### CHAPTER ONE ROADWAY DESIGN STANDARDS

Exhibit 1.1	Rural Highway Functional Classifications	1-5
Exhibit 1.2	Municipal Highway Functional Classifications	
Exhibit 1.3	Lateral Offset to Obstruction - New and Reconstructed Projects	1-24
Exhibit 1.4	Lateral Offset to Obstruction – Resurfacing, Restoration and	
	Rehabilitation (3R) projects	1-25
Exhibit 1.5	Example NDOT Form 76	1-30
Exhibit 1.6	Example Design Exception Request Letter	
Exhibit 1.7	Example Design Decision Documentation Sheet	

### CHAPTER TWO ROADWAY DESIGN PROCESS

Exhibit 2.1	Initial Project Scoping Data Sheet	2-3
Exhibit 2.2	Plan and Agreement Requirements for Public Meetings	
Exhibit 2.3	Public Hearing Notice Worksheet	
Exhibit 2.4	Resolution and Petition Form	

### CHAPTER THREE ROADWAY ALIGNMENT

Exhibit 3.1	Elements of a Simple Curve	3-4
Exhibit 3.2	Superelevation Rates	3-5
Exhibit 3.3	Superelevation Data for Crowned Highways	3-8
Exhibit 3.4	Superelevation Data for Dual Highways (Crowned Surface)	3-12
Exhibit 3.5	Superelevation Data for Dual Highways (Tangent Surface)	3-15
Exhibit 3.6	Superelevation for Dual Highways w/Raised Median	3-18
Exhibit 3.7	Standards for Climbing Lanes	3-23
Exhibit 3.8	Elements and Formulas for Symmetrical Parabolic Vertical Curves	3-25
Exhibit 3.9	Design Controls for Crest Vertical Curves	
Exhibit 3.10	Eye and Object Heights used to Determine Desirable K Values	3-29
Exhibit 3.11	Crest Vertical Curve Design Elements	3-33
Exhibit 3.12	Passing Sight Distance Design Considerations	3-33
Exhibit 3.13	Sag Vertical Curve Design Elements	
Exhibit 3.14	Design Controls for Sag Vertical Curves	3-36
Exhibit 3.15	Roller Coaster Profile	3-39

# CHAPTER FOUR INTERSECTIONS, DRIVEWAYS AND CHANNELIZATION

Exhibit 4.1	Typical Elements of a Roundabout Intersection	4-3
Exhibit 4.2	Roundabout Intersection - Typical Truck Apron Curb Arrangement	4-5
Exhibit 4.3	Typical Reduced Conflict Intersection	4-6
Exhibit 4.4	Intersection Sight Distances for a RCI	.4-10
Exhibit 4.5	RCI Example Island Details	.4-12
Exhibit 4.6	RCI Example Loon Details	.4-13
Exhibit 4.7	Design Guidance for the Intersection of Two Rural Two-Lane State Highways	.4-15
Exhibit 4.8	Flow Chart for Roadway Widths of Frontage Roads and Access Roads	
Exhibit 4.9	Typical Frontage Road Connection off of a Main Roadway	
Exhibit 4.10	Typical Frontage Road Connection off of a Crossroad	.4-19
Exhibit 4.11	Skew Angle Definition	
Exhibit 4.12	Intersection Realignment Design	.4-21
Exhibit 4.13	Guidelines for the Selection of Intersection/Driveway Design Vehicles	
Exhibit 4.14	Typical Auxiliary Lanes	
Exhibit 4.15	18 Foot Median, Left-Turn Lane	
Exhibit 4.16	Tapered Offset Right-Turn Lane	
Exhibit 4.17	Rural Driveway Width Criteria	
Exhibit 4.18	Rural Driveway Without a Special Ditch	
Exhibit 4.19	Rural Driveway With a Special Ditch	
Exhibit 4.20	Minimum Rural Driveway Culvert Pipe Lengths	
Exhibit 4.21	Urban Driveway Width Criteria	
Exhibit 4.22	Urban Driveway	
Exhibit 4.23	Limits of Surfacing at Co. Road Intersections	
	and Other Public Roads	.4-44
Exhibit 4.24	Surfacing Criteria for Rural Driveways	.4-45
Exhibit 4.25	Example of Rural Three-Leg Intersection with Minor Roadway Without Surfaced Shoulder	
Exhibit 4.26	Example of Rural Three-Leg Intersection with Minor Roadway With Surfaced Shoulder	
Exhibit 4.27	Median Types	
Exhibit 4.28	Desirable Lane Change and Deceleration Distances	
Exhibit 4.29	Typical Median Breaks (18 Ft. Raised Medians)	
Exhibit 4.30	Typical Type A Median Break (28 Ft. Raised Median)	
Exhibit 4.31	Typical Types B and C Median Breaks (28 Ft. Raised Medians)	
Exhibit 4.32	Typical Type A Median Break (40 Ft. Depressed Median)	
Exhibit 4.33	Typical Type B Median Break (40 Ft. Depressed Median)	
Exhibit 4.34	Typical Types C and D Median Breaks (40 Ft. Depressed Median)	
Exhibit 4.35	Typical Type A Median Break (50 Ft. Depressed Median)	
Exhibit 4.36	Typical Type B Median Break (50 Ft. Depressed Median)	
Exhibit 4.37	Typical Type C-1 Median Break (50 Ft. Depressed Median)	
Exhibit 4.38	Typical Type C-2 Median Break (50 Ft. Depressed Median)	
Exhibit 4.39	Typical Type D Median Break (50 Ft. Depressed Median)	
Exhibit 4.40	Typical Type A Median Break (54 Ft. Depressed Median)	
Exhibit 4.41	Typical Type B Median Break (54 Ft. Depressed Median)	.4-67

Exhibit 4.42	Typical Type C-1 Median Break (54 Ft. Depressed Median)	4-68
Exhibit 4.43	Typical Type C-2 Median Break (54 Ft. Depressed Median)	4-69
Exhibit 4.44	Typical Type D Median Break (54 Ft. Depressed Median)	4-70

# CHAPTER FIVE INTERSTATES, GRADE SEPARATIONS, AND INTERCHANGES

Exhibit 5.1	Typical Section – Rural Four-Lane Divided Interstate	
	with Depressed Median (Crowned Roadway)	5-4
Exhibit 5.2	Typical Section – Rural Four-Lane Divided Interstate	
	with Depressed Median (Tangent Roadway)	5-5
Exhibit 5.3	Typical Section – Rural Six-Lane Divided Interstate	
	with Depressed Median (Crowned Roadway)	5-6
Exhibit 5.4	Typical Side Slopes for New and Reconstructed Interstates	
	and Interchange Ramps	5-7
Exhibit 5.5	Control of Access Along Intercepting Public Roads and Highways	
	Interstate, Freeway and Expressway (Access only at Interchanges)	5-10
Exhibit 5.6	Common Interchange Configurations	5-16
Exhibit 5.7	Single Point Urban Interchange (SPUI)	5-18
Exhibit 5.8	Diverging Diamond Interchange (DDI)	5-18
Exhibit 5.9	Typical Section of an Interchange Ramp – One Lane	5-22
Exhibit 5.10	Typical Section of an Interchange Ramp –Two Lane	5-23
Exhibit 5.11	Components of a Spiral Curve, Spiral In, Spiral Out of Equal Length	5-24
Exhibit 5.12	Spiral Curve Information, Spiral In, Spiral Out of Equal Length	5-25
Exhibit 5.13	Stationing for Ramps and Loops	5-26

### CHAPTER SIX THE TYPICAL ROADWAY CROSS-SECTION

Exhibit 6.1	Typical Section - Rural Four-Lane Divided Expressway with 54 ft.	
	Depressed Median (Crowned Roadway)	6-6
Exhibit 6.2	Typical Section - Rural Four-Lane Divided Expressway with 54 ft.	
	Depressed Median (Tangent Roadway)	6-7
Exhibit 6.3	Typical Section - Rural Major Arterial 4,000 ADT and Over	6-8
Exhibit 6.4	Typical Section - Rural Major Arterial 1,000 to 3,999 ADT	6-9
Exhibit 6.5	Typical Section - Rural Major Arterial 400 to 999 ADT	6-10
Exhibit 6.6	Typical Section - Rural Major Arterial Under 400 ADT	6-11
Exhibit 6.7	Typical Half-Section of a Tangent Multi-Lane Divided Highway	
	with Future Lanes in the Depressed Median	6-12
Exhibit 6.8	Typical Half-Sections of Two-Lane Low-Speed Municipal Highways	6-13
Exhibit 6.9	Typical Half-Sections of Three-Lane and Five-Lane Undivided	
	Low-Speed Municipal Highways with Two-Way Left Turn Lanes	6-14
Exhibit 6.10	Typical Half-Section of a Four-Lane Divided Low-Speed Municipal	
	Highway with a Twenty Feet Raised Median	6-15
Exhibit 6.11	Teardrop Island on Side Road - Allowable Curb Types	6-18
Exhibit 6.12	Typical Curb Details	6-20
Exhibit 6.13	Erosion Control Curb Location	6-21
Exhibit 6.14	Examples of Rural to Urban Roadway Transitions	6-23
Exhibit 6.15	Clear Zone Application for Auxiliary Lanes Adjacent to Mainline	6-26
Exhibit 6.16	Typical Side Slopes for New and Reconstructed Projects	6-28
Exhibit 6.17	Daylighting	6-33

### CHAPTER SEVEN EARTHWORK

Exhibit 7.1	Earthwork Computation Formula	7-2
Exhibit 7.2	Existing Pavement Removal in Earthwork	7-4
Exhibit 7.3	Map for Estimating Water Needed for Compaction	7-6
Exhibit 7.4	Earthwork at a Bridge Replaced with a Box Culvert	
Exhibit 7.5	Additional Cross-Sections at a Mailbox Turnout	
Exhibit 7.6	Additional Cross-Sections at an Intersection or Commercial Driveway	7-12
Exhibit 7.7	Shear Lines	7-13
Exhibit 7.8	Example Grading Pay Items	7-18
Exhibit 7.9	Additional Requirements for Earthwork Calculations	
Exhibit 7.10	Earthwork Quantities - Case 1	7-19
Exhibit 7.11	Earthwork Quantities - Case 2	7-20
Exhibit 7.12	Earthwork Quantities - Case 3	7-23
Exhibit 7.13	Earthwork Quantities - Case 4	7-23
Exhibit 7.14	Earthwork Quantities - Case 5A	7-24
Exhibit 7.15		7-26
Exhibit 7.16	Earthwork Checklist	7-28

## CHAPTER EIGHT SURFACING

Exhibit 8.1	Typical Shoulder Construction8	-7
-------------	--------------------------------	----

### CHAPTER NINE GUARDRAIL AND ROADSIDE BARRIERS

Exhibit 9.1	Barrier Considerations for Roadside Conditions	9-3
Exhibit 9.2	Nebraska Barrier Summary	
Exhibit 9.3	Runout Length Values	9-7
Exhibit 9.4	Determine the Runout Length & Lateral Extent of Obstacle	9-8
Exhibit 9.5	Plot the Runout Path	
Exhibit 9.6	Graphically Locate the Guardrail Components on the Plan	9-15
Exhibit 9.7	Example W-Beam or Thrie-Beam Guardrail Design:	
	2-Lane, 2-Way Curved Roadway: R > 2950'	9-18
Exhibit 9.8	Example W-Beam or Thrie Beam Guardrail Design:	
	2-Lane, 2-Way Curved Roadway: R ≤ 2950'	9-19
Exhibit 9.9	Example Low-Tension Cable Guardrail Design:	
	2-Lane, 2-Way Tangent Roadway	9-20
Exhibit 9.10	Example Guardrail Design at a Bridge:	
	2-Lane, 2-Way Tangent Roadway	9-22
Exhibit 9.11	Example Guardrail Design at a Bridge:	
	2-Lane, 2-Way Curved Roadway; R > 2950'	9-23
Exhibit 9.12	Example Guardrail Design at a Bridge:	
	2-Lane, 2-Way Curved Roadway; R ≤ 2950'	9-24
Exhibit 9.13	Cable Barrier B/C Ratios	
Exhibit 9.14	Guidelines for Median Barriers	
Exhibit 9.15	Example Guardrail Design - 4 Lane Divided Highway:	
	54 Feet and Wider Median Width	9-28
Exhibit 9.16	Example Guardrail Design - 4 Lane Divided Highway:	
	40 Feet Median Width	9-29
Exhibit 9.17	Example Pier Protection Guardrail Design - 4 Lane Divided Highway:	
	40 Feet and Wider Median Width	9-30
Exhibit 9.18	Example Bullnose Installation for Median Bridge Pier Protection	9-31
Exhibit 9.19	Example Bullnose Bridge Connection in a 40 Feet Wide Median:	
	Tapered Bullnose, Bridges not Connected	9-32
Exhibit 9.20	Example Bullnose Bridge Connection in a 40 Feet Wide Median:	
	Parallel Bullnose, Bridges not Connected	9-33
Exhibit 9.21	Example Bullnose Bridge Connection in a 40 Feet Wide Median:	
	Tapered Bullnose, Bridges Connected	9-34
Exhibit 9.22	Example Bullnose Bridge Connection in a 40 Feet Wide Median:	
	Right-Hand-Back Skew, Tapered Bullnose, Bridges Connected	9-35
Exhibit 9.23	Example Bullnose Bridge Connection in a 40 Feet Wide Median:	
	Left-Hand-Back Skew, Tapered Bullnose, Bridges Connected	9-36
Exhibit 9.24	Details for 31 inch MGS Near Slopes	
Exhibit 9.25	Guardrail Installed Behind a Six-Inch Curb on a Low-Speed	
	(≤ 45 mph) Roadway	9-39
Exhibit 9.26	Dropping the Curb in Advance of the Guardrail	9-40
Exhibit 9.27	Impact Attenuator Installation at a Bridge Adjacent to an Intersection	
	or Driveway (Protection of Bridge Railing Only)	9-42
Exhibit 9.28	Typical Impact Attenuator Installations	
_		_

### CHAPTER TEN MISCELLANEOUS DESIGN ISSUES

Exhibit 10.1	Railroad/Highway Grade Crossing	10-4
Exhibit 10.2	Railroad/Highway Grade Crossing	10-5
Exhibit 10.3	Skew Angle Definition	10-7
Exhibit 10.4	Minimum Vertical Clearances for Structures	
Exhibit 10.5	Vertical Stream Clearances for Crest Profile	10-10
Exhibit 10.6	Vertical Stream Clearances for Sag or Level Profile	10-11
Exhibit 10.7	Four Mile Airport Envelope	10-15
Exhibit 10.8	Runway Protected Area	10-16
Exhibit 10.9	Runway Slope Protection	
Exhibit 10.10	Parking Stall Dimensions for Curb and Street Parking	
Exhibit 10.11	Parking Stall Dimensions for Parking Lots and Garages	

### CHAPTER ELEVEN HIGHWAY PLANS ASSEMBLY

Exhibit 11.1	Plan Sheet Organization	11-12
Exhibit 11.2	Distribution/Notification of Plans Availability	11-13
Exhibit 11.3	Typical Cross Section (B) Sheet	11-19
Exhibit 11.4	Surfacing Elevations	11-23
Exhibit 11.5	Roadway Cross-Section Break Lines	11-29
	Example Revision Letter	
Exhibit 11.7	Deleted Sheet	11-37
Exhibit 11.8	Revised Index Sheet	11-38
Exhibit 11.9	Revised Title Sheet	11-39
	Revised Summary Sheet	
	Revised Detail Sheet	

### CHAPTER TWELVE COST ESTIMATING & FUNDING

Exhibit 12.1	Cost Estimate Submittals	12-8
Exhibit 12.2	Preliminary Cost Estimate Values/Cost Factors	12-11
Exhibit 12.3	Quantity Calculation Guidance Locations	12-18
Exhibit 12.4	Dimensions to Use in Calculating Area of Bridge Structures	12-21
Exhibit 12.5	Estimate Items Often Overlooked or Omitted	12-24
Exhibit 12.6	Pay Item Accuracy	12-28
Exhibit 12.7	Rounding of Surfacing Item Quantities	
Exhibit 12.8	Cost Estimate Item Checklist	
Exhibit 12.9	Pavement Item Checklist	12-33
Exhibit 12.10	Quantity Computations for Gravel and Crushed Rock	12-34
Exhibit 12.11	Estimating Quantities	12-35
Exhibit 12.12	Performance Graded Binder Table	
Exhibit 12.13	Hydrated Lime/Warm Mix Asphalt	12-41
	Asphaltic Concrete Tonnage Table	

### CHAPTER THIRTEEN PLANNING AND PROJECT DEVELOPMENT

Exhibit 13.1	Project Coordination Meeting Timeline	13-5
Exhibit 13.2	Sample Environmental Summary Sheet	13-10
Exhibit 13.3	Pay Limits for Bridge Channel Work	13-16

### CHAPTER FOURTEEN TRAFFIC

Exhibit 14.1	Example Temporary Road1	4-11
Exhibit 14.2	Typical Temporary Road Section1	4-12

### CHAPTER FIFTEEN RIGHT-OF-WAY

Exhibit 15.1	Typical Access Control at Joint Driveways	15-8
Exhibit 15.2	•	
Exhibit 15.3	Desirable and Minimum Access Locations	
Exhibit 15.4	Control of Access Along Intercepting Public Roads and Highways	
	Interstate, Freeway and Expressway (Access only at Interchanges).	15-15
Exhibit 15.5	Control of Access Along Intercepting Public Roads and Highways	
	2-Lane Highway	15-16
Exhibit 15.6	Control of Access Along Intercepting Public Roads and Highways	
	Divided Highway	15-17
Exhibit 15.7	Control of Access Along Intercepting Public Roads and Highways	
	Skewed Intersection	15-18
Exhibit 15.8	Example Public Interest Letter	15-22

### CHAPTER SIXTEEN PEDESTRIAN AND BICYCLE FACILITIES

Exhibit 16.1	Sidewalk and Shared Use Path Minimum Widths	16-4
	Typical Sidewalk Section	
Exhibit 16.3	Fencing on Steep Slopes Adjacent to a Sidewalk	16-6
Exhibit 16.4	Curb Ramp Counter Slopes	16-10
Exhibit 16.5	Typical Section of a Pedestrian Ramp	<b>16-1</b> 1
	Typical Handrail Extension at a Pedestrian Ramp	

# CHAPTER SEVENTEEN RESURFACING, RESTORATION AND REHABILITATION (3R) PROJECTS

Exhibit 17.1	3R Standards for Expressway (Access Only at Interchanges)	17-9
	Optimal Lengths of Passing Lanes	
Exhibit 17.3	Average Passing Lane Spacing (mi) Needed to Meet Specific	
	LOS Targets on Two-Lane Highways in Level Terrain	17-15
Exhibit 17.4	Average Passing Lane Spacing (mi) Needed to Meet Specific	
	LOS Targets on Two-Lane Highways in Rolling Terrain	17-16
Exhibit 17.5	Build Up Strategy vs Build Out Strategy	
Exhibit 17.6	Comparative Barrier Consideration for Embankments	17-36