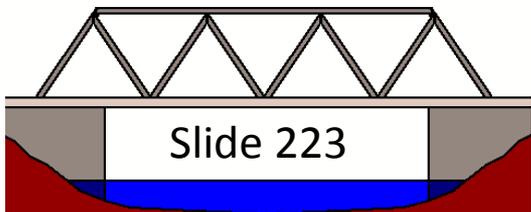
(Basis: Lateral Offset to Obstruction)



Mitigation Strategies

Page 40 (CBW)

Page 64 (LOTO)

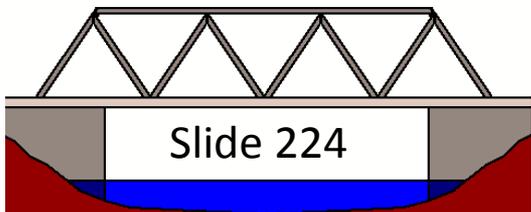


Clear Bridge Width (CBW) Formulas – Basis

Urban 3R Work Curbed Section

Formula G: 0.5 ft each side

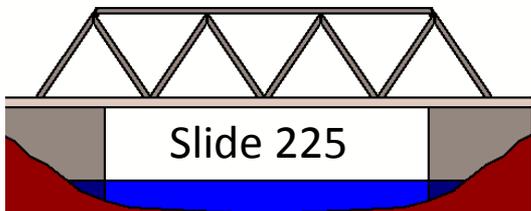
Consistent with State
Highway Standards
(Note G)



Clear Bridge Width (CBW)

Cannot be less than the
width shown in tables

Rural Area Standards – 24 ft minimum CBW



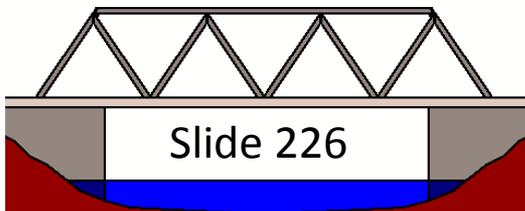
Clear Bridge Width (CBW) Formulas, Minimums

No less than width shown in tables

3R CBW EXCEPTION

Some 3R clear bridge widths
are allowed to be less if

1. CBW is calculated by formula
2. Based on minimum 3R lane width
3. $CBW \geq$ traveled way



Clear Bridge Width (CBW)

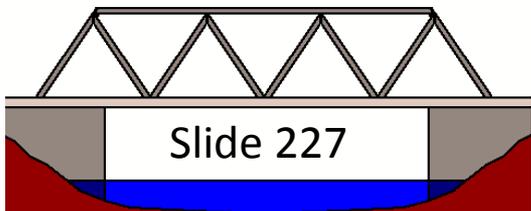
No less than width shown in tables

3R CBW EXCEPTION

Example:

Rural Area, NFC Local,
ADT 400 – 749 VPD, %HT < 10%

- Minimum CBW in table is **22 ft**
- Based on Formula H (approach traveled way width)
- Minimum Lane Width in Table is 10 ft
- 3R Exception in Note 18 allows **20 ft** minimum CBW



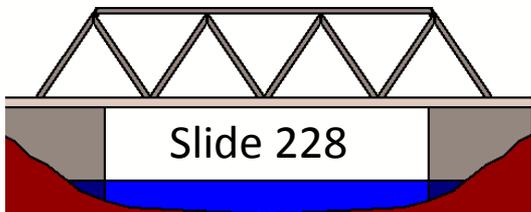
Clear Bridge Width (CBW)

Formulas, Minimums

- CBW value in table may need to increase

Example:

- Rural Area, Minor Collector, ADT < 400 VPD
 - 10 ft Lanes @ 50 MPH, *11 ft @ 55 MPH*
 - Formula (D) = plus 2 ft each side
 - **24 ft** minimum, based on 50 MPH
 - $10 + 10 + 2 + 2 = 24$ ft
 - *For 55 MPH design, minimum is **26 ft***
 - $11 + 11 + 2 + 2 = 26$ ft



Clear Bridge Width (CBW)

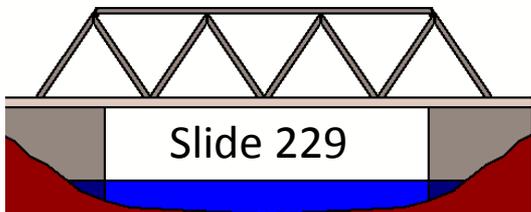
Formulas, Minimums

- CBW value in table may need to increase

Example:

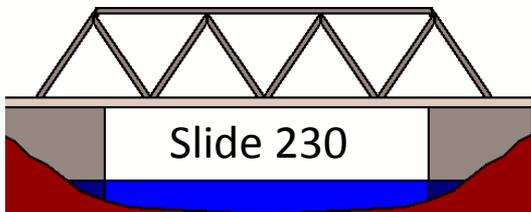
- Urban Area, Minor Arterial, New and Reconstructed work
 - Curbed section, undivided
 - Table value: 25 ft. minimum CBW
 - Four 11 ft. lanes (approach traveled way)
 - **CBW Minimum** = $1.5 + 4(11) + 1.5 = 47 \text{ ft.}$

Plus any additional lanes, shoulders, auxiliary lanes, sidewalks, etc. being carried across the structure



Clear Bridge Width (CBW) Other Requirements

- Paved shoulders carry through
- Rehabilitated bridges desirable width
- Auto Gates 18 ft minimum

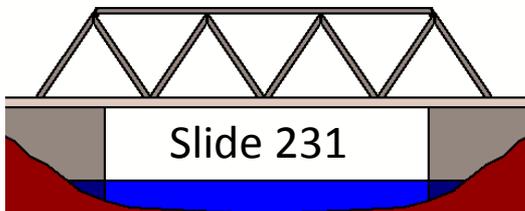


Clear Bridge Width (CBW)

Relaxation of Standards

if cannot meet or exceed CBW in tables or per Note 18

- Don't forget 3R CBW Exception
- Auto gates 18 ft

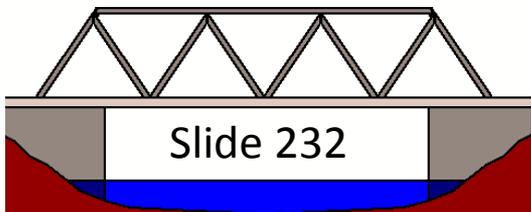


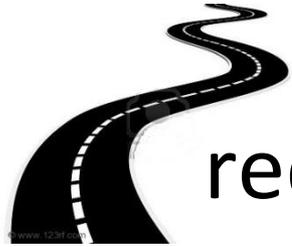
Clear Bridge Width (CBW)^{2 of 2}

Relaxation of Standards

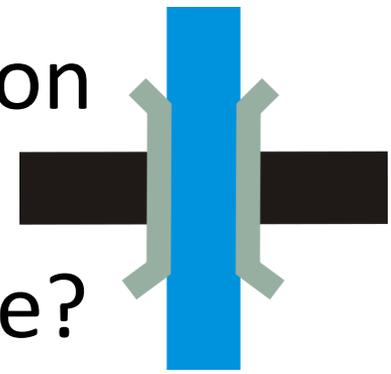
3R Work

- Cost Effective Analysis
- $B/C > 1.0$
- It would be a special hardship to widen the bridge





When does work* only on an existing roadway require work on a bridge?



3R CBW

Bridge Standards

Remain-in-Place Width Structural Capacity?

3R Structural Capacity

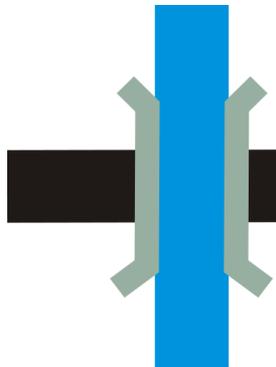
2016 MDS

2010 MDS

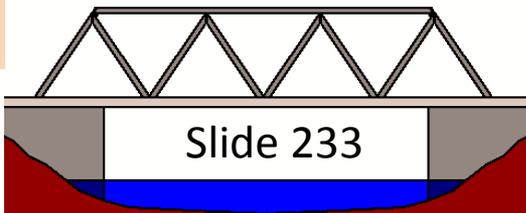
N&R or 3R as appropriate

Roadway Standards

N&R



When does work* only on an existing bridge require work on a roadway?



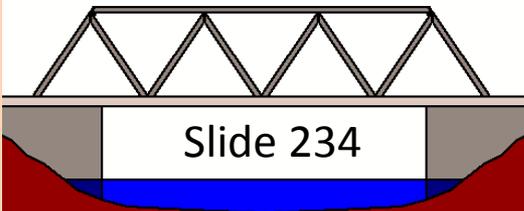
* More than Maintenance

428 NAC 2-001, Part Two, Notes 6, 18 and 22

Roadways and Bridges Work Together



- ✓ Compatibility
- ✓ Consistency
- ✓ Safety
- ✓ Driver Expectation



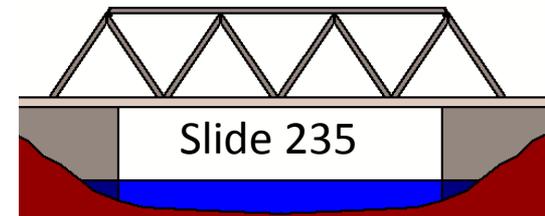
An Issue: Improper Segmentation



Project A
Mill 4" Fill 4"
3R Standards

Bridge/NBS – Less Than
Remain-in-place width
NOT ADDRESSED

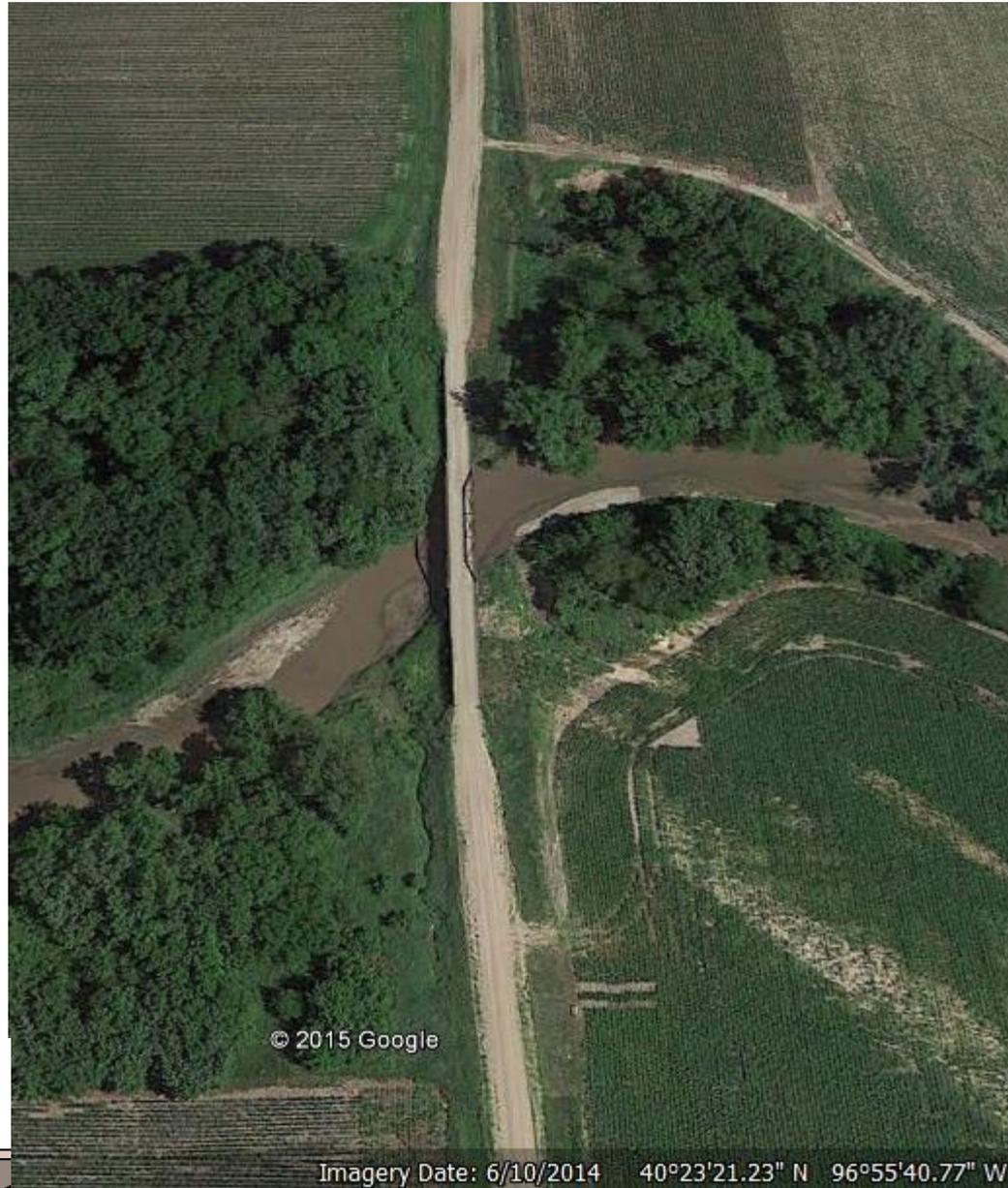
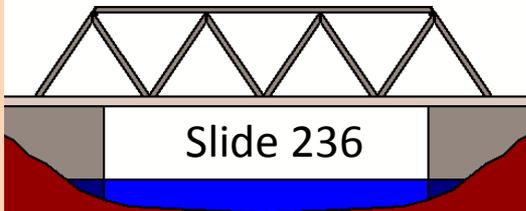
Project B
Mill 4" Fill 4"
3R Standards



Note 18 (new)



Avoid bridge acting as a roadway constriction



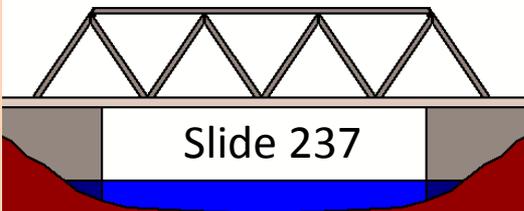
Structures

When does work* on an existing roadway require work on a bridge?

Planning to work only on the approach roadway



When does work* on an existing bridge require work on a roadway?

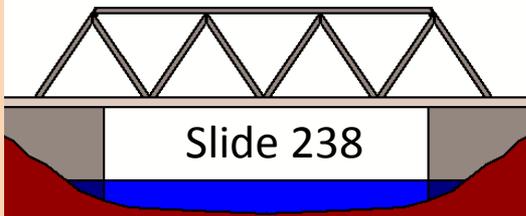


* More than Maintenance

428 NAC 2-001, Part Two, Note 18

Roadway is **Reconstructed** - Effect on Bridge or NBS

- Bridges may already be upgraded to N&R CBW prior to roadway reconstruction
- If not:
 - Meet or exceed 3R standards (required), or
 - Upgrade to N&R CBW (desirable)

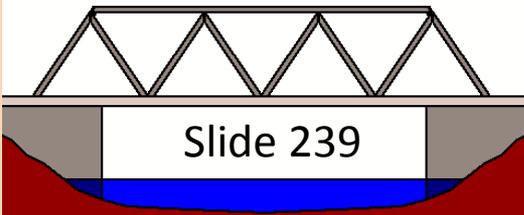


3R Resurfacing Project

2 of 3

Effect on Bridge or NBS Work Scope

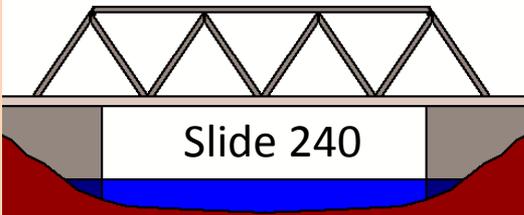
- Widening the approach roadway or traveled way? Note 18 applies:
 - Bridge/NBS: **3R standards**, or request a relaxation of standards
- Not widening the approach roadway or traveled way? Note 6 applies:
 - **Cost effective analysis** helps decide if bridge/NBS needs to be widened



3R Resurfacing Project

Effect on Bridge or NBS Work Scope

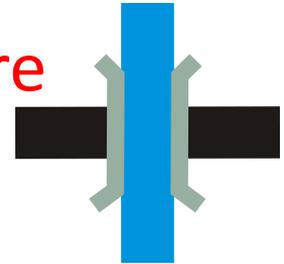
- Upgrade bridge/NBS to 3R standards may be prudent but is NOT required if:
 - Roadway (lanes and/or shoulders) are not being widened and
 - No significant crash history related to clear bridge width
- 10- to 20-year resurfacing life
 - New pavement: potentially higher speeds
 - Is bridge a constriction?



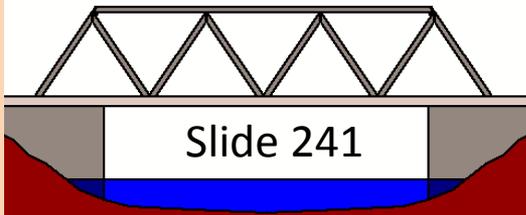
When does work* on an existing roadway require work on a bridge?

When does work* on an existing bridge require work on a roadway?

Planning to work only on a structure



* More than Maintenance



Structure Replacement

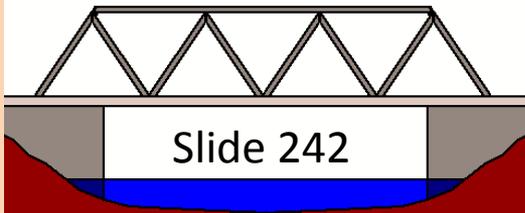
- Bridge
- NBS
- Culvert
- Low-water Crossing
- Ford

By Definition, Standards for the Structure are:

- New and Reconstructed
- 3R
- Maintenance



What standards apply to the road on either side?



2010 Standards: New and Reconstructed

Structure Replacement

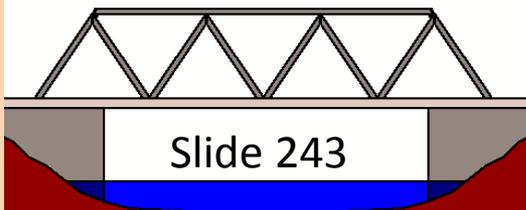
2016 Standards applicable to road on either side:

New and Reconstructed



Life-span of structures

Neb. Rev. Stat. §39-2101



428 NAC 2-001, Part Two, Note 22

Note 22 (new)

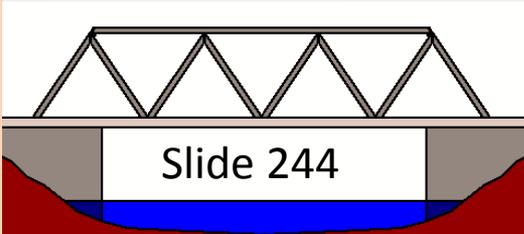
Road either side of Structure

Structure Replacement

ADT < 400 VPD

Where Rural Area Standards

Note 22 (new)



If no significant related crash history,
N&R standards are not required for:

Lane Width

Horizontal Curve Radius

Superelevation

Shoulder Width

Stopping Sight Distance

Grade

Vertical Alignment

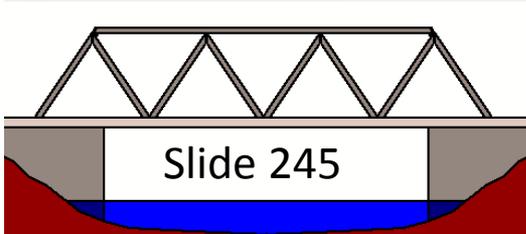
Horizontal Clear Zone

Road either side of Structure

Structure Replacement

ADT < 400 VPD

Where Rural Area Standards Apply



Design Considerations:

Continuity

Signing

Driver Expectation

State Statute 60-6,190

Consistency

Road either side of Structure

Recap of previous six slides:

Structure Replacement

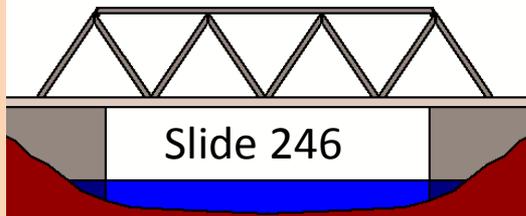
Note 22 (new)

ADT \geq 400 VPD



400 VPD

ADT $<$ 400 VPD



Roadway on both ends shall meet
New and Reconstructed Standards:

All roadways, Urban and Rural

400 VPD

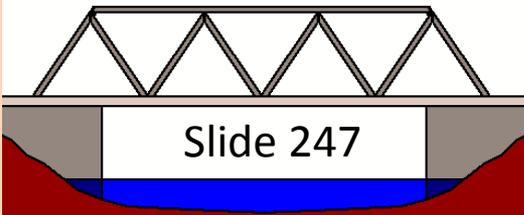
Urban Standards: in all cases

Rural Standards: if a significant, relevant
crash history exists and benefits of
improvement outweigh costs

Clear Bridge Width (CBW)

Widening, Bridge Rail and Guardrail Upgrades*

- Defined as 3R Work
- 3R Minimum CBW must be met
- Structural Capacity Note 19 applies
- Guardrail upgrade extending beyond bridge – may need to widen roadway

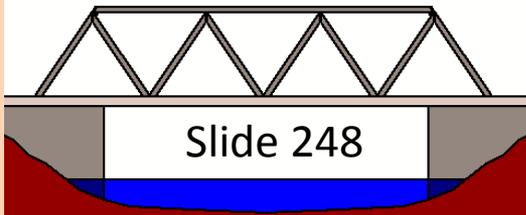


* Not in-kind replacement,
which would be Maintenance

428 NAC 2-001, Part Two, Notes 6 and 18

3R Bridge-Only Project Structural Capacity (Only) Work Effect on Roadway Work Scope

Does not by itself require
work on approach traveled
way, per 2016 Standards



Example: 3R Work* on Bridge Existing Narrow (sub-standard) Roadway

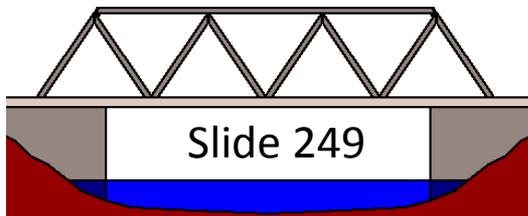
Example

18 ft bridge needs 3R work

3R standards require widening CBW to 22 ft

18 ft traveled way approach; 20 ft is 3R std.

Do standards require approach traveled way widening?



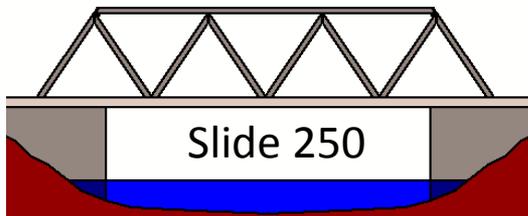
* Such as re-decking or adding a bent or adding stiffeners, i.e. work more than maintenance

Example: 3R Work* on Bridge Existing Narrow (sub-standard) Roadway

May require a wider approach traveled way if work is done on the approach (guardrail)

- Widen Bridge to 3R CBW or
- Request a Relaxation of Standards

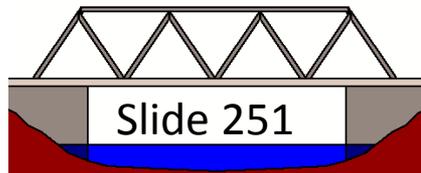
* Such as re-decking or adding a bent or adding stiffeners, i.e. work more than maintenance



Notes 6, 18 and 22 (new)

Initial Planned Work Scope	2016 Minimum Design Standards			
	Bridge/NBS Clear Bridge Width (CBW)	Note	Roadway Lane Width (Traveled Way)	
Roadway-only N&R	3R	6, 18		
Roadway-only 3R (widened)	3R	18		
Roadway-only 3R (not widened)	3R (conditional)	6		
Structure-only N&R (reconstructed, i.e. replaced or lengthened)			ADT, VPD	
		22	≥ 400	N&R
		22	< 400	N&R (conditional where Rural Area standards apply)
Structure-only 3R (CBW increased, or culvert extended)		6	3R (conditional)	
Bridge/NBS-only 3R work (CBW not increased) work termini within the structure e.g. re-deck or add bent or stiffeners			Maintenance	

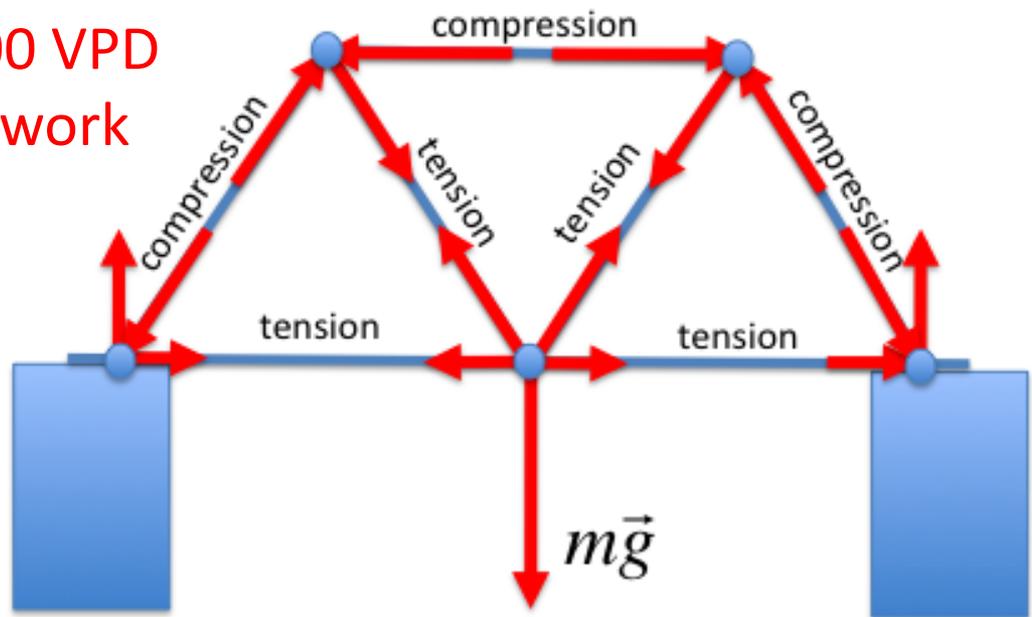
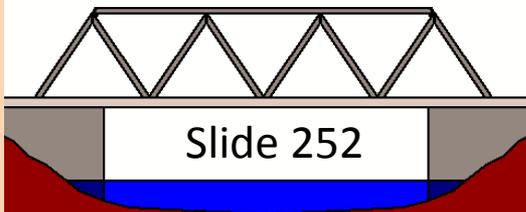
Flexibility



Conditional - if significant related crash history and $B/C \geq 1.0$

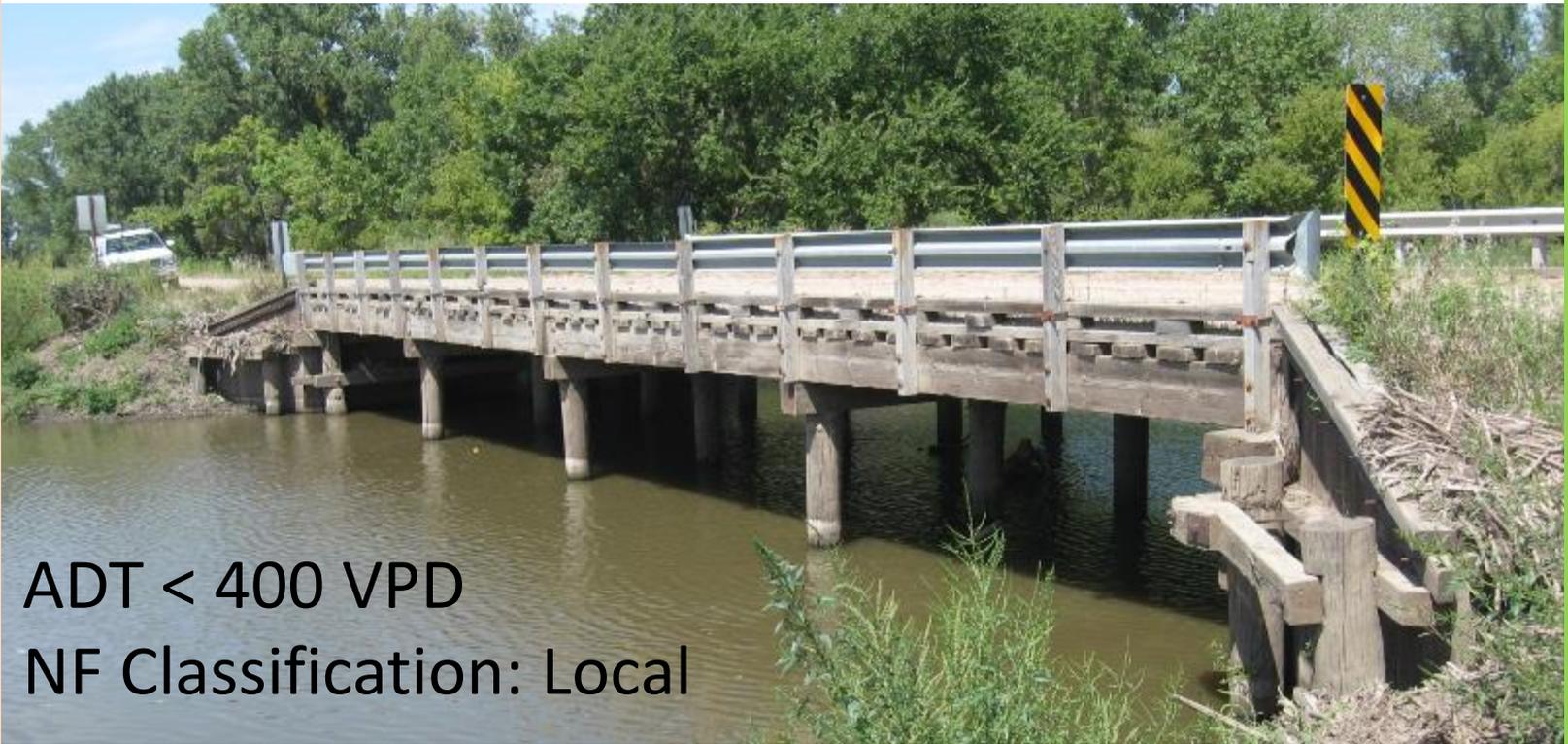
Structural Capacity

- HL93 for New and Reconstructed work
- HS15 for 3R work
- No Load Posting after work EXCEPT
 - 3R work - NFC Local with ADT < 400 VPD
 - Maintenance work



Timber Bridges In-Kind* Superstructure Replacement

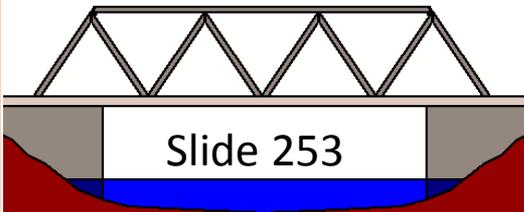
Note 20 (new)



ADT < 400 VPD
NF Classification: Local

Structures

Maintenance Standards



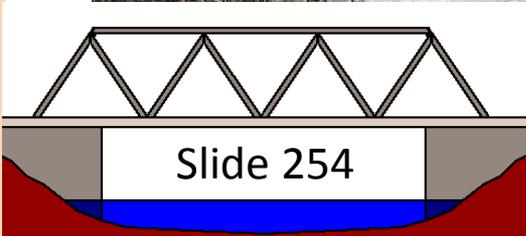
* Same or similar materials and dimensions (length, CBW)

428 NAC 2-001, Part Two, Note 20

Low Water Crossings and Fords

May be built if

- Not the only access to an occupied dwelling
- ADT < 50 VPD
- SFC Minimum Maintenance
- SFC Local



• Relaxation of standards granted



#10

Construction and
Maintenance
standards, and
One- and Six-year
Plans, Transition,
Summary, NBEA
requirements



Slide 256

Title 428 Chapter 2

Procedures for Standards

- 001 Minimum Design Standards
 - Part One - State Highway System
 - Part Two - County Roads and Municipal Streets
- **002 Minimum Construction Standards**
- 003 Minimum Maintenance Standards
- 004 Relaxation of Standards
- 005 Standard Compliance Inspection Procedures

Construction Standards Changes

- 2007 NDOR Standard Specifications for Construction (was 1973)
- Non-NDOR specifications acceptable off the National Highway System
 - must be “equivalent in quality”
 - no longer need to be submitted to NBCS for approval

Title 428 Chapter 2

Procedures for Standards

- 001 Minimum Design Standards
 - Part One - State Highway System
 - Part Two – County Roads and Municipal Streets
- 002 Minimum Construction Standards
- **003 Minimum Maintenance Standards**
- 004 Relaxation of Standards
- 005 Standard Compliance Inspection Procedures



Minimum Maintenance Standards Changes

Very few changes



Minimum Maintenance



Resurfacing no longer restricted
to bituminous material



Replace Bad Bridge Piling



Replacement with Steel Piling is allowed under 2016 standards

Current Standards	Proposed Standards
New & Reconstruction	Maintenance, unless something else drives the project to a higher standard.



Timber Structures – Maintenance

Note 20 (new)



- Replacement of Entire Superstructure
 - NFC = Local, ADT < 400 VPD



Build Sidewalk Ramps



Current Standards	Proposed Standards
New & Reconstruction for the roadway	Maintenance (see definition 001.03A1c) unless something else drives the project into 3R or New & Reconstruction.
Correct anything along the project that does not meet standards	No design relaxation requests necessary

Minimum Maintenance Standards Changes

Reminder:

Unusual or Disaster Operations
Extensive repair or replacement may
be considered “extraordinary
maintenance”



Learning Objectives

1. Know what has changed
2. New format for design standards
3. How to find the correct table
4. Understand the notes
5. Present selected definitions
6. Understand 3R requirements
7. **Application to one- and six-year plan**

Title 428

Chapter 1 Procedures for Classifications

Chapter 2 Procedures for Standards

Chapter 3 One- and Six-year Plans

Chapter 4 Standardized System of Annual Reporting

Chapter 5 Hearing Practice and Procedure of the NBCS

One- and Six-Year Plans Form 7

- Include 3R and New & Reconstructed work
- Do not include Maintenance work unless it is a part of 3R or New & Reconstructed work
- Township counties need to put their Township culvert replacement work on Form 7

Recap – MDS – Some Comparisons

Item	2010	2016
Areas	Corporate Limits	Urbanized Area
3R standards	No	Yes
Functional Class	State	National
Nat'l Hwy System	Not Addressed	Use State Hwy Stds
ADT range, Rural	Up to 750 VPD	All
ADT range, Urban	Not Addressed	All
Alignment with AASHTO	Conservative	Follows more closely
Min. Rural Design Speed, ADT < 50 VPD	30 MPH	As low as 40 MPH in constrained situations
Min. Rural Bridge Width	20 ft	24 ft
CBW: Long (>100 ft) Bridges	Less Width Allowed	Same as Short Bridges
Roadside	Fixed Obstacle Cl.	Hor. Clear Zone

Recap – Standards Comparisons

Item	2010	2016
Intent Statement	No	Yes
Definitions	No	Yes
Construction Specs	1973 NDOR Spec	2007 NDOR Spec
Submission of LPA Construction Specs	Required	Not Required If Equal in Quality
Maintenance Steel Piling allowed	No	Yes
Maintenance PCC overlay allowed	No	Yes
Relaxation of Standards submittals	Not many detailed requirements	Clear, detailed instructions

Transitioning into 2016 Standards

- 2nd Public Hearing – TBD (possibly March 7)
- NBCS consider approval: March 18 meeting
- Attorney General approval
- Governor's approval
- Secretary of State filing
- Standards take effect (mid to late April, 2016)



STATE OF NEBRASKA BOARD OF
ENGINEERS AND ARCHITECTS

<http://www.ea.nebraska.gov>

E&A Regulation Act

- Public Works Projects – including roads and bridges – must comply if project expenditures exceed **\$109,000**
- Compliance means: a licensed professional engineer provides design and construction phase services



#11 Roadside Design



Roadside Design

County Roads and Municipal Streets



3-day NHI Course: February 23, 2016 (one spot open)

1-day Course: May, 2016



ROADSIDE DESIGN GUIDE

4th Edition 2011



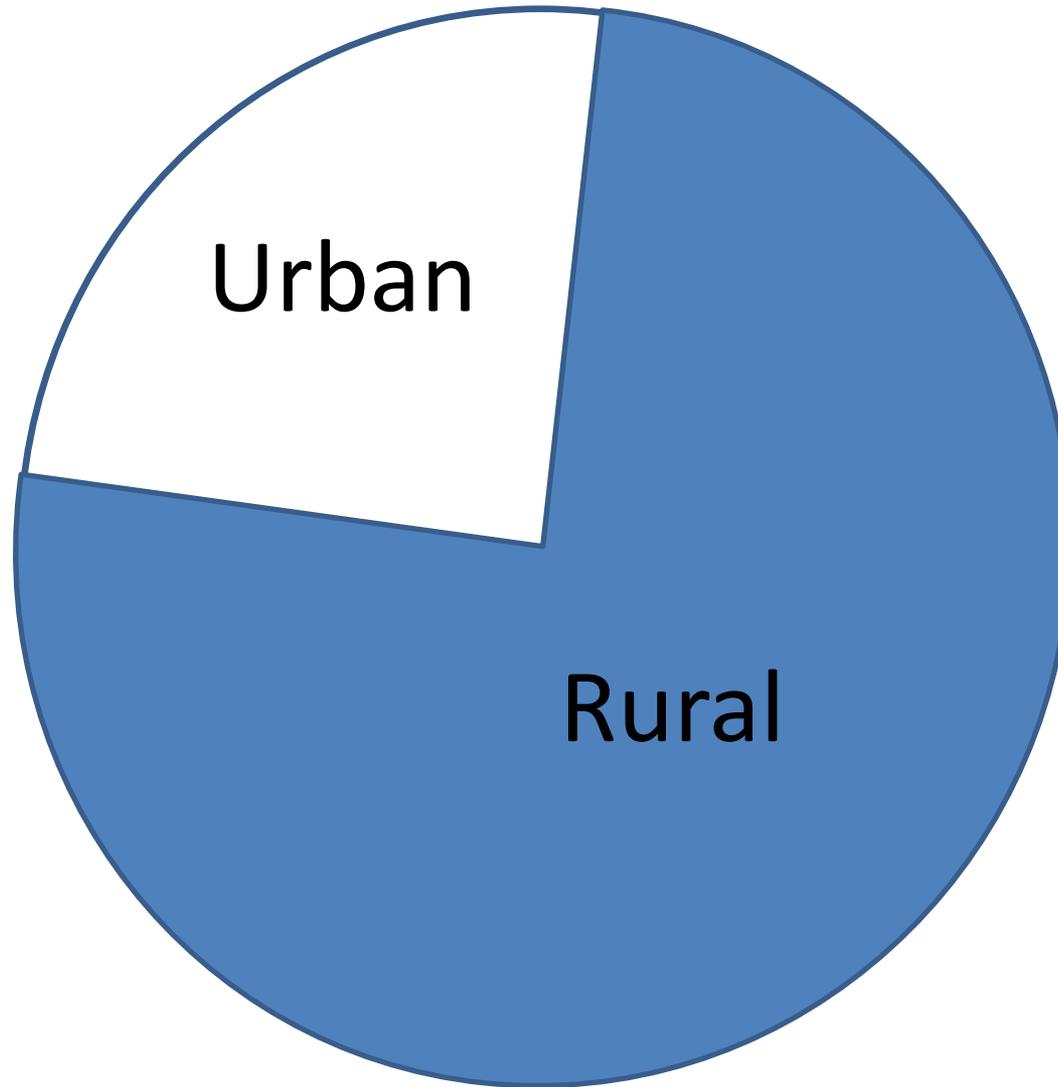
American Association of State Highway
and Transportation Officials

The main
reference
for
establishing
a clear
roadside
recovery
area for
errant
vehicles

**Fixed Obstacle
Clearance
(2010 Standards)**

Slide 276

Run-off-the-Road Crashes



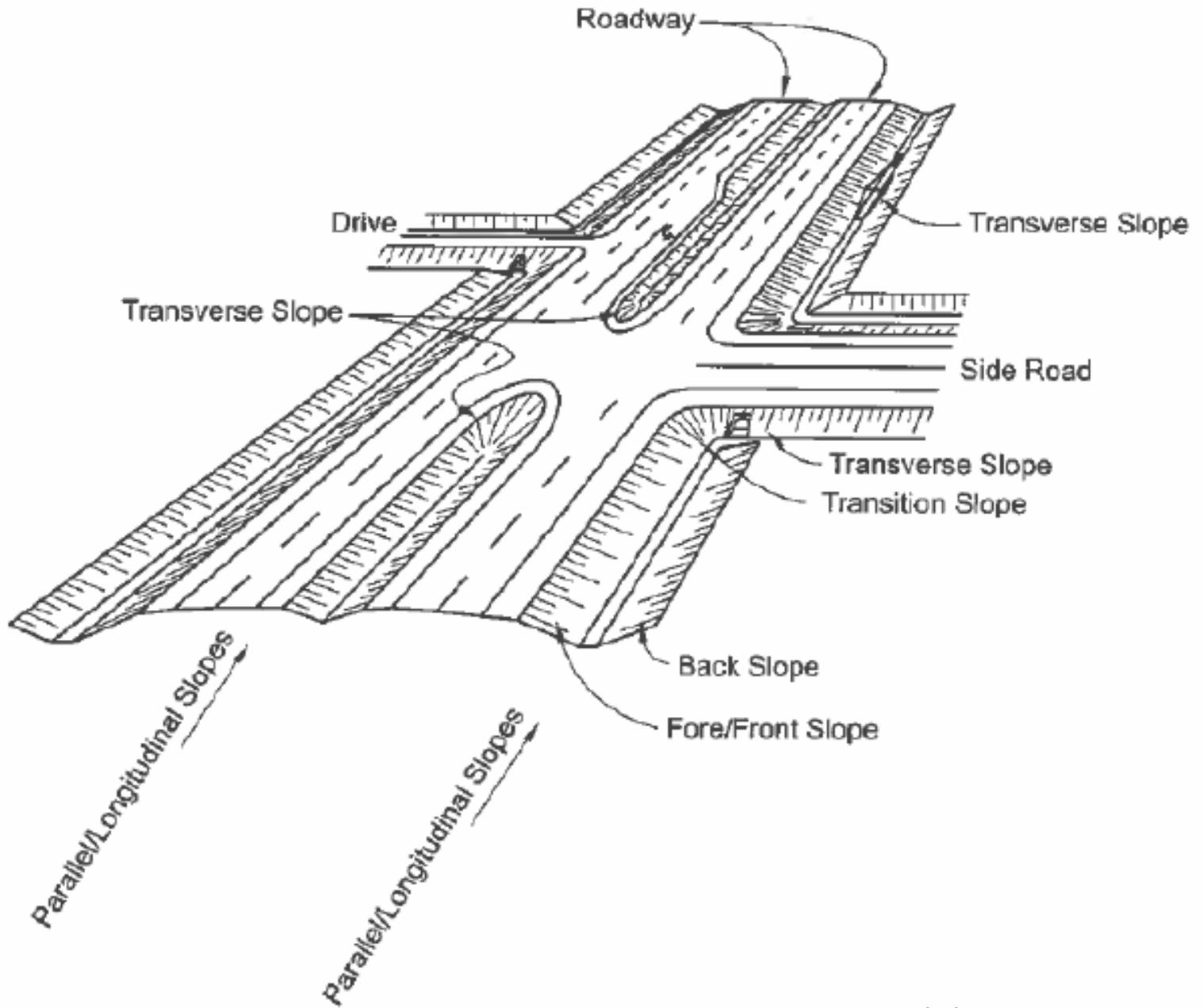
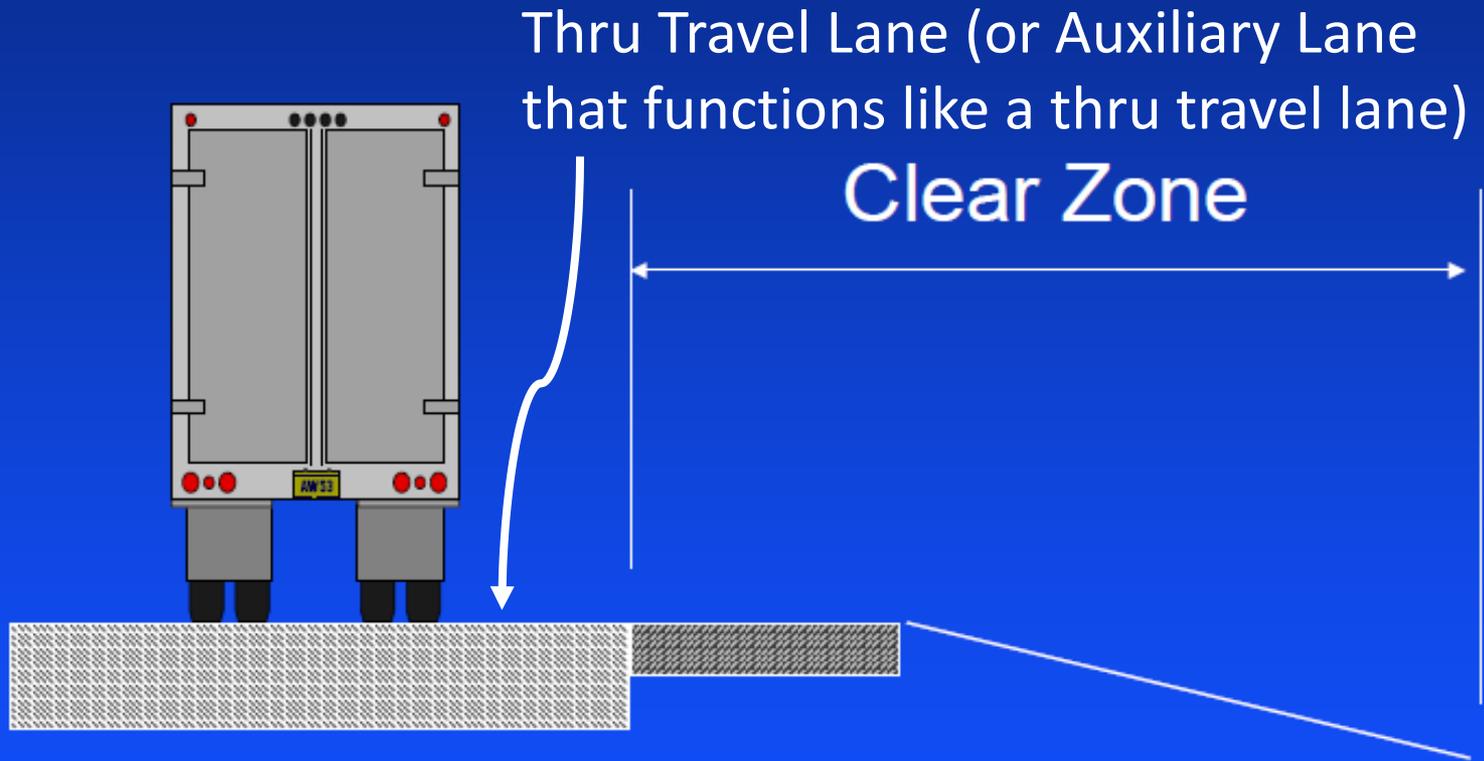
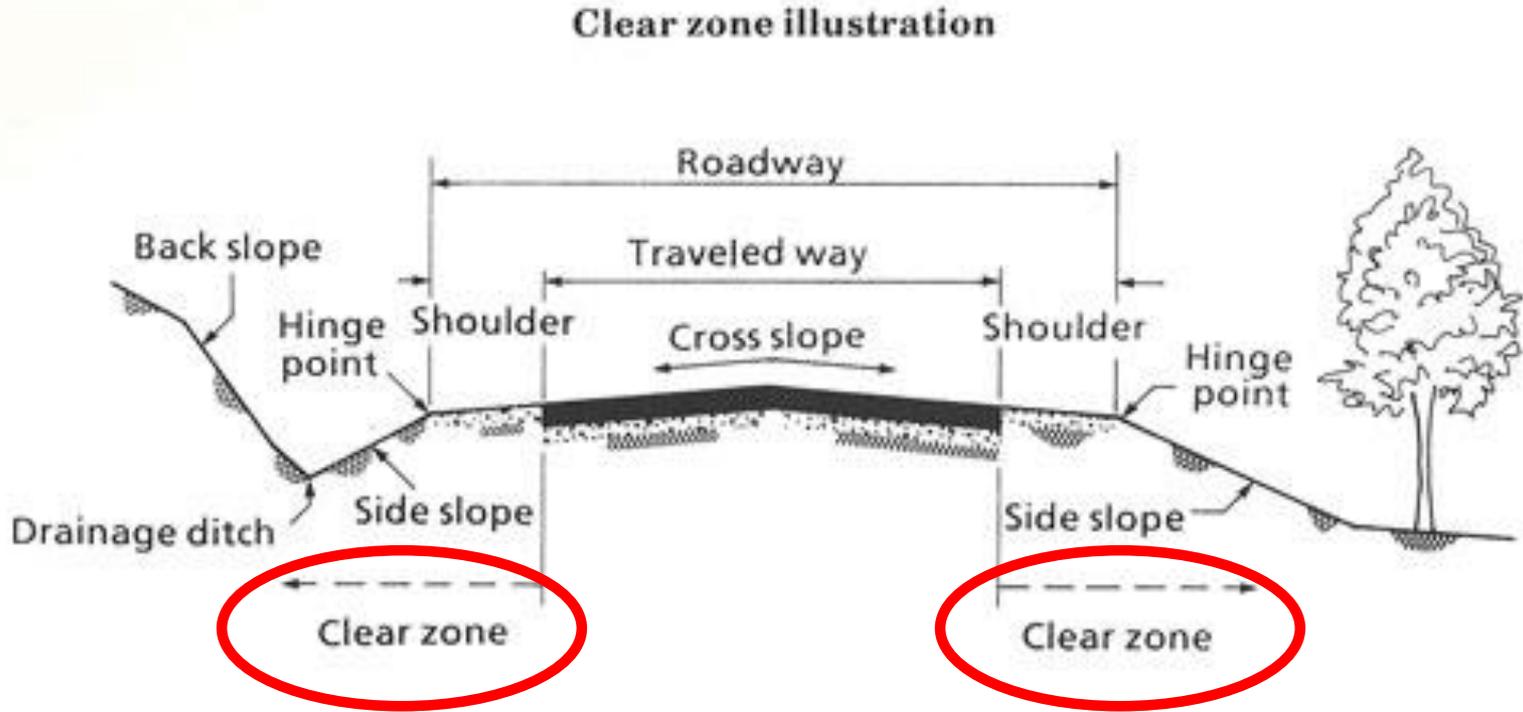


Figure 3-1. Roadway Geometry Features

Area Available For Safe Use By Errant Vehicle





Hinge Point

Point where the slope rate changes.

Clear Zone

That area along the side of the traveled way including the shoulder that is available for recovery of an errant vehicle.

Recoverable



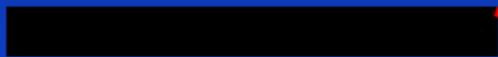
(Traversable)



Non-Recoverable



Critical



(Not Traversable)



How to Mitigate Obstacles

- Remove or Redesign
- Relocate
- Make Breakaway
- Shield
- Delineate

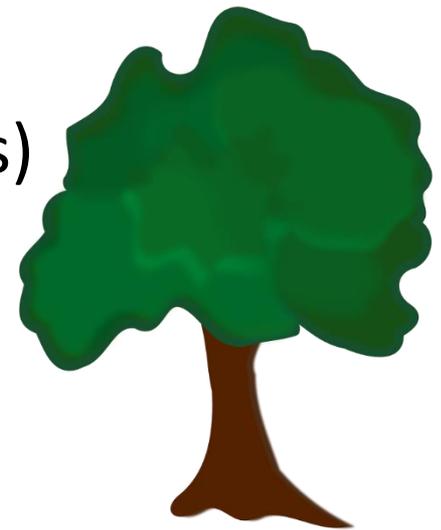
Horizontal Clear Zone

- Recovery area for errant vehicles
- Minimum Width in Tables apply to New and Reconstructed work
- Width starts at edge of Traveled Way (or auxiliary lane that functions as a thru travel lane)
 - See Tables - New and Reconstructed Work

“Existing” in the Tables

Horizontal Clear Zone 3R Value: Existing

- Means **Existing Design Feature**
- Not the same as whatever is out there, and not a free pass
- Legal Immunity?
 - Likely: Features on previous plan(s)
 - Not Likely: Maintenance work
- Consider risks



Horizontal Clear Zone Width

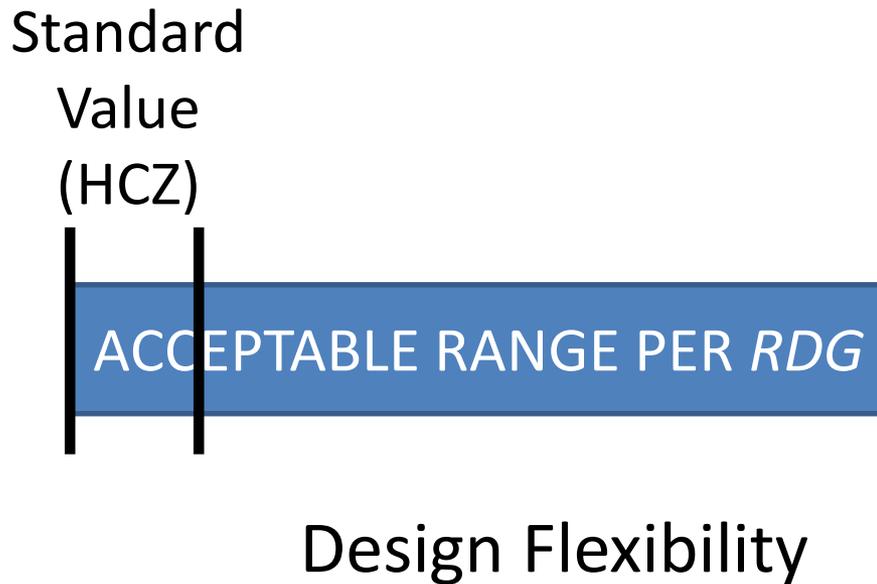
Is a function of

- Design speed
 - Slower speeds → less width
- Traffic volume
 - lower ADTs → less width
- Steepness of foreslope
 - flatter slopes → less width



Minimum Design Standards are

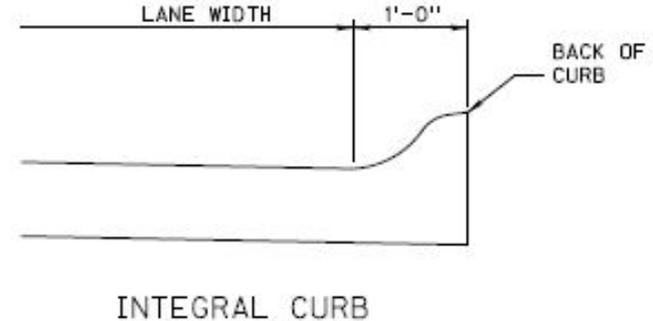
Lowest limit to build a facility without
requesting a relaxation of standards



Horizontal Clear Zone Width Urban Area N&R Standards

- Curbed Sections

- 2 ft. from BOC
- or **6 ft. from EOTW**,
- whichever is greater from EOTW

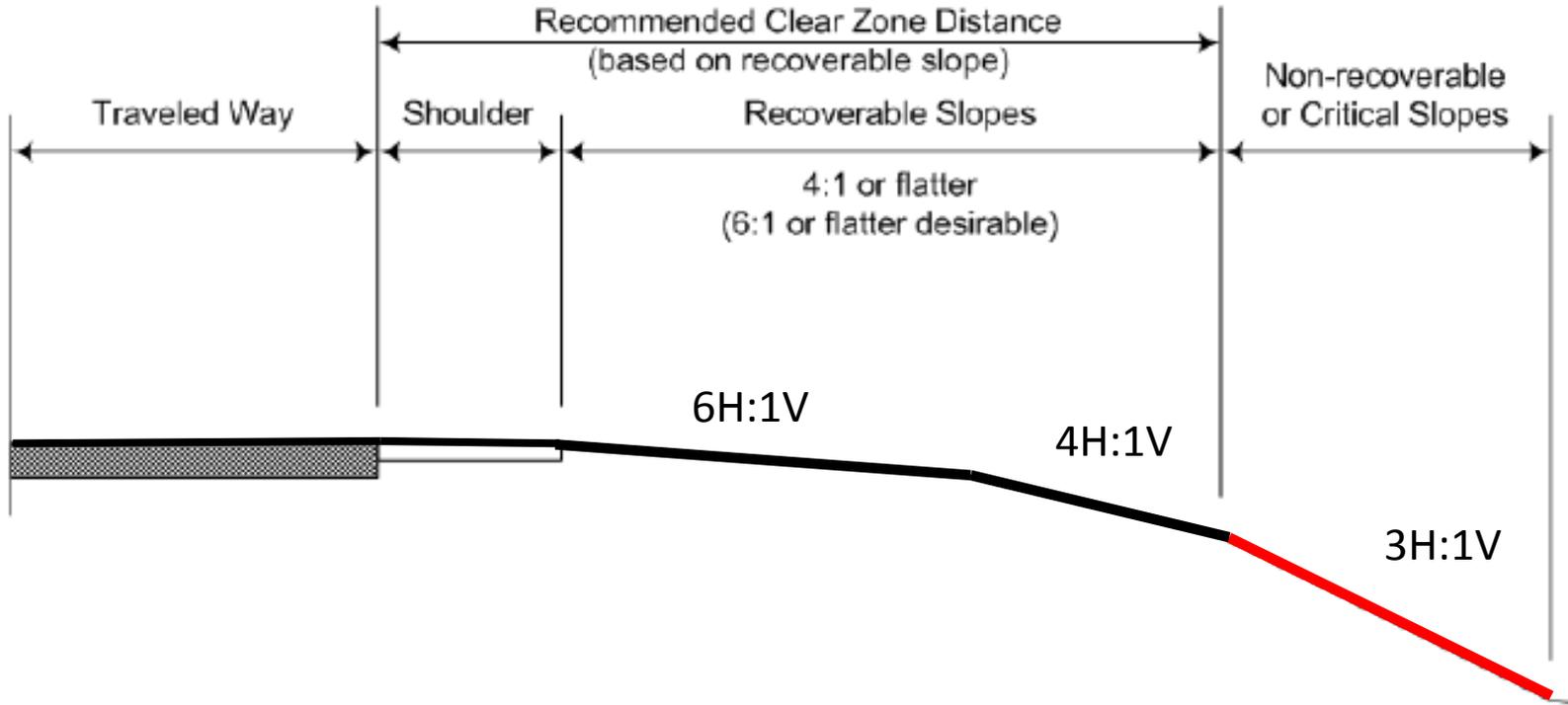


- Non-curbed Sections

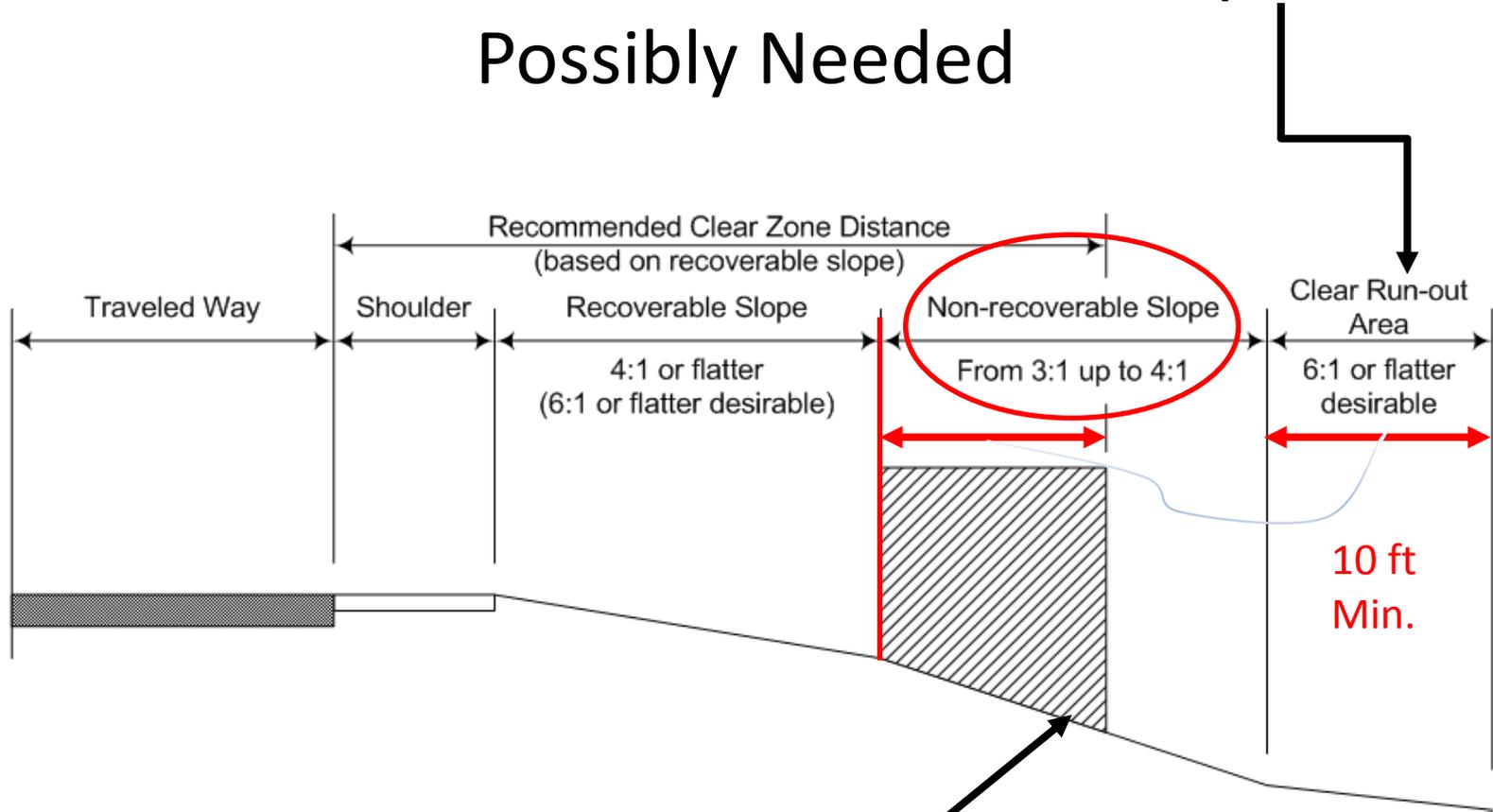
- 8 ft. for
 - all Minor Arterials
 - MajColl, MinColl, Local: ADT \geq 400 VPD
- Nominal Shoulder Width
 - MajColl, MinColl, Local: ADT $<$ 400 VPD



Example Horizontal Clear Zone – Non-curbed Section

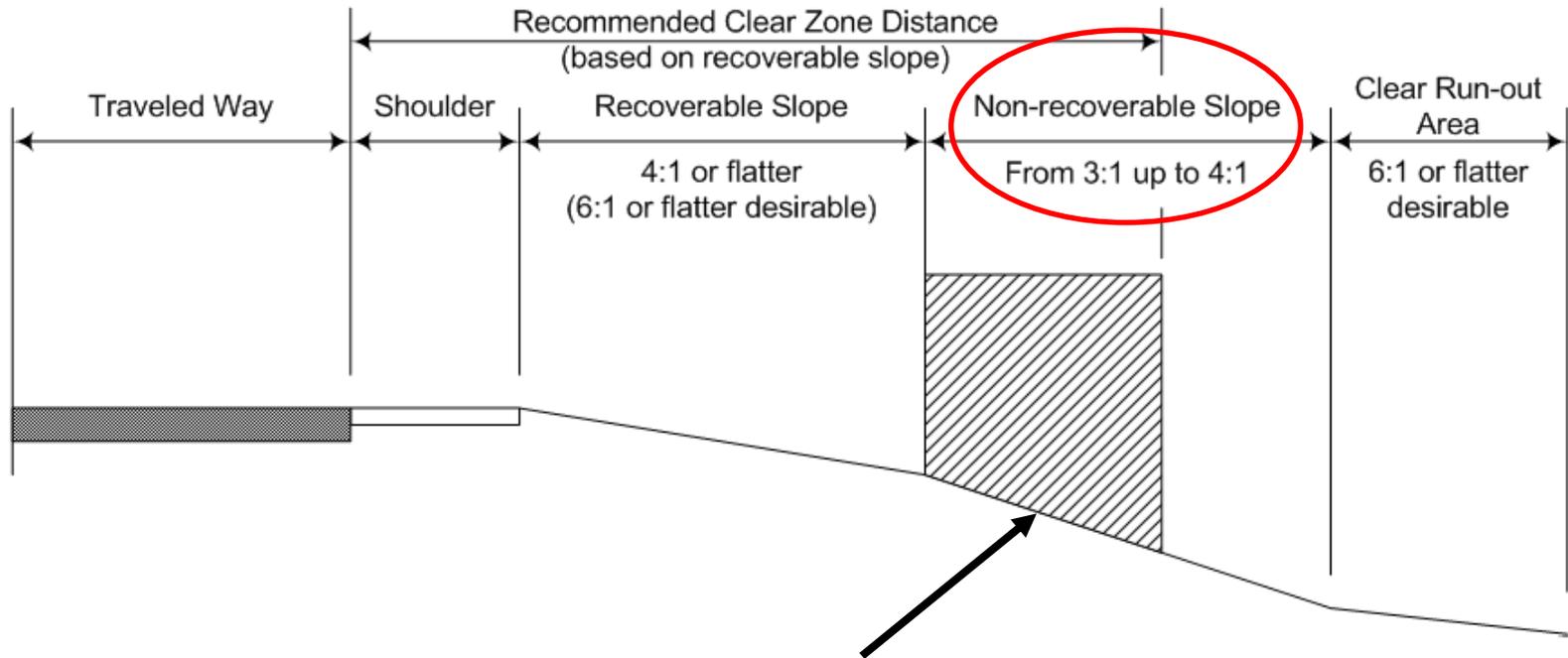


Non-curbed Section Clear Runout Area at Toe of Slope Possibly Needed



Non-recoverable foreslope
3H:1V up to 4H:1V
Within Horizontal Clear Zone

Critical Slopes Not Appropriate for HCZ Curbed and Non-curbed Sections



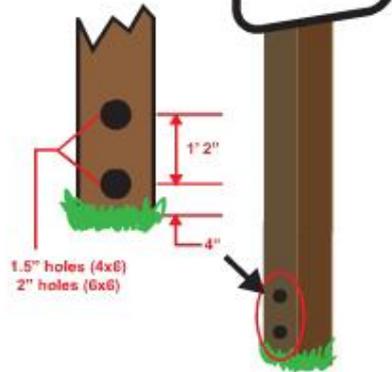
Critical Slopes (steeper than 3H:1V) not allowed within HCZ

No steep V-ditches

Horizontal Clear Zone (HCZ)



- ✓ Crashworthy
- ✓ Breakaway obstacles
- x Non-shielded obstacles



HCZ – List of Exceptions (22)

Traffic signal poles roadway lighting
railroad signals and tracks
ditches driveways intersections
bike/pedestrian paths earth dikes
curbs raised islands guardrails
median barriers crash cushions
drainage inlets drainage flumes
culverts bridge rails bridges
erosion control devices fire hydrants
traffic control devices

HCZ – List of Exceptions Additional – Urban Areas (5)

trash cans

parking meters/facilities

handrails

concrete barrier

barrier curb

HCZ – Engineering Study

- Roadside Safety Analysis Program (RSAP) or
- A comparable AASHTO approved economic analysis

Request Relaxation of Standards

Only if . . .

- Obstacle in HCZ is not covered in the list of exceptions and
 - Examples: utility pole, tree, culvert FES > 3 ft, critical slope
- Benefit/Cost Ratio > 1.0 and
 - From Engineering Study
- Removing or treating obstacle would be a special hardship

Beyond HCZ – List of Exceptions

The 27 Exceptions within the HCZ
plus (9) more

trash receptacles

drainage facilities

wetlands

bodies of water

critical and non-recoverable slopes

trees

vegetation

mailboxes

utility facilities



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American Association of State Highway
and Transportation Officials

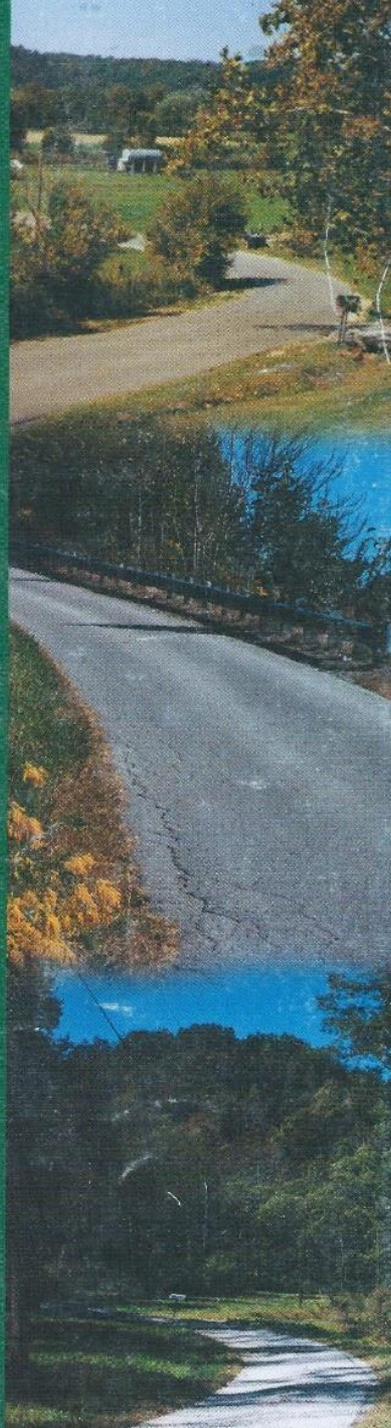
Chapter 12
Covers Low
Volume Roads



American Association of
State Highway and
Transportation Officials

**Guidelines for
Geometric
Design of Very
Low-Volume
Local Roads
(ADT \leq 400)**

2001



6 feet
desirable

Chapter 4
Page 48



#12 ADA, and a
little on Bicycles



FEDERAL HIGHWAY ADMINISTRATION'S
TECHNICAL ASSISTANCE
ON THE
AMERICANS WITH DISABILITIES ACT
REQUIREMENTS TO PROVIDE CURB RAMPS
THROUGH RESURFACING

August 20 & 21, 2013

Slide 304

PRESENTERS:

Candace Groudine, Director-External Civil Rights, FHWA

James Esselman, Special Counsel, FHWA

Robert Mooney, Pre-Construction Team Leader, FHWA

<http://connectdot.connectsolutions.com/p7r08bvr75l/>

PRESENTERS

Chris Malmberg, PE
HDR Engineering, Inc.

ADA Guidelines:

Overview of
ADA / PROWAG
Criteria and
Intersection Design

Proposed Accessibility Guidelines
for Pedestrian Facilities
in the Public Right-of-Way

July 26, 2011

UNITED STATES ACCESS BOARD
A FEDERAL AGENCY COMMITTED TO ACCESSIBLE DESIGN

PROWAG



- ***Public Right of Way***
- ***Accessibility Guidelines by the US Department of Justice***



ADA/Section 504 Program



NDOR's Presentation

Providing Access for Individuals with Disabilities



FHWA's Americans with Disabilities Act (ADA) Program / Section 504 of the Rehabilitation Act of 1973

Primary purpose:

**ensure that pedestrians with disabilities
have the opportunity to use the
transportation system in an accessible
and safe manner.**



The Need for Accessible Programs and Facilities



- 11.9% (34 million) of the US Population has a disability (2010 census)
- 10 million Americans have serious hearing disabilities
- 6 million have visual impairments

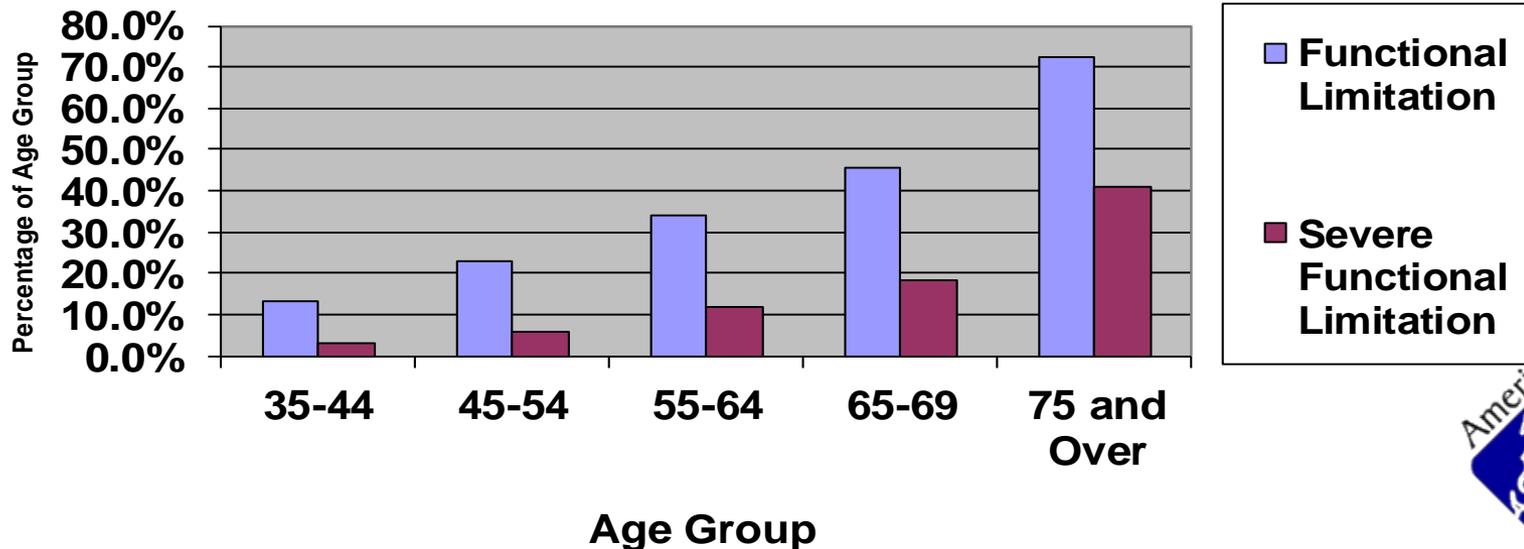


The Need for Accessible Programs and Facilities



- 70 percent of us will eventually have a temporary or permanent disability that makes climbing stairs impossible

Age Progression of Physical Limitation - US Population



Americans with Disabilities Act (ADA) of 1990

- **A civil rights statute**
- **Prohibits discrimination** against people with disabilities in all aspects of life, including transportation.
- **USDOJ** has designated USDOT as the federal agency responsible for overseeing and implementing ADA compliance
- **FHWA's Responsibility:** The implementation of ADA pedestrian access requirements.

http://www.fhwa.dot.gov/civilrights/memos/ada_memo_clarificationa.htm



Title II of the ADA

Applies to:

- Facilities built after 1990;
- Pre-existing facilities;
- All public entities, such as State and local governments, **even if they are not recipients of federal funding.**



Why must curb ramps be provided?

- **To ensure a person with a mobility disability can travel** from a sidewalk on one side of the street, over or through any curbs or traffic islands, to the sidewalk on the other side of the street.

Where must curb ramps be provided?

- Wherever a sidewalk or other pedestrian walkway crosses a curb

[https://www.fhwa.dot.gov/civilrights/
programs/doj_fhwa_ta.cfm](https://www.fhwa.dot.gov/civilrights/programs/doj_fhwa_ta.cfm)



When must curb ramps be provided?

- whenever streets, roadways, or highways are **altered**, curb ramps must be provided at street level pedestrian walkways that cross curbs
- Applies to facilities altered after January 26, 1992
- Temporary Structures/Construction Zones must also be accessible

https://www.fhwa.dot.gov/civilrights/programs/doj_fhwa_ta.cfm

DOJ Regulation (28 CFR 35.151(i))



What is an alteration?

- a change that affects or could affect the usability of all or part of a building or facility.

https://www.fhwa.dot.gov/civilrights/programs/doj_fhwa_ta.cfm

DOJ Regulation (28 CFR 35.151(b))



Alterations vs. Maintenance

- What specific treatments are included in Alterations?
- Potholes? Microsurfacing?
- 1.5" resurfacing?
- Past confusion, inconsistency, questions CLARIFIED 6/28/2013



Pavement Treatment Types (Maintenance vs. Alteration)

Slide 317

MAINTENANCE

Chip Seals

Crack Filling and Sealing

Diamond Grinding

Dowel Bar Retrofit

Fog Seals

Joint Crack Seals

Joint repairs

Pavement Patching

Scrub Sealing

Slurry Seals

Spot High-Friction Treatments

Surface Sealing

ALTERATION

Addition of New Layer of Asphalt

Cape Seals

Hot In-Place Recycling

Microsurfacing / Thin-Lift Overlay

Mill & Fill / Mill & Overlay

New Construction

Open-graded Surface Course

Rehabilitation and Reconstruction

https://www.fhwa.dot.gov/civilrights/programs/doj_fhwa_ta.cfm

Pavement Treatment Types (Maintenance vs. Alteration)

MAINTENANCE

plus

Chip Seals

Crack Filling and Sealing
Diamond Grinding
Dowel Bar Retrofit

Fog Seals

Joint Crack Seals
Joint repairs
Pavement Patching

Scrub Sealing

Slurry Seals
Spot High-Friction Treatments
Surface Sealing

ALTERATION

Addition of New Layer of Asphalt

Cape Seals

Hot In-Place Recycling
Microsurfacing / Thin-Lift Overlay

Mill & Fill / Mill & Overlay

New Construction

Open-graded Surface Course

Rehabilitation and Reconstruction

Where are curb ramps not required?

- If there is no walkway with a prepared surface* for pedestrian use
- If there is no curb, elevation or other barrier between the street and the walkway

* **Prepared Surface:** concrete, asphalt, etc. the material doesn't matter as long as it is designed to be a pedestrian access route.

<https://connectdot.connectsolutions.com/p7r08bvr751/?launcher=false&fcsContent=true&pbMode=normal>



Accessibility Guidelines



- Americans with Disabilities Act Accessibility Guidelines (ADAAG)
 - Two versions: USDOJ version and USDOT version
 - Both must be followed and have the force of law



Documentation Requirements



- ADA Policy and Assurances – on file with NDOR if receiving federal funds through NDOR
 - Many were submitted in 2013
- ADA Self-Evaluation and ADA Transition Plan
 - If any physical or structural changes for ADA compliance are planned
 - Even if not receiving federal funds
 - Should have been done shortly after 1992
 - Have them on file; do not need to submit to NDOR unless requested
 - Federal or State can ask to see documents at any time

PROWAG

- ***Public Right of Way***
- ***Accessibility Guidelines by the US Department of Justice***
- ***Addresses gaps in ADAAG***



PROWAG - Update

- Not legally required (as of January, 2016)
- Recognized as best practice by FHWA
- Many entities use it for the basis of their accessible standards and policies.
- Schedule: publish final rule in mid-late 2016
- Then must be adopted by DOT and DOJ as an official standard to be enforceable under the ADA.



PROWAG - Update

Link to the most current version of proposed PROWAG guidelines:

<http://www.access-board.gov/guidelines-and-standards/streets-sidewalks/shared-use-paths/supplemental-notice>



New Project
(not yet advertised)

Maintenance

Proceed w/ Work

Alteration

Existing Sidewalks /
Prepared Surfaces w/ Barriers

No

Proceed w/Work

Yes

Meets 1991 or 2010 Standards

Yes*

Proceed w/Work

No

Install/Update
Curb Ramps



Example of Implementation

Current Fiscal Year Plan

Project A = Slurry Seal

Project B = Mill & Fill

Project C = Microsurfacing

Project D = Reconstruction

Updated Fiscal Year Plan

Project A = Slurry Seal

Project B = Mill & Fill

Project B1 = Install **Curb Ramp**

Project C = Microsurfacing
(project does not have sidewalks)

Project D = Reconstruction
(including **curb ramp work**)

Maintenance,
no curb ramps

No curb ramps



ADA and PROWAG



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<http://www.ada.gov/>

<http://www.access-board.gov/>



Examples:

- Barden vs. City of Sacramento, CA 2004
- Set a nationwide precedent requiring cities and other public entities to make all public sidewalks accessible
- Settlement provides that for up to 30 years, 20% of its annual Transportation Fund to make the City's Pedestrian Rights of Way accessible to individuals with vision and/or mobility disabilities



Examples:

- 2007 City of Chicago, IL
- Pay Largest ADA Curb Ramp Settlement Ever - \$50,000,000 in New Money (\$10,000,000 for 5 years)
 - *repair and replace curb ramps and sidewalks in high traffic areas which are not on the City's schedule for repair or replacement*
- Continue to spend approximately eighteen million dollars (\$18,000,000) each year installing curb ramps and sidewalks as a part of the City's annual resurfacing work



Examples:

- 2011 City of Lincoln, NE
- 294 recently constructed ramps to be redone
- Not meeting criteria
- City 20% of reconstruction costs \$168,000



Bicycles

Federal Highway Administration
**SEPARATED BIKE LANE
PLANNING AND DESIGN GUIDE**



U.S. Department of Transportation
Federal Highway Administration

MAY 2015



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Bicycles

Link to FHWA's website for bicycles and the MUTCD:

http://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/mutcd/index.cfm



Bicycles



NACTO



Urban Bikeway Design Guide

April 2011 Edition

National
Association of
City
Transportation
Officials

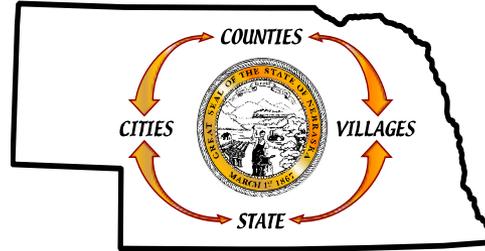


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428 NAC 2 Changes

NDOR

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Boards - Liaison Services Section



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