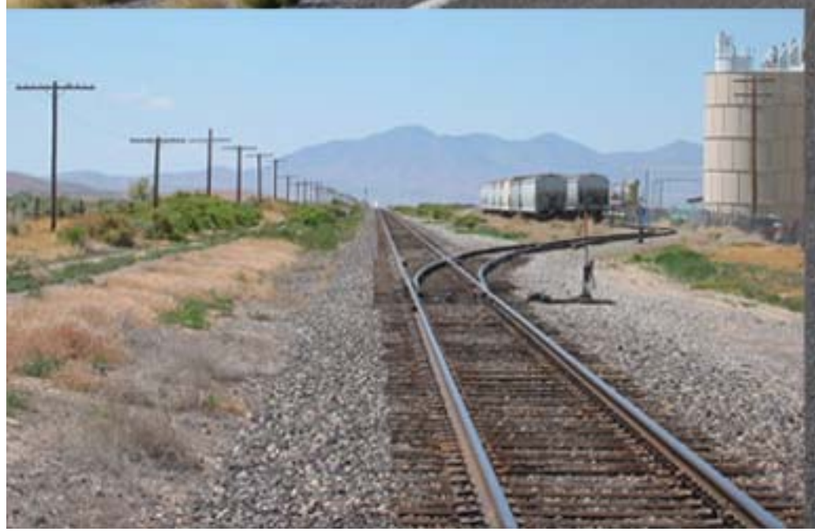
ROAD DESIGN GUIDE
2009 EDITION



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NEVADA DEPARTMENT OF TRANSPORTATION

ROAD DESIGN GUIDE 2009 EDITION

This guide has been prepared for the Nevada Department of Transportation's engineering personnel and other interested agencies, departments, and individuals.

The purpose of this guide is to establish design criteria and supplement the AASHTO Green Book in instances where it gives a large range or is open to varying interpretation. It is also intended to provide uniform guidelines for decisions that are not necessarily a part of geometric design to insure that a continuity level of design standards are used throughout the State.

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Section 3 Standards and Practices. This Section addresses common design details that may arise from the Standard Plans, Standard Specifications, field reviews, and construction activities. It is intended to establish standard design practices that are not necessarily a part of geometric design.

Section 4 Policy and Procedures. This Section addresses specific policy and procedures for items that are the responsibility of Roadway Design. This Section also defines submittal requirements, project types and scope, and reports that are commonly encountered on capacity and 3R projects.

Section 5 Engineering Support, Divisional Resources and Other Agencies. This Section describes the type of services and design support provided by each division. It also describes the type of correspondence or information that may be exchanged between the Design Division and the other divisions

Section 6 Project Workflow. This Section describes the major steps for developing capacity and 3R projects. These steps are generally in the order in which they occur. The terminology follows the PSAMS dashboard in an effort to reduce confusion across inter-divisional departments within NDOT.

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SECTION 1 DESIGN CRITERIA

This Section establishes a range of design criteria for the eight categories of roadway. For simplicity, the eight levels of categories are combined into high speed and low speed facilities. Use criteria that are appropriate for specific roadway category, terrain, AADT, and land use. For more information that describes the roadway characteristics and other design standards, access control, and general design features, refer to the Access Management System and Standards 1999 Edition. Refer to the 2005 AASHTO Policy on Design Standards Interstate System for other specific design criteria for Interstate Systems. The criterion listed below is intended for new construction or capacity type improvements.

Roadway Category One, Freeways
Roadway Category Two, Expressways
Roadway Category Three, Regional Highways
Roadway Category Four, Rural Highways
Roadway Category Five, Principal Arterials

HIGH SPEED FACILITIES (50-MPH AND ABOVE)

Design Element	Desirable Criteria		Min Criteria		Criteria Basis		Comments
Design Vehicle	WB-65		WB-50		2001 GB pg 18		See design vehicle under Section 2 for further guidelines
Design speed (Mainline)(Rural)	80mph Freeway	75mph Arterials	50 mph Freeway	40mph Arterial	2001 GB pg 507 FRWY	2001 GB pg 448	Need to consider terrain, adjacent land use, and functional classification
Design speed (Mainline)(Urban)	70 mph Freeway	60 mph Arterials	50 mph Freeway	30mph Arterial	2001 GB pg 507 FRWY	2001 GB pg 425	Need to consider terrain, adjacent land use, and functional classification
Design speed (Ramp)	50 mph		35 mph		2001 GB pg 830 Exh 10-56		See Ramps under Section 2 for further guidelines
Lane width (Mainline)	12’		12’		2001 GB pg 508		See lane width under Section 3 for further guidelines
Lane width (Ramp)(Turn lanes)	12’ Ramp	14’ Turn lanes	11’ Ramp	12’ Turn lanes	2001 GB pg 842-843 Exh 10-67		For ramp radius less than 500’ consider wider travel lane width for off tracking
Shoulder width (Mainline) (Rt)	12’ Freeway/ Interstate	10’ All Others	8’ Freeway/ Interstate	4’ All Others	2001 GB pg 509		Widths shown include lateral offset for guardrail/barrier rail
Shoulder width (Mainline) (Lt)	8’ Freeway/ Interstate	6’ All Others	4’ Freeway/ Interstate	4’ All Others	2001 GB pg 509		1. Widths shown include lateral offset for guardrail/barrier rail 2. Number of lanes changes the shoulder widths (See Section 2 Shoulders)
Shoulder width (Ramp) (Rt)	8’ -10’		6’		2001 GB pg 842-843 Exh 10-67		Widths shown include lateral offset for guardrail/barrier rail
Shoulder width (Ramp) (Lt)	4’		2’		2001 GB pg 842-843 Exh 10-67		Widths shown include lateral offset for guardrail/barrier rail
Bridge width	---		Match approach roadway		2001 GB pg 765, 770		See design year (bridge projects) in Section 2 for other considerations
Horizontal Alignment							
Min radius (Mainline)	2675’ (^{e}max 8%, 80mph)**		760’ (^{e}max 8%, 50mph)**		2001 GB pg 159 Exh 3-22, pg 161 Exh 3-23		**Values shown are both considered minimum radius
Min radius (Ramps)	835’ (^{e}max 6%, 50mph)		310’ (^{e}max 6%, 35mph)		2001 GB pg 159 Exh 3-22		Loop ramps may use 25mph design speed, pg 201 Exh 3-43 and pg 829 “Loops”
Min length of curve (Mainline)	---		---		Varies		See Horizontal Alignments under Section 2
Min tangent between curves	---		---		Varies		See Horizontal Alignments under Section 2
Vertical Alignment							
Crest vertical curve “K” Value (Mainline)	384 (80mph)		84 (50mph)		2001 GB pg 273 Exh 3-75 & pg 274 Exh 3-76		See “K-Value” under Alignments in Section 2 for additional information
Crest vertical curve “K” Value (Ramp)	84 (50mph)		29 (35mph)		2001 GB pg 273 Exh 3-75 & pg 274 Exh 3-76		See “K-Value” under Alignments in Section 2 for additional information
Sag vertical curve “K” Value (Mainline)	231 (80mph)		96 (50mph)		2001 GB pg 278 Exh 3-78 & pg 280 Exh 3-79		Check against headlight sight distance
Sag vertical curve “K” Value (Ramp)	96 (50mph)		49 (35mph)		2001 GB pg 278 Exh 3-78 & pg 280 Exh 3-79		Check against headlight sight distance
Min length of vertical curve							
Interstates - NHS	800’ VC		3X Design speed		NDOT Policy		
Superelevation							
^{e}max (Method 5)	^{e}max 8%		^{e}max 6%				Cross slope of 6% should be considered max super in icy climates
Min. runoff length	Varies with no. of lanes and ^{e}max		---		2001 GB Eq 3-25, pg 171		
Min. tangent runout	Varies with no. of lanes and ^{e}max		---		2001 GB Eq 3-26, pg 173		
% of runoff on tangent	85% (Number of lanes changes %)		67% (Number of lanes changes %)		2001 GB pg 173-175		1. No runoff /run-out on bridge structures if all possible. 2. Consider extending runoff/run out thru bridge structure if Note 1 is unattainable

HIGH SPEED FACILITIES (50-MPH AND ABOVE) CONT.

Design Element	Desirable Criteria	Min Criteria	Criteria Basis	Comments
Grades				
Mountainous	5% max (Design speed of 70mph)	6% max (Design speed of 50mph)	2001 GB Exh 8-1, pg 510	Grades 1% steeper than values shown may be used for extreme cases in urban areas
Rolling	4% max (Design speed of 80mph)	5% max (Design speed of 50mph)	2001 GB Exh 8-1, pg 510	Grades 1% steeper than values shown may be used for extreme cases in urban areas
Level	3% max (Design speed of 80mph)	4% max (Design speed of 50mph)	2001 GB Exh 8-1, pg 510	Grades 1% steeper than values shown may be used for extreme cases in urban areas
Curb and gutter facilities	0.5% or greater slope	0.3%	NDOT Policy	
Sight Distance				
Stopping (Mainline)	910’ (80mph design speed)	425’ (50mph design speed)	2001 GB Exh 3-1, pg 112	Use adjustment factors for grades Exh 3-2 pg 115
Stopping (Ramps)	425’ (50mph design speed)	250’ (35mph design speed)	2001 GB Exh 3-1, pg 112	Use adjustment factors for grades Exh 3-2 pg 115
Stopping (Urban Arterials)	495’ (55mph design speed)	200’ (30mph design speed)	2001 GB Exh 3-1, pg 112	Use adjustment factors for grades Exh 3-2 pg 115
Passing Sight Distance	2480’ (70mph design speed)	1835’ (50mph design speed)	2001 GB Exh 3-7, pg 124	Adjustment factor for grades is not available, exercise judgment for adjusting distances
Intersection Sight Distance	--	--	2001 GB pg 654- 682	Sight distance based on case (see page 658)
Horizontal (Mainline)	--	--	pg 228 thru 232	
One Lane Ramp Design				
Acceleration Lanes				
Gap acceptance length	500’	300’	2001 GB Exh 10-69, pg 849	Use adjustment factor for grades greater than 2% Exh 10-71 for lengths
Acceleration length	---	820’	2001 GB Exh 10-70, 10-71, pg 851-852	Length based on 45mph ramp and 70mph Freeway. Adjust for grades >2%
Taper, (Desirable design)	70:1	50:1	2001 GB Exh 10-69, pg 849	
Taper, parallel design	---	300’	2001 GB Exh 10-69, pg 849	Use adjustment factor for grades greater than 2% Exh 10-71 for lengths
Deceleration Lanes				
Deceleration Length	---	390’	2001 GB Exh 10-73, pg 855	Length based on 45mph ramp and 70mph Freeway. Adjust for grades > 2%
Taper length	---	250’	2001 GB Exh 10-72, pg 854	
Divergence angle	2^{o}	5^{o} (max angle)	2001 pg 853	
Curve Radius	---	1000’	2001 pg 850	
Two Lane Ramp Design				
Acceleration Lanes				
Gap acceptance length	500’	300’	2001 GB Exh 10-76, pg 862	Gap acceptance is increased when volume exceeds capacity in HCM (pg 861)
Acceleration length	---	820’	2001 GB Exh 10-70, 10-71, pg 851-852	Length based on 45mph ramp and 70mph Freeway. Adjust for grades >2%
Taper, (Desirable design)	70:1	50:1	2001 GB Exh 10-76, pg 862	
Taper, parallel design	---	300’	2001 GB Exh 10-76, pg 862	
Deceleration Lanes				
Deceleration Length	---	390’	2001 GB Exh 10-73, pg 855	
Auxiliary lane length	---	1500’	2001 GB Exh 10-77, pg 863	
Taper length	---	300’	2001 GB Exh 10-77, pg 863	
Divergence angle from mainline to ramp	2^{o}	5^{o} (max angle)	2001 GB Exh 10-77, pg 863	
Curve Radius	---	1000’	2001 GB Exh 10-77, pg 863	
Clearances				
Vertical				
New highway bridges over or under street or highway		16’-6”	NDOT BDPM Tbl 11.3A	
Temporary structures		16’-0”	NDOT BDPM Tbl 11.3A	UPRR requires temporary construction 20’-6” vertical clearance
Bridges to remain in place		16’-0”	NDOT BDPM Tbl 11.3A	
Overhead sign struct./Ped-Xings		18’-0”	NDOT Policy	
Railroad under highway (measured from top of track to bottom of structure)		23’-0”	UPRR guidelines for highway separation over railroad 1999	Coordinate false work and construction activities with UPRR See Section 3 for additional information regarding clearances
Electrified (50 Kv Line)		26’-0”	Verify with utility	
Electrified (25 Kv Line)		24’-3”	Verify with utility	
Non Electrified		23’-0”	Verify with utility	
Horizontal				
Railroad to pier protection wall		18’-0”	Measured from centerline of track	Requires coordination with UPRR
Railroad to parallel roadway		25’-0”	Measured from centerline of track	Requires coordination with UPRR (UPRR may require future track or frontage)

Roadway Category Six, Minor Arterials
Roadway Category Seven, Collectors
Roadway Category Eight, Frontage or Service Roads

LOW SPEED FACILITIES (50-MPH AND BELOW)

Design Element	Desirable Criteria	Min Criteria	Criteria Basis	Comments
Design Vehicle	WB-50	Passenger Car	2001 GB pg 18	See design vehicle under Section 2 for further guidelines
Design speed (Rural)	50mph	30 mph	2001 GB pg 385 Exh 5-1	Need to consider terrain, adjacent land use, and functional classification
Design speed (Urban)	50 mph	30 mph	2001 GB pg 385 Exh 5-1	Need to consider terrain, adjacent land use, and functional classification
Lane width	12' Lane / 14' Turn lane	10' (30mph)	2001 GB pg 508	See lanes under Section 2 for further guidelines
Shoulder width (Mainline) (Rt)	10' Arterial / 4' Frontage/service road	6' Arterial / 2' Frontage/service road	2001 GB pg 388 & 429 Exh 5-5, 6-5	Widths shown include lateral offset for guardrail/barrier rail
Shoulder width (Mainline) (Lt)	8'	4'	2001 GB pg 509	Widths shown include lateral offset for guardrail/barrier rail
Bridge width	---	Match approach roadway		See design year (bridge projects) in Section 2 for other considerations
Horizontal Alignment				
Min radius (Mainline)	540' (normal crown @ 45mph)**	230' (Normal crown at 30mph)	2001 GB pg 201 Exh 3-43	**Values shown are both considered minimum radius 1. It is desirable to super-elevate roadway when possible
Min tangent between curves	---	The sum of superelevation runoff and and runout lengths	2001 GB pg 234	
Vertical Alignment				
Crest vertical curve "K" Value (Mainline)	84 (50mph)	19 (30mph)	2001 GB pg 385 Exh 5-2	See "K-Value" under Alignments in Section 2 for additional information
Sag vertical curve "K" Value (Mainline)	96 (50mph)	37 (30mph)	2001 GB pg 385 Exh 5-2	Check against headlight sight distance
Min length of vertical curve	600'	3X Design speed		
Superelevation				
^{e}max (Method 2)	^{e}max 6%	^{e}max 4%	2001 GB pg 193, 197 Exh 3-41	^{e}max 6% should be considered max super in icy climates
Min. runoff length	Varies with no. of lanes and ^{e}max	---	2001 GB pg 171 Exh 3-25,	
Min. tangent runout	Varies with no. of lanes and ^{e}max	---	2001 GB pg 173 Exh 3-26,	
% of runoff on tangent	67%	67%	2001 GB pg 173-175	1. No runoff /run-out on bridge structures if all possible. 2. Consider extending runoff/run out thru bridge structure if Note 1 is unattainable
Grades				
	Rural Arterial	Urban		
Mountainous	7% max (Design speed of 50mph)	9% max (Design speed of 50mph)	2001 GB pg 476 (Urban) pg 450 (Rural)	Consider truck climbing lane over 6% grade
Rolling	5% max (Design speed of 50mph)	7% max (Design speed of 50mph)	2001 GB pg 476 (Urban) pg 450 (Rural)	
Level	4% max (Design speed of 50mph)	6% max (Design speed of 50mph)	2001 GB pg 476 (Urban) pg 450 (Rural)	
Curb and gutter facilities	0.5% or greater slope	0.3%	NDOT Policy	
Sight Distance				
Stopping (Mainline)	425' (50mph design speed)	200' (30mph design speed)	2001 GB pg 385 Exh 5-2, 5-13, 6-2	Use adjustment factors for grades Exh 3-2 pg 115
Intersection Sight Distance			2001 GB pg 654- 682	Sight distance based on case (see page 658)

SECTION 2 DESIGN ELEMENTS

This Section is a supplement to the Green Book and is intended to clarify, expand, and formally adopt certain geometric design elements used in Roadway Design. These elements are listed in alphabetical order.

ALIGNMENTS

Horizontal. The horizontal alignments of roadways should be free of curvature in and around intersections, interchanges, railroad crossings, drop lanes, and roadside hazards.

Compound curves. Compound curves should be used with caution. Although compound curves give flexibility to fitting the highway to the terrain and other controls, designers should avoid them whenever possible. When curves with considerably different radii are located too close together, the alignment will not have a pleasing appearance. On one-way roads such as ramps, the difference in radii of compound curves is not so important if the second curve is flatter than the first. On compound curves for open highways, the ratio of the flatter radius to the sharper radius should not exceed 1.5 to 1. On ramps the ratio of the flatter radius to the sharper radius may be increased to a 2 to 1 ratio. However, the use of compound curves on ramps, with a flat curve between two sharper curves should be avoided. **(2001 GB pg 234)**

Curve length. For small central angles, curves should be sufficiently long to avoid the appearance of a “kink” in the highway. The minimum length of horizontal curve on main highways should be 15 times the design speed. On high speed controlled access facilities a desirable minimum length of curve for aesthetic reasons should be 30 times the design speed for flat terrain. **(2001 GB pg 233)**

Reversing curves. Reversing curves should be avoided whenever possible. Severe physical restrictions or other considerations may dictate the use of curves in opposite directions with a short connecting tangent. In such cases, the minimum length of tangent shall be sufficient to provide superelevation transitions for both curves consistent with the design speed.

Vertical. Avoid steep down grades on roads where high profile vehicles need to make free movement turns. For example, a roadway that has a design speed of 40mph at a 6% down grade could cause a high profile truck attempting to make a turn onto a cross street or on-ramp to tip over. The 6% down grade acts like a negative super when making the turning movement. Steep down grades should be limited near on-ramps and cross streets to avoid the affects of a negative superelevation.

K-value. K-value is a quick and useful way to verify the minimum lengths of vertical curves for various design speeds. K-value is the distance in feet needed to make a 1% change for the algebraic difference in intersecting grades (K= Length of curve / Algebraic difference in intersecting grades.) The table in **(2001 GB page 274, 276, and 280 Exh 3-75, 3-76, 3-79)** gives the designer the ability to check the design speed against the stopping sight distance for crest and sag vertical curves.

Crest. On flat vertical curves, a minimum grade of 0.30% should be reached 50’ from the crest to satisfy any drainage issues. **(2001 GB pg 275)**

Sag. On flat vertical curves, a minimum grade of 0.30% should be reached 50’ from the low point to satisfy any drainage issues. **(2001 GB pg 279)** Avoid “Roller-coaster” or hidden-dip” type profiles. Such profiles generally occur on relatively straight horizontal alignments where the roadway profile closely follows a rolling natural ground line. Hidden dips may create difficulties for drivers who wish to pass because the driver cannot be sure whether or not there is an oncoming vehicle hidden beyond the rise. See **(2001 GB pg 283)** for general controls on vertical alignments.

Profile-grade location. The profile grade is vertically situated on the final lift of the dense graded paving. On undivided roadways the profile is placed at the crown. On divided highways where the roadways are treated independently of each other, the profile is normally placed between lane 1 and lane 2 (or centerline). Divided highways that are intended to be widened to the median, the profile is located to an imaginary point halfway between the inside edges of the roadway. On ramps the profile is located at the outer edge of pavement. See Plan Preparation Guide for location of alignments.

Grade breaks. Normally a vertical curve is required for all changes in grade. Grade breaks at the beginning or ending of a vertical curve should be avoided. On 3R projects grade breaks may be perpetuated only if the cost of eliminating the grade break is unreasonable. Grade breaks greater than 0.2% should be corrected with a vertical curve unless justified otherwise. Example of these grade breaks may occur where a history of plantmix overlays meets Portland Cement Concrete Paving (P.C.C.P.)

On 3R projects a grade break may be introduced to transition the structural roadbed improvement into the adjoining section of road at the following rates:

- 50 feet per inch where the posted speed limit is 45 mph or less
- 100 feet per inch where the posted speed limit is greater than 45 mph

Vertical considerations. When developing vertical alignments the clearance requirements for bridges must be considered, for example:

- Accommodating the current and future expansion of the roads
- The constructability of the bridge such as by providing additional height for false work
- In urban areas achieving sight distance to the signal system heads
- Providing additional height on single point urban interchanges to accommodate clearance of the signal system when the convergence is designed underneath
- Meeting the requirements of the owner for structures over infrastructure such as railroads

See Railroad crossing in Section 2 for clearances around railroad facilities

See Clearances in Section 1 for vertical and horizontal distances around structures

Drainage. Changes to vertical profiles can have significant impacts to the drainage design, e.g., overtopping areas, fill slopes (affecting culvert lengths, roadside ditches, pipe cover, etc.), longitudinal slopes (affecting onsite drainage design), etc. Consult with the Hydraulics Section when modifying vertical profiles throughout the design process.

APPROACHES AND ACCESS

The minimum radius on approaches should not be less than 25' (measured at the face of curb or edge of oil.) Refer to the Access Management System and Standards 1999 Edition for type of approach, spacing, and application on various roadway facilities.

CROSS SLOPE

Normal crown. On tangents, the standard cross slope should be a 2% crown section with the high point located at the center of the roadway. Divided roadways with medians less than 34' for plantmix (36' for P.C.C.P.) should be crowned to an imaginary point halfway between the inside edges of the roadway to accommodate future widening into the median and treated as a single vertical profile. The median width is the dimension between the through-lane edges including the left shoulders, if any. See page 8 in this Section for example. Existing facilities may deviate from this design suggestion and does not require an exception.

Divided roadways with medians greater than 34' that are not intended for future widening in the median, should be sloped to drain away from the inside edge of oil at a 2% slope and treated as independent alignments and profiles. See Plan Preparation Guide for location of alignment.

Ramps. Ramps should be sloped to drain away from the inner edge of pavement (the edge adjacent to the mainline) at a 2% slope. See Plan Preparation Guide for location of alignment.

Bridges. Geometric changes, such as superelevation and width transitions, should not occur within the limits of a bridge structure unless the cost of doing so is justified with the Structural Engineer. Such justification shall include the costs and schedule impacts associated with the design and construction of the bridge.

Drainage. If there are facilities that may impede drainage from the normal crown, e.g., offset median (worm) islands, raised lane separators, etc., coordinate with the Hydraulic Section for any necessary drainage considerations.

DESIGN SPEED

General. Design speed is a concept by which coordination of the various physical design elements is achieved. Design speed has a significant effect on the operation and safety of a highway because it is used to determine various individual design elements with specific dimensions such as stopping sight distance or horizontal curvature.

Selecting design speed. The Designer selects the design speed based on the type of roadway category, AADT, terrain, and adjacent land use. For roadway category and design speeds see Access Management System and Standards 1999 Edition. For freeways, the design speed should equal or exceed the regulatory speed limit in every case. **(2001 GB pg 448 and 507)** Coordinate the design speed with the Principal Traffic Operation Engineer and the Safety/Traffic Division on new facilities so the posted speed limit can be signed accordingly. For additional information selecting a design speed see NCHRP Report 504.
See Ramps in Section 2 concerning design speeds.

Posted speed. Posted speed limits are not the highest speeds that might be used by drivers. They are usually set to the approximate 85th percentile speed of traffic. **(2001 GB pg 72)**

Operating speed is the speed at which drivers are observed operating their vehicles. The 85th percentile of the distribution of observed speed is the most frequently used descriptive statistics for the operating speed associated with a particular location or geometric feature. Planning can provide speed studies when requested. See Planning in Section 5.

Improvements on existing facilities. Since speeds often increase when there is a new pavement widening and when geometric improvements are made, engineering judgment should be exercised in determining the reasonableness and applicability of using an existing off-peak 85th percentile speed that is below the maximum functional class speed.

New facilities. The anticipated operating speed and traffic volumes are frequently used when selecting the design speed. The anticipated off-peak 85th percentile speed may be based on the speeds of facilities with similar classifications, geometry, and traffic characteristics.

Other. No-passing zones should be based on a design speed of 70 MPH on 2-lane rural highways. Any approved modifications to highway preservation projects having criteria based on design speed should use 70 MPH. Coordinate the design speed with the Safety/Traffic Division (striping and signing section) to insure that proper regulatory signs are installed on the facility.

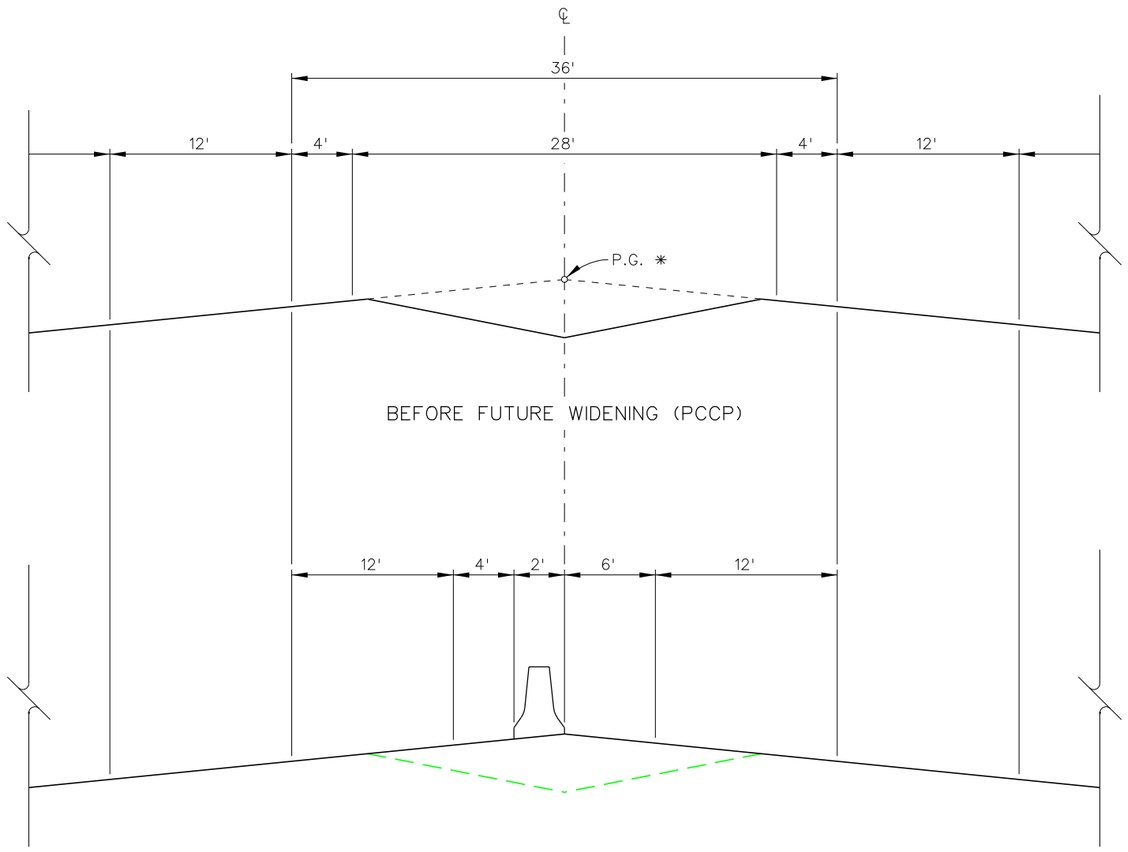
DESIGN VEHICLE

Interstate and NHS. The design vehicle for interstate and NHS routes is WB-65. The design vehicles for other routes need to be evaluated on a project basis by the Designer.

Turn templates. Select the appropriate design vehicle for the facility and run turning templates using “Auto-Turn” at all intersections to check for off-tracking around island noses, curb returns, and tight ramp configurations.

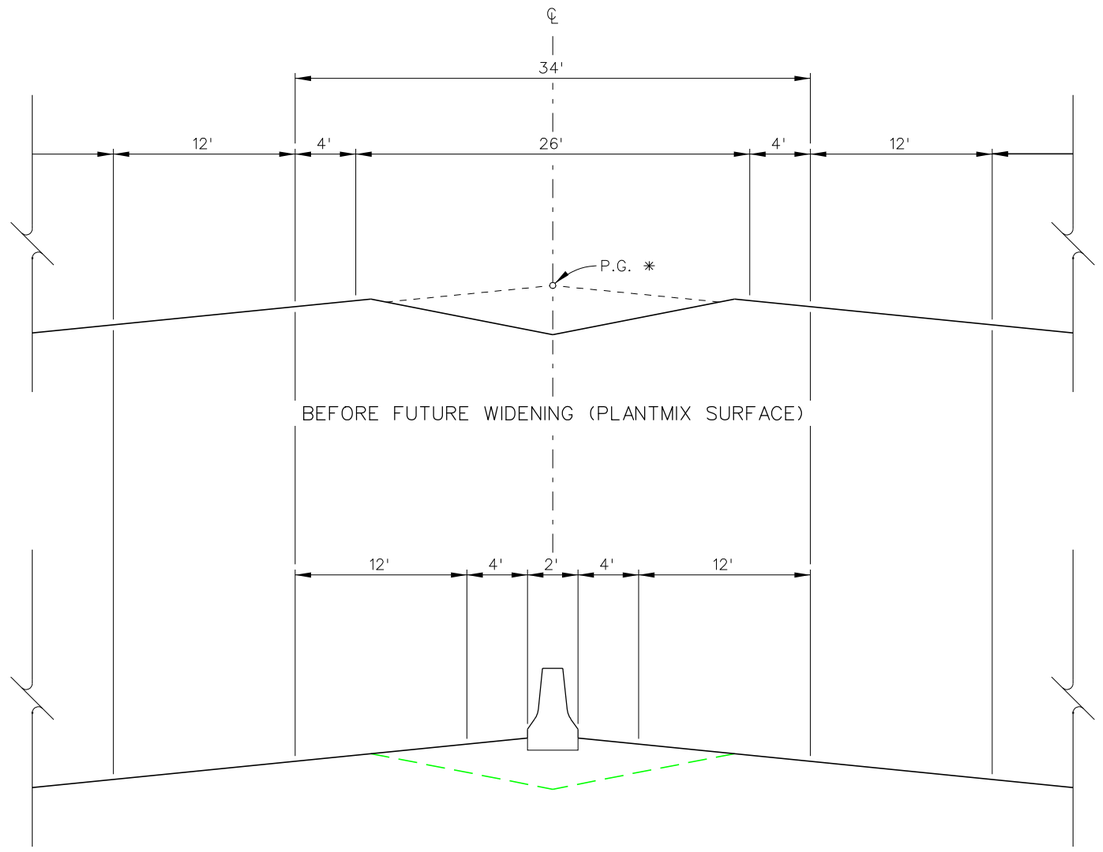
Permitted facilities. The physical design vehicle for all facilities intended for use by motor vehicles shall be all such vehicles allowed by law including tractor-trailer combinations operating under annual or trip permits issued by the department; the department’s website lists the current dimensions for these tractor-trailer combinations http://www.nevadadot.com/business/trucker/

CONSIDERATION FOR FUTURE MEDIAN WIDENING



BEFORE FUTURE WIDENING (PCCP)

AFTER FUTURE WIDENING (PCCP)



BEFORE FUTURE WIDENING (PLANTMIX SURFACE)

AFTER FUTURE WIDENING (PLANTMIX SURFACE)

* – PROFILE GRADE IS PROJECTED FROM DENSE GRADED SURFACE.

SECTION 2 DESIGN ELEMENTS

DESIGN YEAR

General. The design year starts from the time when a highway project is open to traffic. Highway and bridge design should be based on traffic volumes that are expected to occur within the expected service life of the project. Traffic forecast design years provide necessary information so that the designer can evaluate alternatives to address traffic and congestion issues. The selected design year is intended to cover the time period necessary to evaluate functionality over the expected service life of the project. This information is requested from the Principal Traffic Operation Engineer.

Design year traffic forecast volumes are necessary to:

- Determine the appropriate scope of improvements (e.g., adding a turn lane vs. not doing so) and associated geometric design criteria.
- Determine how well the project meets objectives for capacity, delay, and mainline or intersection level of service (LOS). LOS is determined by means of capacity analysis, which requires the design year traffic volumes. **(2001 GB pg 84-85)**
- Evaluate project work types on a consistent statewide basis.
- Determine the number of lanes to remain open during construction
- Allow for informed decision making on project alternatives and trade-offs.

It may not always be practicable to construct projects that fully accommodate design year traffic, or even to fully address existing traffic congestion. Engineering judgment and consideration of all relevant factors provides the flexibility in determining to what extent design year traffic can be accommodated. Traffic forecasts alone do not dictate project scope. Forecasts are only one of many factors (safety needs, mobility needs, environmental issues, community needs, etc.) to be addressed.

Capacity projects. New capacity projects are usually designed with a service life to meet the 20 year traffic forecast model.

Bridge projects. New bridge projects are usually designed with a service life to meet the 30 year traffic forecast model. Provide adequate bridge width for intersection approach lane widening, either in the scope of the bridge work or design the bridge to facilitate future widening.

INTERSECTION DESIGN

Angle. Intersecting streets should meet at approximately a 90 degree angle. Intersection legs that operate under stop control should intersect at right angles wherever practical, and should not intersect at an angle less than 60 degrees. See intersection sight distance in Section 2

Grades. The intersection and approach areas where vehicles are stored while waiting to enter the intersection should be designed with a relatively flat grade; the maximum grade should not exceed 5% where practical. Where ice and snow may create poor driving conditions, the desirable grade on approach leg should be 0.5% with no more that 2% wherever practical. Intersections should not be located just beyond a short crest vertical curve or sharp horizontal curve.

Grading. If it is impractical to match the elevation of an intersecting road, the crossroad should be reconstructed for a suitable distance using adequate vertical geometry to make the grade adjustment. In general, a 2% maximum tangent grade break is allowed at the edges of signalized intersections to allow vehicles on the crossroads to pass through an intersection on a green signal. For un-signalized or stop condition intersections, a maximum tangent grade break of 4% may be employed.

Design vehicle path. The minimum edge of traveled way designs requires the use of simple curves with tapers or 3-centered curves for larger design vehicles. Use the appropriate edge design for the selected design vehicle so it does not encroach into oncoming lanes. **(2001 GB pg 598- 612 Exh 9-21 thru 9-28)**

Other. Intersections on sharp horizontal curves should be avoided wherever practical because the superelevation and widening of pavements on curves complicate the intersection design and may reduce sight distance. **(2001 GB pg 584 Exh 9-18)**

Type. For various types of intersection designs see **(2001 GB pg 562-580).**

LANES

Width. All traffic lanes intended for use by motor vehicles shall be 12’ wide with an additional 2’ added when the lane is directly adjacent to a curb or other physical feature.

In order to make bicycle travel safer on urban streets, the Department has agreed to stripe State owned and maintained roadways within Clark County using a striping standard established by the Clark County RTC as a guideline. The intent is to provide a shared outside travel lane of 14’ for bicyclists by reducing our standard 12’ travel lanes to 11’. Any lane next to a median barrier curb will be a minimum 12’ wide with a desirable width of 13’. On preservation projects it will not always be possible to provide the desired lane configuration and judgment will have to be used to determine an acceptable compromise between lane widths and the desire to provide a 14’ outside travel lane. The Chief Road Design Engineer should review the compromise. This standard will also pertain where the roadway is not on reconstruction projects or new

roadway projects, the 14’ can be expanded to 15’ and at the same time the travel lanes should be 12’. If this will cause the need for new right-of-way or significantly increase the size of takes, then the RTC standard may be used. If Federal funds are involved then any planned bicycle facility must be accommodated.

Accel-decel lanes. Refer to the Access Management System and Standards 1999 Edition.

Auxiliary lanes. Auxiliary lanes are defined as the portion of the roadway adjoining the traveled way for speed change, turning, storage for turning, weaving, truck climbing, and other purposes supplementary to through traffic movements. The width of an auxiliary lane should be equal to the through lanes (12’ preferred). An auxiliary lane may be provided to comply with the concept of lane balance, to comply with capacity needs, or to accommodate speed changes, weaving and maneuvering of entering and leaving traffic.

Where auxiliary lanes are provided along freeway main lanes, the adjacent shoulder should be 8’-12’ in width; the preferred width of 12’ should be considered unless otherwise justified. **(2001 GB pg 818)**

Lane balance. To provide efficient traffic operation through and beyond an interchange, there should be a balance in the number of lanes on the freeway and ramps. The basic number of lanes should be established for a substantial length of freeway and should not be changed through pairs of interchanges; variations in traffic demand should be accommodated by means of auxiliary lanes where needed.

At a freeway entrance, the number of lanes beyond the entrance should not be less than the sum of the merging roadway lanes and the freeway minus one, but may be equal to the sum of all traffic lanes on the merging roadway. At a freeway exit, the number of approach lanes before the exit should be equal to the number of the lanes on the freeway beyond the exit, plus the number of lanes on the exit, minus one. Exceptions to these principles occur at cloverleaf loop ramp exits that follow a loop-ramp entrance and at exits between closely spaced interchanges. The traveled way on the freeway should not be reduced by more than one traffic lane at a time. Examples of proper lane balance can be seen in **(2001 GB pg 816 Exh 10-49).**

Lane tapers. To be developed (Access Management Standards Vs.GB).

Bike lanes. Bike lanes are used when it is desirable to delineate a portion of the pavement for the preferential use by bicyclists or to provide for more predictable vehicle movements. Bike lanes are delineated with signs and pavement markings. They should be one-way facilities located within the limits of the paved shoulder. The minimum width of a bike lane is 4’. In areas with raised curb or longitudinal barriers, the minimum width is 5’. The open graded plantmix surface wearing course is to be paved flush with the lip of the gutter pan and inlet grates. A width of 5’ or greater is preferred where substantial truck traffic is present, or where motor vehicle speeds exceed 50 mph.

On highways without full control of access where a bridge deck is being replaced or rehabilitated, and where bicycles are permitted to operate at each end, the bridge shall be reconstructed so that bicycles can be safely accommodated when it can be done at a reasonable cost. Consultation with local groups of organized bicyclists is encouraged in the development of projects with bicycle facilities.

In situations where the lateral offset of an existing longitudinal traffic barrier from the shoulder stripe is less than 5’ then, in consideration of bicycle traffic, the placement of a rumble strip must be justified by an engineering study. The study should consider: [a] the consequences of omitting the rumble strip adjacent to the traffic barrier, and [b] adjusting the lateral offset of the traffic barrier to at least 5’. On new roads or new traffic barrier installations on existing roads the minimum distance from the shoulder line to the face of the traffic barrier is 6’ if the road also serves as a bikeway.

Additional resources. For further guidance refer to the 1999 AASHTO’s Guide for Development of Bicycle Facilities.

Policy and Procedure. See Section 4 for additional guidance concerning bike lanes.

Drainage. Consult with the Hydraulic Section if shoulder widths next to barrier rail or curb and gutter are proposed to be reduced as this may affect onsite drainage design criteria.

MEDIANS

General. A median is defined as the portion of a divided highway separating the traveled way for traffic in opposing directions. **(2001 GB pg 341)** The principle functions of a median are to provide separation from opposing traffic, provide a recovery area for out of control vehicles, provide a stopping area in case of emergencies, provide for special changes and storage of left turning and U-turning vehicles, minimize headlight glare, and to provide width for future travel lanes. Medians are highly desirable on arterials carrying four or more lanes.

Width. The median width is the dimension between the through-lane edges including the left shoulders, if any. The minimum width for interstates and freeways in rural areas is 36’ and 10’ in urban areas. For 3R projects, these widths should be evaluated based on crash information and considered for longitudinal protection such as guardrail, barrier rail, or cable rail. See cross slope in Section 2 for additional information.

Slopes. A depressed median is generally preferred on freeways for more efficient drainage and snow removal. Median slopes should preferably be 6H:1V, but slopes of 4H:1V may be adequate when constrained. Drainage inlets in the median should be designed with the top of the inlet flush with the ground and cross culverts extend beyond clear zone. See culverts in Section 3 for additional information.

Median openings. Before minimum spacing of median crossings are used on individual projects the length of need for weaving maneuvers and safe signing shall be analyzed for the design-year capacity. Arterials and collectors shall be further analyzed to ensure adequate turning movements and signal progressions are achieved. When requested by NDOT Maintenance, the Nevada Highway Patrol or other agencies, the NDOT may, with adequate justification, provide emergency crossovers on rural freeways at an average spacing of not less than 2 miles where interchange spacing is 4 miles or greater. The actual spacing shall be adjusted to avoid curves and other locations with inadequate geometrics for this type of maneuver. Delineation and markings for emergency crossovers will be in accordance with the MUTCD, except that a double blue delineator will be placed on the left side of the through roadway on the far side of the crossover for each roadway. Signing, if any, will be as directed by the Traffic/Safety Division.

Raised median islands. Raised medians have application on arterial streets where it is desirable to regulate left turn movements. See curb and gutters in Section 3 for selecting curb type.

The smallest curbed corner island normally should have an area of approximately 50 sqft for urban and 75 sqft for rural intersections. However a minimum of 100 sqft is preferable for both. Accordingly, corner triangular islands should not be less than 12', and preferably 15', on a side after the rounding of corners. **(2001 GB pg 631)**

Elongated or divisional islands should not be less than 4' wide and 20' to 25' long. In special cases where space is limited, elongated islands may be reduced to a minimum width of 2'.

The approach nose of a curbed island should be conspicuous to approaching drivers and should be clear of vehicle paths, physically and visually, so drivers will not shy away from the island. The offset from the travel lane to the approach nose should be greater than that to the face of the curbed island, normally about 2'. For curbed median islands, the face of curb at the approach island nose should be offset at least 2' and preferably 3' from normal median edge of the traveled way. The island should then be gradually widened to its full width. See curbs and gutters in Section 3 for application.

Where a curbed corner island is proposed on an approach roadway with shoulders, the face of curb on the corner island should be offset by an amount equal to the shoulder width. If the corner island is preceded by a right turn deceleration lane, the shoulder offset should be at least 8'. **(2001 GB pg 634-637 Exh 9-37 thru 9-40)**

Island shapes and types. It is important to consider the appropriated shape of a median end and run turning templates to ensure they work for the design vehicle and intersection skew angle **(2001 GB pg 701)**. There are 4 ways to develop left turn lanes. The preferred method is symmetrical reversing curves for most intersections **(2001 GB pg 721 Exh 9-95).**

Openings. For spacing of median openings refer to the Access Management System and Standards 1999 Edition.

SHOULDERS

Interstate. The adopted criteria for Interstates specify that the paved width of the right shoulder shall not be less than 10'. Where truck traffic exceeds 250 DDHV (the design hourly volume for one direction) a 12' right should be considered. On freeways with six or more lanes the usable paved width of the median shoulder should also be 10' and preferably 12' where the DDHV for truck traffic exceeds 250 veh./h. On freeways with a four-lane section, the paved width of the left shoulder shall be at least 4'. **(2001 GB pg 509)**

Ramps. On 3R projects, substandard ramp widths should be addressed during the Preliminary Design Field Study (PDFS) where it is economically feasible to widen them to meet current standards. The desirable single lane ramp width is 24'. (Striped 4'-12'-8')

See Section 1 design criteria for shoulder widths.

SIGHT DISTANCE

Stopping sight distance. Stopping sight distance is the minimum sight distance to be provided at all points on multi-lane highways and on two-lane roads. Stopping sight distance also is to be provided for all elements of interchanges and intersections at grade, including driveways. The minimum stopping sight distance is the distance required by the driver of a vehicle, traveling at a given speed, to bring the vehicle to a stop after an object on the road becomes visible. Stopping sight distance is measured from the driver's eyes, which is 3.5' above the pavement surface, to an object 2' high on the road. Stopping sight distance design values can be obtained from **(2001 GB pg 112 Exh 3-1).** Increases in the stopping sight distances on downgrades are indicated in **(2001 GB pg 115 Exh 3-2).**

Stopping sight distance on horizontal curves. Where an object off the pavement such as a longitudinal barrier, bridge pier, bridge rail, sound wall, building, cut slope, or natural growth restricts sight distance, the minimum radius of curvature is determined by the stopping sight distance. Stopping sight distance for passenger vehicles on horizontal curves is obtained from **(2001 GB pg 230 Exh 3-57).** For sight distance calculations, the driver's eyes are 3.5' above the center of the inside lane (inside with respect to curve) and the object is 2' high. The line of sight is assumed to intercept the view obstruction at the midpoint of the sight line and 2.75' above the center of the inside lane. Of course, the midpoint elevation will be higher or lower than 2.75', if it is located on a sag or crest vertical curve respectively. The clear distance (M) is measured from the center of the inside lane to the obstruction.

The general problem is to determine the clear distance from the centerline of inside lane to a median barrier, retaining wall, bridge pier, abutment, cut slope, or other obstruction for a given design speed. Using radius of curvature and sight distance for the design speed the middle ordinate (M) which is the clear distance from centerline of inside lane to the obstruction can be calculated **(2001 GB pg 230 Exh 3-57).** When the design speed and the clear distance to a fixed obstruction are known, this figure also gives the required minimum radius which satisfies these conditions.

When the required stopping sight distance is not available because of an obstruction such as a railing or a longitudinal barrier, the following alternatives shall be considered: increase the offset to the obstruction, increase the horizontal radius, use lower height barrier rail, or do a combination of both. However, any alternative selected should not require the width of the shoulder on the inside of the curve to exceed 12', because the potential exists that motorists will use the shoulder in excess of that width as a passing or travel lane.

When determining the required middle ordinate (M) distance on ramps, the location of the driver's eye is assumed to be positioned 6' from the inside edge of pavement on horizontal curves. The designer is cautioned in using the values from **(2001 GB pg 230 Exh 3-57)** since the stopping sight distances and middle ordinates are based upon passenger vehicles. The average driver's eye height in large trucks is approximately 120 percent higher than a driver's eye height in a passenger vehicle. However, the required minimum stopping sight distance can be as much as 50 percent greater than the distance required for passenger vehicles.

Stopping sight distance at under crossings. On routes with high percentages (10 percent or more) of truck traffic, the designer should consider providing greater horizontal clearances to vertical sight obstructions to accommodate the greater stopping distances required by large trucks. **(2001 GB pg 281 Exh 3-80)**

Headlight sight distance. For sag vertical curves, formal design exceptions are required for curves that meet the comfort criteria but not the headlight criteria, unless lighting is provided.

Passing sight distance. Passing sight distance is the minimum sight distance that must be available to enable the driver of one vehicle to pass another vehicle, safely and comfortably, without interfering with the speed of an oncoming vehicle traveling at the design speed, should it come into view after the overtaking maneuver is started. The sight distance available for passing at any place is the longest distance at which a driver whose eyes are 3.5' above the pavement surface can see the top of an object 3.5' high on the road. Passing sight distance is considered only on two-lane roads. At critical locations, a stretch of four-lane construction with stopping sight distance is sometimes more economical than two lanes with passing sight distance. **(2001 GB pg 118-130)** Adjustment factor for grades is not available, exercise judgment for adjusting distances.

See Section 5 for obtaining passing sight distance studies from Planning

Intersection sight distance. Uncontrolled intersection designs should provide sufficient sight distances to avoid potential conflicts between vehicles turning onto or crossing a highway from a stopped position and vehicles on the through highway operating at the design speed. Specified areas along intersection approach legs and across their included corners should be clear of obstructions that might block a driver's view of potentially conflicting vehicles. These specified areas are known as clear sight triangles specifically they are approach and departure sight triangles as depicted in **(2001 GB pg 656 Exh 9-50).** These sight triangles are determined by using the sight distance along the major and minor roads. The resulting sight triangles should be clear of obstructions.

Traffic barriers. The heights of longitudinal traffic barriers relative to the standard driver eye height of 42" requires that some consideration be given to sight distance when locating traffic barriers near intersections. This is especially true when the vertical alignments of the roadways exacerbate the affect of the traffic barriers on the lines of sight.

Left turn from minor road. Left turns from a minor road to a major road with a stop condition should provide departure sight distance for traffic approaching from the right or left. Approach sight distance is not needed in a stop condition on the minor road. The length of sight triangle along the minor road **(distance a in Exh 9-50B)** is 14.4' plus ½ lane width approaching from the left or 1 ½ lane width from the approaching right. The length of the sight triangle along the major road is **(distance b in Exh 9-50B)** is determined by **(2001 GB pg 664-65 Exh 9-57/58).**

Left turns from a minor road to a major road with a yield condition should provide approach sight distance for traffic approaching from the right or left. Departure sight distance need not be checked as it is less than approach sight distance. The length of sight triangle along the minor road **(distance a in Exh 9-50A)** is 82'. The length of the sight triangle along the major road **(distance b in Exh 9-50A)** is determined by **(2001 GB pg 676 Exh 9-64).**

Right turn from minor road. Right turns from a minor road to a major road with a stop condition should provide departure sight distance for traffic approaching from the left. Approach sight distance is not needed in a stop condition on the minor road. The length of sight triangle along the minor road **(distance a in Exh 9-50B**) is 14.4' plus 1 ½ lane width. The length of the sight triangle along the major road **(distance b in Exh 9-50B)** is determined by **(2001 GB pg 668 Exh 9-57/58).**

Right turns from a minor road to a major road with a yield condition should provide approach sight distance for traffic approaching from the left. The length of sight triangle along the minor road **(distance A in Exh 9-50A)** is 82' The length of the sight triangle along the major road is **(distance B in Exh 9-50A)** is determined by **(2001 GB pg 676 Exh 9-64).**

Crossing maneuver from minor road. In most cases, the departure sight triangles for left and right turns onto the major road will provide adequate sight distance to cross the major road. However, if the major road is six lanes or wider, right or left turns are not permitted, or when a large amount of truck traffic in conjunction with steep grades the designer should verify the amount of sight distance available.

Decision sight distance. Drivers need decision sight distances whenever roadway features have a distinct probability to cause driver error. Examples of locations that are likely to cause driver error are interchange and intersection locations where unusual or unexpected maneuvers are required, changes in roadway cross section such as toll plazas and lane drops, and areas with excessive sources of visual information such as

traffic and advertising signs. It may not be feasible to provide decision sight distance because of horizontal or vertical curvature, thus the designer should look to provide advance warning of the critical location that may be encountered. Decision sight distances vary depending the location is on a rural or urban road and the type of avoidance maneuver required to negotiate the location properly. **(2001 GB pg 116)**

SUPERELEVATION

Super Elevation Distribution. NDOT has adopted super elevating roadways using Method Five for all high speed facilities (50mph or greater). Method Two is used in low speed facilities (45mph or less) which are typically urban streets. Use of other superelevation criteria requires approval of the Principal Design engineer. Desirably the design should be based on an emax of 8% for all high-speed roads and emax of 4% for urban conditions. Provide adequate tangent lengths between reversing curves to accommodate superelevation transitions for full run-off and run-out between the curves. **(2001 GB pg 138-140)**

The superelevation rates for Method 5 can be found in **(2001 GB pg 157-165)** while those for method 2 are found in **(2001 GB pg 195-197).**

Run-out transition. The tangent run-out section consists of the length of roadway needed to accomplish a change in outside-lane cross slope from the normal cross slope rate to zero (flat), or vice versa.**(2001 GB pg 185).**

Run-off transition. The superelevation run-off section consists of the length of roadway needed to accomplish a change in outside-lane cross slope from zero (flat) to full superelevation, or vice versa. **(2001 GB pg 185)**

Minimum superelevation runoff and tangent runout lengths can be found in **(2001 GB pg 174 Exh 3-29)** Runoff locations are adjusted for the number of lanes rotated and found in **(2001 GB pg 175 Exh 3-30).**

Drainage. Check for drainage problems in vertical sag or crest curves that contain superelevation transitions. The location of the superelevation transition may cause a flat roadway cross slope (0% cross slope) at the bottom of a vertical sag curve or top of a crest curve. This can be corrected by moving the vertical sag out of the superelevation transitions. See **(2001 GB page 190, 279)** for additional guidance. Vertical grades or cross slopes less then 0.50% may cause drainage problems. For reverse superelevations on large, multi-lane facilities, short transitions are preferred for drainage, to minimize the areas with flat transverse slopes. The larger, flatter areas do not drain quickly, resulting in a potential increase for hydroplaning.

Ramps. Direct and semi-direct ramps generally are designed with a high speed exit and a high speed entrance and are designed with Method Five. For ramps designed for speeds of 45 mph or less Method Two can be used for the ramp proper. Loop ramps with a design speed less than 45mph use **(2001 GB pg 201 Exh 3-43)** for superelevation. Superelevation development at ramp entrance and exit terminals is shown in **(2001 GB pg 647-652).**

Axis of Rotation:

Undivided Highways. For undivided highways, the axis of rotation for superelevation is usually the centerline of the traveled way. However, in special cases where curves are proceeded by long, relatively level tangents, the plane of superelevation may be rotated about the inside edge of the pavement to improve perception of the curve. In flat terrain, drainage pockets caused by superelevation may be avoided by changing the axis of rotation from the centerline to the inside edge of the pavement.

Divided Highways. If future widening is to the inside median, then rotate dual roadbeds in a single plane about centerline. When considering facilities for future widening to the outside shoulder, roadbeds should be rotated independently to reduce earthwork, and to reduce the length of the superelevation transitions. For example, the longer superelevation transitions can have an adverse impact to closely spaced ramps. See **(2001 GB pg 184)** for the four methods of rotation.

Divided highways with medians less than 34’ should be super elevated around an imaginary point halfway between the inside edges of the roadway to accommodate future widening into the median. Where the ultimate median width is greater than 34’, the axis of rotation should be at the proposed median edges of pavement. See page 8 in this Section for example.

Local Roads and City Streets. Lower design speeds with larger radii may utilize a normal crown section instead of superelevating the roadway. **(2001 GB pg 168 Exh 3-26 and 201 Exh 3-43)**

Ramps and Freeway to Freeway Connections. The axis of rotation for ramps is usually along the outer edge of pavement. The axis of rotation for Multi-lane ramps and direct connects is usually at centerline and considered one lane for number of lanes rotated. Appearance and drainage considerations should always be taken into account in selection of the axis rotation.

Number of lanes rotated. Auxiliary lanes are not to be considered as additional lanes to be rotated. Additionally, shoulder widths are generally not considered as additional lanes to rotate. **(2001 GB pg 175)**

TRAFFIC VOLUMES

Number of lanes. Coordinate with the Principal Traffic Operation Engineer concerning traffic volumes and number of lanes, length of turn lanes, storage lanes, etc.

RAILROAD CROSSING

All permanent structures over railroads require a minimum horizontal clearance of 12’ on one side and a minimum of 18’ on the other to provide for maintenance road access; space for the future addition of another track may also be required by the owner that would add 27’ to either side. Their desirable clearance to provide for maintenance road access is 23’. For temporary construction they require a minimum of 6.5’ horizontal clearance on tangent sections and a minimum of 9.5’ for all curved sections. For additional information see Guidelines for Railroad Grade Separation Projects.

RAISED FEATURES

General. Concrete curbs, gutters, dikes should only be used when justified for drainage, controlling traffic movements and replacement of existing infrastructure. Raised islands will be provided only in those instances where a need to control access is warranted.

The main purpose of shoulder dike is to confine drainage only where necessary to protect side slopes susceptible to erosion. Whenever possible, roadway drainage should be permitted to flow over the side of the fill as sheet flow to avoid concentrations points and the use of embankment protectors.

Curb height considerations. The standard height of dikes shall be 3” as this is suitable in most locations. For mountainous roadways with steep fill slopes a 4” dike may be used with the approval of the Chief Hydraulic Engineer. A 6” dike may be placed at site-specific locations where its use can be justified for both hydraulic and erosion control purposes; approval must be obtained from the Chief Hydraulic Engineer first and then the Chief Road Design Engineer.

Curbs 6” or less in height may be used along non-freeway urban arterials in areas where the posted speed limit is 45 mph or less. In areas where snow removal operations are expected, the use of mountable concrete curb designs are preferred over vertical (barrier) designs. The mountable designs have proven to be less susceptible to damage from scraping by the snow plow blades thereby resulting in longer lasting curbs.

Curb and barrier placement. Curbs installed in front of guardrail may cause vehicles to vault over the guardrail for some departure angles. Raised longitudinal features are not allowed within the end treatment area for any longitudinal traffic barrier. For operating speeds up to 50 mph, 1:1 slope faced curbs that are 6” or shorter can be used with a lateral offset of 0.0’ (installed flush with the face of the guardrail.) **(NCHRP Report 537)** Guardrail installed behind curbs that are beyond the lateral offset of 0.0’ (not flush with the face of the guardrail) should not be located closer than the following:

Operating Speed	Minimum Offset	Allowable Curb height
45 MPH or less	8’	6” or less with 1:1 sloping face
45 MPH to 55 MPH	12’	4” or less with 1:1 sloping face
55 MPH or greater	Not allowed	

The minimum offset shown above allows the suspension and bumper to return to their normal position after traversing over the curb allowing impacts with the barrier to proceed successfully.

RAMPS

Design speed. Ramp design speeds should approximate the low-volume running speed on the intersecting highways. This design is not always practical to provide design speeds on ramps that are comparable to those on the through roadways. On cloverleaf interchanges, the outer connections should desirably be designed for 35 mph. The minimum recommended ramp design speeds for various ramp configurations are as follows: Loop ramps, 25 mph; semi-direct, 30 mph; and direct connections, 40 mph. **(2001 GB pg 829-830, Exh 10-56)** The designer should make provisions to provide for design speeds in the upper range whenever possible.

Entrance ramps. Geometrics should be such that the vehicular speed is within 5 mph of the freeway speed and is obtained within the ramp before convergence. For consistency, the point of convergence is where the right edge of the ramp traveled way is 12’ from the right edge of the through lane of the freeway. **(2001 GB page 850)** The minimum acceleration length for entrance terminals is indicated in **(2001 GB pg 851-852, Exh 10-70, 10-71.)** A taper type design is preferred over a parallel type, except when the length is insufficient to enable a vehicle to accelerate to near-freeway speed prior to merging.

Exit ramps. Taper design fits the direct path preferred by most drivers. **(2001 GB pg 853)** Use a parallel design when deceleration is needed before the ramp or additional storage length is needed. **(2001 GB pg 856)**

Future widths. When designing ramp/crossroad intersections that may ultimately be controlled by signals, consideration should be given to providing enough room to allow two lanes for the left turn from the ramp to the crossroad. If the 20-year traffic does not require two lanes, and the additional right of way needed would appear to be cost prohibitive, then the additional right of way would not be warranted. When additional right of way is not warranted, retaining walls are an option but will have to wait until the dual lanes are actually warranted by traffic in the future.

Accel lengths. For parallel design, length is measured from the point where the ramp joins the freeway (physical gore). In the taper design acceleration is accomplished on the ramp upstream of the convergence point **(2001 GB pg 850)**

Sight distance. Sight distance along a ramp should be at least as great as the design stopping sight distance. The sight distance on a freeway preceding the approach nose of an existing ramp should exceed the minimum stopping sight distance for the through traffic design speed, desirably by 25 percent or more. Decision sight distance is desirable where feasible. **(2001 GB pg 832)**

Tapers. See ramp design under Criteria in Section 1.

Loop ramps. The upper range values of design speed generally are not attainable on loop ramps. Ramp design speeds above 30 mph for loops involve large areas, rarely available in urban areas. Long loops, which are costly and left turning drivers to travel a considerable extra distance, therefore minimum values usually control. Highway speeds more than 50 mph, the loop design speed should not be less than 25 mph (150' Radius.) **(2001 GB pg 829)**

Terminal Spacing. When ramp terminals are placed in close succession proper weaving length should be provided, check **(2001 GB pg 848 Exh 10-68)** for the minimum terminal spacing. Also avoid placing exits on crest vertical curves.

Grade and profile design. Adequate sight distance is more important than a specific gradient control and should be favored in design. Usually, these two controls are compatible. With proper ramp terminal facilities, one-way ramps with short upgrades of 7 to 8% permit safe operation without unduly slowing down passenger cars. Short upgrades (less than 2000') as much as 5% do not usually interfere with truck and bus operation. On one-way down ramps, gradients up to 8% do not cause hazard due to excessive acceleration.

The length of vertical curve for ramps that extend onto the freeway should preferably be designed with mainline design speeds. Limit downgrades to 4% on ramps with sharp horizontal curvature and heavy truck traffic.

It is desirable that ascending gradients on ramps with a design speed of 45 to 50 mph be limited to 3 to 5%; 35 to 40 mph limited to 4 to 6%; and those for 25 to 30 mph limited to 5 to 7%. Where topographic conditions exist, grades with steeper ascending gradients mentioned above may be 2% greater. **(2001 GB pg 833)**

In areas of snow and ice, it is desirable to limit gradients near the ramp terminals to 2% where vehicles would normally stop.

For ramps at interchanges, consider designing them longer than required for an interim condition, such that it minimizes the impact when the ultimate section is constructed.

Gores. The term gore refers to the area between a through roadway and an exit ramp, and may also be used to refer to the similar area between a through roadway and a converging entrance ramp. The physical gore nose should be paved up to a point between 4' to 8' in width. The neutral area refers to the triangular area between the painted nose (where the ramp shoulder and mainline shoulder lines meet) to the gore nose. The neutral area should be free of obstructions to provide a clear recovery area. The unpaved area beyond the physical nose to the gore nose **(2001 GB pg 837, Exh. 10-59)** should be graded as nearly as level to prevent overturning and abrupt stops. For striping the gore areas, refer to the 2003 Manual on Uniform Traffic Control Devices pg 3B-12, 13.

In special situations, gore areas may require grading details when the mainline cross slope does not cross the gore area at a constant slope. See Plan Preparation Guide for gore grading details.

Mainline rollover to ramp. Check cross-slope for maximum allowable rollover for entrance or exit ramps. **(2001 GB pg 652 Exh 9-49)** For example, when the freeway mainline cross-slope is 2% and the merging on-ramp is an 8% superelevation, this is an algebraic difference of 6%, which exceeds the maximum allowable rollover slope of 5%. Some superelevation is introduced at the nose gore, either by a single crown line centering on the nose or by a double break in the cross slope over the pavement wedge in front of the nose gore. Most of the superelevation should be gained beyond the nose. **(2001 GB pg 650 Exh 9-47)**

REFERENCES

General. The following is a listing of Publications for additional information regarding specific design standards:

AASHTO Publications

- 2001 Policy on Geometric Design of Highways and Streets
- 2005 Policy on Design Standards Interstate System
- 2006 Roadside Design Guide
- 1999 Guide for the Development of Bicycle Facilities
- 2004 Guide for the Planning, Design and Operation of Pedestrian Facilities

Federal Highway Administration (FHWA) Standards

- Federal-Aid Policy Guide
- 2003 Manual on Uniform Traffic Control Devices (MUTCD)
- Traffic Control Devices Handbook
- Standard Highway Signs

NDOT Publications

- 2006 NDOT Drainage Manual
- 2007 NDOT Plan Preparation Guide
- 1999 Access Management System and Standards
- 2007 Standard Plans for Road and Bridge Construction
- 2001 Standard Specifications for Road and Bridge Construction
- 2006 Standard Highway Signs, Nevada Supplement
- 2008 Nevada Work Zone Safety & Mobility Implementation Guide

ROADSIDE DESIGN

Clear zone. The clear roadside concept provides drivers a traversable area off the traveled way clear of obstructions and obstacles. This area is called the clear zone which is determined by speed, design AADT, and slopes of the traveled way **(2006 RDG pg3-6, table 3.1)**. However, table 3.1 only provides a general approximation of the needed clear zone distance. The designer must keep in mind site specific conditions, design speeds, rural versus urban locations, and practicality. Extrapolating clear zone data for higher design speeds not shown in table 3.1 will not be considered by NDOT.

In urban areas the back of sidewalk may be considered as the clear zone.

The designer may choose to modify the clear zone distance for horizontal curvature by using table 3.1 with table 3.2. **(2006 RDG pg 3-7, table 3.2)** These modifications are normally considered only when crash histories indicate a need, or a specific site investigation shows a crash potential that could be significantly lessened by increasing the clear zone width, and when such increases are cost effective.

Preferred channels. The preferred foreslopes and backslopes for basic ditch configurations are calculated by using tables from the **(2006 RDG pg 3-11 & 12, table 3.6 & 3.7).**

Side slopes. Side slopes are the cut and fill configurations that extend from the edge of the roadway to original ground. The department determines desirable side slope limits for roadways based on the function and utilization of the facility in the table on page 17.

Flattening fill slopes to eliminate the need for guardrail shall be evaluated. Where possible the slopes should be flattened when the cost of flattening is less than the cost of the guardrail construction and associated maintenance for a 20 year design life.

The fore slope ratio should remain constant and uniform throughout a cut section except where variable slopes are needed to meet ditch grade elevations established by the hydraulic engineer. When the cut section is to be excavated for additional material or if for any other reason a flat bottom ditch is needed, the bottom should be graded to drain away from the roadbed at a 20:1 slope.

Changes in slope ratio should be transitioned a minimum distance along the edge of the road of 50’ for every unit change in ratio. For example, a 200’ or greater transition length would be required when changing from a 2:1 fill slope to a 6:1 fill slope.

Using a “barn roof” type roadside slope configuration to achieve clear zone (a recoverable slope out to the clear zone then a critical slope beyond) should be evaluated on a case by case scenario when right of way is a constraint. Written approval from the Principal Road Design Engineer is required for use of barn roof fill slope designs.

The use of benched back slopes requires the approval of the Chief Road Design Engineer in consideration of the right-of-way, geotechnical, hydraulics and aesthetic impacts. Access to benches should be provided for maintenance.

When contemplating constructing 4:1 fore slopes the designer should consider using flatter slopes if all possible. This is because additional shouldering material on future overlays will potentially render a portion of a 4:1 slope non-recoverable (3:1) thereby reducing the applied clear zone. This can result in objects that were originally beyond the clear zone becoming situated in the clear zone.

Roadside Slope Design Guide

Functional Class	Parameters	Cut Slopes				Fill Slopes	
		Height (Feet)	Fore Slope		Back Slope	Height (Feet)	Slope Ratio
			Max.	Des.			
Freeways	All	0 to 4	6:1	10:1	6:1	0 to 5	10:1
		4 to 15	6:1	10:1	4:1	5 to 10	7:1
		Over 15	6:1	10:1	2:1	10 to 15	5:1
						Over 15	2:1
Principal Arterials	All	0 to 4	6:1	10:1	6:1	0 to 5	10:1
		4 to 15	6:1	10:1	4:1	5 to 10	7:1
		Over 15	6:1	10:1	1½:1*	10 to 15	5:1
						Over 15	2:1*
Minor Arterials and Collectors	Over 750 ADT	0 to 4	6:1	10:1	6:1	0 to 5	10:1
		4 to 15	6:1	10:1	4:1	5 to 10	7:1
		Over 15	6:1	10:1	1½:1*	10 to 15	5:1
						Over 15	2:1*
	50 to 750 ADT	0 to 4	6:1	10:1	6:1	0 to 4	10:1
		4 to 12	6:1	10:1	4:1	4 to 8	7:1
		Over 12	6:1	10:1	1½:1*	8 to 14	5:1
						Over 14	2:1*
	Under 50 ADT	0 to 3	6:1	10:1	6:1	0 to 4	10:1
		3 to 6	6:1	10:1	4:1	4 to 8	7:1
		Over 6	6:1	10:1	1½:1*	8 to 14	5:1
						Over 14	2:1*

Note: 4:1 fill slopes may be used to reduce right-of-way where the presence of roadside features, such as curbs and sidewalks, precludes the need for shouldering material on future overlays.

*Slopes steeper than 2:1 require a Geotechnical evaluation.

WEAVING SECTIONS

General. Weaving sections occur where one-way traffic streams cross by merging and diverging maneuvers. Principle types of weaving sections are illustrated in **(2001 GB pg 87, Exhibit 2-33).**

Length. The weaving section should have a length and number of lanes based on the appropriate level of service, as given in **(2001 GB pg 85, Exhibit 2-32).** The Highway Capacity Manual (HCM) presents an equation for predicting the average running speed of weaving and non-weaving traffic based on roadway and traffic conditions. Level of service criteria for weaving section are based on the average running speeds. The Designer coordinates weaving sections with the Principal Traffic Operation Engineer.

Ramps. The weaving section between ramps is shown in **(2001 GB pg 848, Exhibit 10-68).**

SECTION 3 DESIGN STANDARDS AND PRACTICES

This Section addresses common design details that may arise from the Standard Plans, Standard Specifications, field reviews, and construction activities. It is intended to establish standard design practices that are not necessarily a part of geometric design.

ADJUST COVERS

General. There are 3 methods of adjusting manhole and valve covers as follows:

- **Method A.** Use this method when removal of existing pavement by cold milling is not required. Pave over the cover. Once all paving is completed, locate and adjust to the final finished pavement level.
- **Method B.** Use this method when removal of the existing pavement by cold milling is required.
- **Method C.** Use this method of adjustment outside the areas as described in Methods A and B. (i.e. Roadbed modification, Cold recycle, and utilities in sidewalks)

List the owner of the utility in the structure list as shown in the Plan Preparation Guide See Section 5 for coordination of Right of way/Utilities

AGGREGATE BASE

Type. Type 1, Class B aggregate base is used on all projects unless otherwise requested from Materials. Type 2, Class B aggregate base is used between median barrier rails. See Standard Plans sheet (R-8.6.2)

Quantities. The quantities for aggregate base are to include 8 percent for moisture content.

Placement. On new construction projects or reconstruction projects where gravel base courses are being placed, the base course material will be used as shouldering material.

APPROACHES

Urban. In urban areas approaches are generally paved to the back of the radius returns in order to restore crosswalks and stop bars. Consideration to right of way needs to be addressed if paving to the radius returns puts the improvements beyond right of way. Temporary easements or permission to construct may be needed to perform this work or the scope is modified to avoid right of way.

Rural. In rural areas with dirt roads, approaches may be paved beyond the radius returns, not to exceed right of way limits, in an effort to provide room for mud and dirt to shed from the tires to keep the stop bars clean and visible. For construction of new approaches, refer to the Access Management System and Standards 1999 Edition for determining the approach type for roadway category.

On overlay projects, frequently used approaches should be keyed in with milling to the end of the curb or radius returns. Approaches that are used infrequently paving shall be transitioned within 10’ or to right-of-way, whichever is less. Pave permitted gravel approaches to protect the edge of road.

Policy and procedure. See Section 4 for additional guidance concerning permitted approaches.

BARRIER RAIL

Application. Concrete barrier rail is generally recommended in high volume urban areas especially freeways, because of frequent hits and minimal required maintenance. Considerations such as roadside drainage, flood plans, and accommodating future traffic control should be considered when contemplating its use versus guardrail.

Divided roadways with Portland Cement Concrete Pavement (PCCP), separated by a concrete barrier should have the center of the crown coincide with one of the outside edges of the concrete barrier. This facilitates construction when constructing barrier rail on PCCP.

A common application of barrier rail and crash cushions is at elevated exit ramp gore or where bridge rail requires shielding and the use of guardrail does not work. Combinations of barrier rail and crash cushions are also frequently used to shield bridge columns within clear zone.

Median concrete barrier rail should not be used for carrying conduits. In order to do certain types of work on freeways portions of the barrier may be removed to construct temporary crossovers to accommodate traffic during construction. Rerouting conduit runs at that time is very expensive and might reduce the available options for traffic control.

On controlled access highways, concrete barriers will generally be provided in medians of 34’ or less. On non-controlled access highways, concrete barriers may be used on medians of 34’ or less; however, care should be exercised in their use in order to avoid the creation of an obstacle or restriction in sight distance at median openings or on horizontal curves. Generally, the use of concrete barriers on non-controlled access facilities should be restricted to areas with potential safety concerns such as railroad separations or through areas where median constriction occurs. Concrete barriers may be considered in medians wider than 34’ based on an operational/safety analysis.

Existing. Traffic barriers may not be 3" or more below standard height after the roadway improvements are completed. Measures must be taken so those that fall below the 3" allowance are restored to standard height. Traffic barriers must be brought into conformance with the current length of need criteria. Obsolete crash cushions, guardrail end terminals, and barrier transitions (guardrail to bridge rail or guard rail to concrete barrier rail connections) must be upgraded to current standards.

Type. F-shaped barrier rail is used in critical areas such as the outside curve of fly-over structures and separating high volume/ high speed traffic on freeways. F-shape barrier rail is also preferred along retaining walls and tie back walls.

A-shape barrier rail is used in all other locations where F-shape would otherwise take precedence.

Fine surface finish. Fine surface finish shall be placed on all bridge structures and concrete barrier rail installations in urban areas. Fine surface finish is not included in other items of work and requires a separate bid item paid for on a square area basis. Fine surface finish shall not be used in rural areas.

End treatments. When contemplating the use of safety hardware the designer should consider safety factors and economics. Ends of longitudinal traffic barriers flared beyond clear zone have a 3 percent better severity index than crash cushions. Therefore, the approach ends of longitudinal barriers should be flared out of the clear zone wherever practical and concrete barriers should only be fitted with a crash cushion when flaring is impractical. Flaring longitudinal traffic barriers beyond the clear zone also reduces the risk of vehicles passing behind the end terminal and being prevented from returning to the roadway thus eliminating the need to provide a safe run out area.

If there are extenuating circumstances the designer should seek approval to designate a specific device or to limit the choices to those devices listed in the QPL that will perform satisfactorily. Some possible scenarios are:

- If analysis indicates the device will be struck frequently, the designer should consider devices that have self-restoring properties and/or are quick, easy and inexpensive to maintain.
- If there is limited space for installing the crash cushion, their physical dimensions may preclude certain devices.
- If there is little room behind the crash cushion area, the location requires a device that can handle hits from both sides or there are other safety concerns with vehicles passing beyond the device then gating devices may be precluded.

Aesthetics. In areas of historic, environmental, or scenic significance (as determined by Environmental and Landscape and Aesthetics); Design will give attention to the barrier rail and identify it as a specific item on the PDFS Report. The report will recommend how the rail will be addressed; which will then be reviewed and approved by the Chief Road Design Engineer. Areas of potential scenic significance are:

- Areas of National Forests and State, Local, and National Parks
- Historic Districts/Landmarks
- Scenic Byways: Lake Tahoe-Eastshore Drive (US 50 & SR 28), South Las Vegas Strip (SR 604), North Las Vegas Strip, Pyramid Lake Scenic Byway (SR 445, SR 446, & SR 447), Angel Lake Road (SR 231), Lamoille Canyon Road (SR 227), Extraterrestrial Highway (SR 375), The Great Basin Byway (US 93, US 50, US 6), The Loneliest Road in America (US 50), Highway US 93 through Lincoln County, Mount Rose Highway (SR 431), Mt. Charleston Scenic Byway (SR 156, SR 157, & SR 158), Red Rock Canyon Road (SR 159), Valley of Fire State Park Roadways (from SR 169)

The first priority should be given to removing the need for barrier rail. Strategies must meet NCHRP 350 criteria.

CABLE RAIL

General. To be developed.

CATTLE GUARDS

General. Steel cattle guards Type B, C, and Timber Foundation cattle guards are to be used in fence-line approach installations only. They are not appropriate for continuous, heavily traveled roadways.

Cattle guards are normally installed on ramps, cross roads and other suitable locations at interchanges. In areas of Open Range, at the limits of fenced right-of-way on a State maintained highway, metal cattle guards, wings and fencing shall be installed according to Department Standard Plans and Specifications.

Since cattle guard wings are an obstruction, the setback should be 2' wider than the edge of pavement on each side. The extra width is necessary in maintenance and overlay operations. In order to facilitate truck-turning movements the cattle guard should be constructed a minimum of 50' from the closest turning radius. All layouts should be tested with turning templates for WB-65 trucks to insure that the largest vehicle will be crossing the cattle guard on the tangent. The preferred cattle guard placement in an interchange would be on each end of a crossroad. If the cattle guards are to be placed on the ramps, that decision should be fully documented by the designer. The designer should take into consideration that motorists use the entire ramp as either an acceleration or deceleration zone. In either case the rails on the cattle guard degrades the friction factor necessary to changes in speed.

The Designer is further cautioned to choose a location so that the installation is free draining. Some thought should be given to the function of outlet pipe and the direction of drainage and any additional length of pipe should be specified in the plans.

Policy and Procedure. See Section 4 for additional guidance concerning cattle guards.

COLDMILLING

General. Check for any drainage problems around bridge structures from past overlay projects. Correct drainage issues by providing an adequate slope 100' beyond the structure before transitioning back to the new finished grade elevation. The transitions at the beginning or end of a project may also require correction if the condition is warranted. See below for transition rates.

Disposal. The priority for the use of cold-milled products is as follows: 1) Used on the project as shoulder material 2) Stockpiled at respective district 3) Stockpiled with local governments 4) Disposed of by Contractor

Project needs will be met first with the coldmilled product. Second, the Project Coordinator shall contact the District Maintenance Engineer to determine if they want the excess coldmilled product from the project for their use. If the district does not want the excess coldmilled product then the Project Coordinator will contact the local government to offer them the cold-milled product. As a last choice the contractor will be given any excess coldmilled product as salvaged material.

When contacting the District and local governments make sure they provide a physical location where the coldmilled product will be placed and a contact person to coordinate with so this information can be added to the special provisions for the project. In addition, consider the haul distance from the project to the stockpile location; it should be relatively close to the project. A summary of coldmilled product table is required on all projects that have coldmilled product being generated. The table should include the depth, amount of coldmilled product generated by the project, where the coldmilled product will be used, the amount that will be used and what will remain after all the project needs are satisfied. See the Plan Preparation Guide for an example of a Summary of Cold-milled Product table

For aesthetic reasons coldmilling product may not be used along roadsides as shoulder material in certain scenic areas including Washoe Valley and the Tahoe Basin. Coordination with the Landscape Architect and the Environmental Engineer is required to determine if coldmillings will be allowed on new construction projects.

Transitions. Normally mainline coldmilling depth is carried to the physical gore before starting a different pavement section (transition) along ramps. Transitions are normally carried beyond the project limits to provide full structural section within the project. Coldmilled transitions should also be completed 100' before/after bridge structures to reduce the "pounding" effect and helps eliminate potential ponding issues. On 3R projects a grade break may be introduced to transition the structural roadbed improvement into the adjoining section of road at the following rates:

- 50' per inch where the posted speed limit is 45 mph or less
- 100' per inch where the posted speed limit is greater than 45 mph

Miscellaneous cold milling. This item was created as a means to compensate the contractor for the additional coldmilling to remove areas of stripping or delamination encountered during the coldmilling process as determined by the Resident Engineer. Normally this item can be expected when cold milling is required for the full project length but may also be needed when only portions of a project require cold milling and areas of delamination are anticipated.

The Designer will be notified of anticipated areas of stripping or delaminating by the Materials Division and will coordinate with them to determine a quantity or percentage of the project if an estimated amount is not provided. The quantity should be estimated such that the Resident Engineer will have the flexibility to over run or under run the quantity without having to negotiate an agreed price.

CONCRETE ITEMS

Major Vs Minor bid item. Concrete for structures is classified as either major or minor depending on several considerations. The cost of minor concrete is significantly more than for major concrete to accommodate cost variables. A general distinction based on the pay quantity can be used as a starting point where less than 25 cubic yards is minor and greater than 25 cubic yards is major; this quantity is based on each structure or location and not on the contract quantity. In addition, the estimator must consider the complexity (special engineering, surveying, shop drawings and approvals) and amount of labor, equipment and materials included in the pour such as for forming (multiple angles, corners, vertical levels) and reinforcement (special doweling, multiple bends in reinforcing steel).

Some general examples of minor concrete include drop inlets (all types), pipe headwalls and small RCB headwalls, waterline caps and plugs, special manholes that are cast in place, special connections of pipes to RCB, and small drainage swales. In contrast, some examples of major concrete include a large cast-in-place RCB, approach slabs, wing walls, retaining walls, deck slabs, and a bridge barrier rail. A concrete slab with wire mesh reinforcing is a simple pour and, for a pay quantity moderately less than 25 cubic yards, could be considered major. Large junction boxes with multiple inlets, special separators for water quality improvements and special loadings are complex and, for a pay quantity moderately greater than 25 cubic yards, could be considered minor.

Class A Vs Class AA bid item. Class AA is air-entrained concrete and is produced through the use of air-entraining portland cement, or by introducing air-entraining admixtures. The use of air-entraining agents results in concrete that is highly resistant to severe frost action and cycles of wetting and drying or freezing and thawing and has a high degree of workability and durability. Class A is not air-entrained concrete and is used primarily in Clark County. Class AA concrete is to be used in all other counties unless otherwise specified by Construction or Materials.

Crack and Seat. This is a rehabilitation process performed on failing concrete pavement. A guillotine type of machine is utilized to break the pavement into blocks, which perform independently. Traffic is allowed to drive on this surface in order to seat it. A leveling course of plantmix is placed on this seated material and then the structural section plantmix is placed on top of the leveling course. A prime coat is placed between this seated concrete and the leveling course.

See section 410 in the Standard Specifications for more information on this operation and associated bid items.

CURBS AND GUTTERS

Type A Vs Type B. Type A curb should be limited to median islands in urban areas where speeds are less than 45 mph. Type B curb may be used for median islands in higher speed facilities. In areas where snow removal operations are expected, the use of mountable concrete curb such as Type 6, 7, and 8 designs are preferred over vertical Type 1, 2, 4, and 5 designs. The mountable designs have proven to be less susceptible to damage from scraping by the snow plow blades thereby resulting in longer lasting curbs. See Raised Features in Section 2 for placement or curbs around longitudinal traffic barriers.

Type 2 & 3. These curbs are generally used to match older curb sections that were used during the time of construction. Glue down curbs are generally easer to construct and are preferred over type 2 & 3.

CURB RAMPS

New Vs existing bid item. When constructing new curb, gutter, and sidewalk, the curb ramp will be included in the respective bid items. See Plan Preparation Guide for example construction notes. When retrofitting curb ramps within existing curb, gutter, and sidewalk, the curb ramp will be paid for as concrete ramp. The bid item for detectable warnings is required on ramp structures regardless if it is new or retrofitted.

CULVERTS

Safety end sections. Use safety end sections when cross culverts 30” or greater in diameter cannot be extended beyond clear zone. All longitudinal culverts that can be hit head-on within clear zone are to use safety end sections.

EXCAVATION

General. See Standard Specifications for various types of excavation, measurement, and payment. **(Section 203 pg 87-94)**

Shrink / Swell factors. The Designer requests shrink/swell factors from Geotech. See Plan Preparation Guide for example of earth work notes and shrink/swell factors in the summary of earthwork.

FENCES

Open range. In areas of Open Range, as defined in NRS 568.355, any fence constructed outside Department right-of-way which intersects the right-of-way shall be terminated at the right-of-way line(s). Installation of gates, and the appropriate type, will be the responsibility of the road design division on a site-specific basis. Metal drive gates should be installed in right-of-way fences where property access may have frequent usage (excluding driveways, approaches, road intersections) and especially in those rural areas close to or bounded by urban or suburban areas. Missouri type gates may be installed in right-of-way fences in rural areas other than those stated above and where a relatively low incident of usage is required.

Be aware of fence (especially chain link) that would obstruct drainage paths or culvert inlets and outlets

In rural areas where both large and small animals exist, use fence type C-NV-4B per the Standard Plans.

Tortoise fencing. Upon evaluation from Environmental Services, tortoise fencing may be required to be installed within the project limits and proposed NDOT material site. These projects are typically in Clark County.

Control of access. Control of access fence should be installed whenever it is necessary to prohibit access to the roadway lanes by pedestrians, animals and/or vehicles. Control of access is generally placed along the right of way lines. At interchanges, the control of access fence in normally extended 300’ past the radius returns in urban areas and 500’ in rural areas along major cross roads and/or frontage roads. In urban areas, a traffic study should be conducted to determine if any nearby access within these guidelines may pose a detriment to the operation of the interchange. The control of access may need to be lengthened or modified to accommodate operations. The analysis is requested from the Principal Traffic Engineer. See page 24 in this Section for example of minimum spacing of approaches and access control near interchanges

In urban and suburban areas a 4’ chain link fence will be normally used. When the need to control pedestrians, use 6’ chain link fence. In rural areas where both large and small animals exist, use a minimum of a 4 wire fence per the Standard Plans.

Removal / modification. In many cases both a permit and an agreement will be required before we will authorize removal of our access control fence; the agreement is to be negotiated by the Right-of-Way Division.

Removal of the state's access control fence in certain restrictive cases proposed by private, adjoining developers is subject to the following:

• Case 1. When a developer proposes to remove our access control fence and replace it on our right of way line with a block or concrete wall, or a metal fence (chain link or decorative iron), NDOT will require that the new wall or fence will become the property of NDOT with the developer being responsible for maintenance of the nonstandard wall or fence. A maintenance agreement with the developer, or some sort of property owners' association in the event the developer sells his interests to individual property owners, will be required for the continuing maintenance responsibility. A right of way occupancy permit will be issued for the actual construction. The permit will cover removal of the existing fence, temporary fencing during construction, and traffic control requirements.

• Case 2. When a developer proposes that we allow removal of our access control fence in favor of a fence to be constructed on his property, all conditions listed in case 1 will apply, except the developer will continue to own the replacement fence since it will be on his property. Here again, we will authorize removal of our fence only if it will be replaced by a block or concrete wall or a metal fence (chain link or decorative iron). NDOT will enter into the same type of agreement with the developer or property owner's association for maintenance specified in case 1. Should it be necessary for safety or security, the agreement will require that the existing NDOT access control fence be physically tied to the replacement fence or wall.

• Case 3. In those cases where existing block or concrete walls, immediately outside NDOT's access control fence, provide safe and durable access control barriers, NDOT may remove the access control fence to enhance aesthetics and/or for maintenance. Where necessary, we will, through our Right of Way Division, enter into agreements with property owners allowing us to connect our remaining access control fence to the existing block or concrete walls. In cases where we do remove our access control fence in favor of existing block or concrete walls, our District personnel will take care to erect temporary fencing whenever breaks in the block or concrete walls are found. Should intentional access openings be developed in the block or concrete wall, or should necessary maintenance not be performed allowing some compromise to the access control, NDOT will immediately replace its permanent access control fence.

• Wooden fences, even in combination with masonry or steel supports, are not allowed.

MINIMUM SPACING FOR FREEWAY INTERCHANGE AREAS WITH MULTI LANE CROSSROADS

Type Of Area	Spacing dimension			
	X	Y	Z	M
Fully Developed Urban*	750 ft	2640 ft	990 ft	990 ft
Suburban/Urban	990 ft	2640 ft	1320 ft	1320 ft
Rural	1320 ft	2640 ft	1320 ft	1320 ft

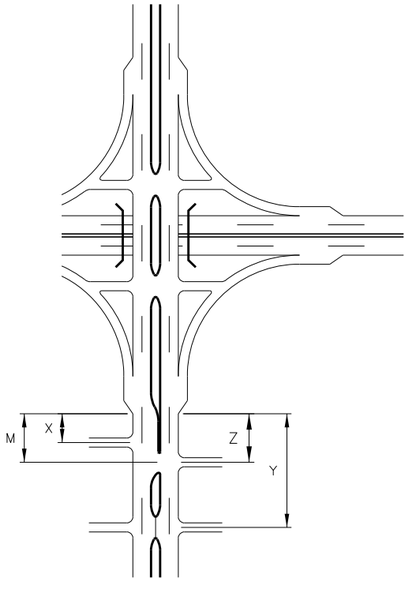
X = Distance to first approach on the right; right in/right out only.

Y = Distance to first major intersection. No four-legged intersections may be placed between ramp terminals and the first major intersection.

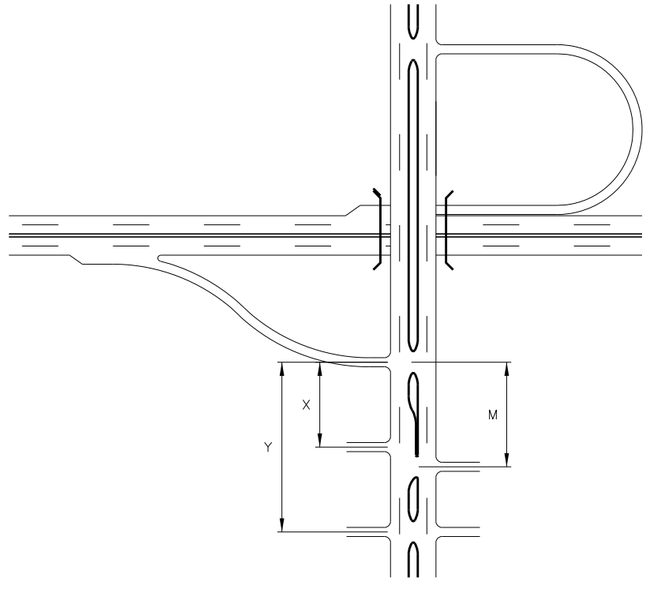
Z = Distance between the last access connection and the start of the taper for the on-ramp.

M = Distance to first directional median opening. No full median openings are allowed in nontraversable medians up to the first major intersection.

* Free-flow ramps are generally discouraged in fully developed urban areas and are questionable in suburban/urban areas because pedestrian and bicycle movements are difficult and potentially dangerous.



Diamond or Cloverleaf Interchange



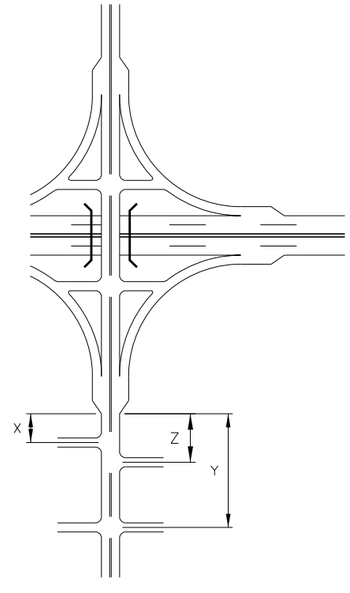
Partial Interchange

MINIMUM SPACING FOR FREEWAY INTERCHANGE AREAS WITH TWO-LANE CROSSROADS

Type Of Area	Spacing dimension	
	X or Z	Y
Fully Developed Urban	750 ft	1320 ft
Suburban/Urban	990 ft	1320 ft
Rural	1320 ft	1320 ft

X or Z = Distance to first access connection from the taper of the off-ramp or on-ramp. This dimension provides for either X or Z but not both, to avoid a four-way connection.

Y = Distance to first major intersection. No four-legged intersections may be placed between ramp terminals and the first major intersection.



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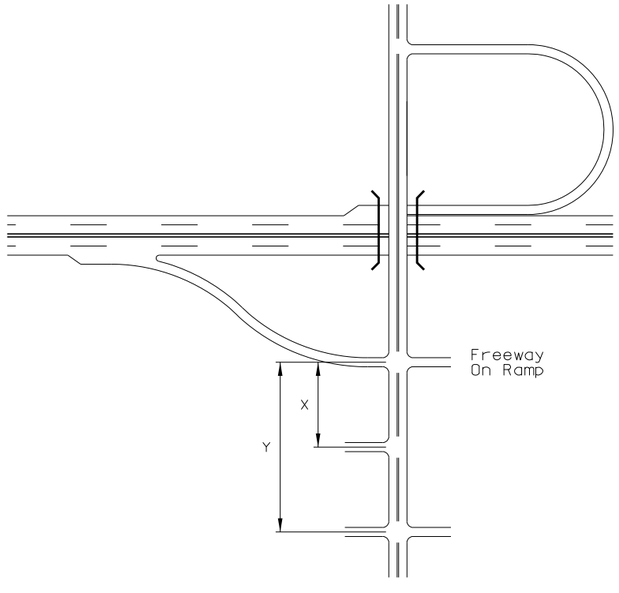


Partial Interchange

GUARDRAIL

Application. Thri-beam should be used on freeways where: snowmelt or other drainage considerations are an issue, adequate room is not available for concrete rail, or in flood areas. W-beam can be used off the freeway, especially when W-beam is predominant in the area or W-beam is being extended. W-beam would normally be used on low volume routes.

Guardrail should be installed in areas where the consequence of an errant vehicle leaving the roadway is judged to be more severe than impacting the guardrail. If economically feasible, flattening slopes, extending culverts, and removing obstacles from the clear zone should be considered first before installing any barriers. See side slopes under roadside design in Section 2.

Post length. When it is not economical to construct the additional 2' graded area behind the guardrail posts per the Standard plans, longer posts should be used and specified in the Special Provisions.

Blocks. Steel post 3-beam systems with 14" modified steel offset blocks do meet the NCHRP350 test requirements however the department no longer uses this configuration due to the 2" height difference between it and the other 3-beam configurations. Therefore any such installation that is being altered in any way, either permanently or for temporary construction purposes, should have the offset blocks replaced with an approved offset block from the QPL. If the guardrail is determined to be in good condition and is to remain in place; the blocks are to be replaced using the pay item guardrail block.

End terminals. Break away crash terminals (BCT's) do not meet the NCHRP350 test requirements and should be upgraded with new end terminals from the QPL.

Flared and tangential guardrail end terminals each have advantages and disadvantages that must be considered when selecting the type of system to use. Tangential end terminals were developed to overcome the inflexible installation tolerances associated with the flared-type end terminals. The trade-off is that tangential end terminals are more likely to be struck than the flared type, resulting in higher maintenance costs. As a general rule, a flared-type end terminal is preferred to the tangential type and should be used unless problems installing or maintaining the system.

End anchors are used where it is not necessary to project the trailing end of the guardrail outside of clear zone in the apposing direction; typically found on divided highways and interstate systems.

Buried end sections are used when it is convenient to bury the end section into the back slope.

Existing. Traffic barriers may not be 3" or more below standard height after the roadway improvements are completed. Measures must be taken so those that would fall below the 3" allowance are restored to standard height. Traffic barriers must be brought into conformance with the current length of need criteria. Obsolete crash cushions, guardrail end terminals, and barrier transitions (guardrail to bridge rail or guard rail to concrete barrier rail connections) must be upgraded to current standards.

Grading. Material necessary to construct the graded areas around the end terminals and behind the run of guardrail posts normally consist of borrow, or coldmilled products. The quantities are to be included in the summary of base and surface (shouldering material is not suitable for this purpose.) For end terminals, the use of longer posts is not an option and must be graded according to the Standard Plans.

Pay items. The remove and reset bid item will be used on projects to facilitate moving existing and/or new guardrail panels and blocks to accommodate the milling and paving operations. On new construction projects, such as roadways with new alignments and no traffic will be operating on the roadway, the bid item will not be required. Projects with a combination of traffic and no traffic sections will have to be addressed accordingly.

The reconstruct guardrail bid item will require new guardrail posts; coordinate bid items with Specifications.

Markers. Additional guide posts are calculated along guardrail runs. See Standard Plans for details (R-9.2.2).

Miscellaneous. The distance behind the guardrail must allow for deflection necessary for proper function when guardrail is impacted. Methods 1-4 are shown in the Standard Plans (R-8.3.1) for guardrail installation, deflections and back spacing. When designing guardrail runs adjacent to fixed obstructions, the designer should state in the plans the preferred method to prompt the Contractor and Resident Engineer. The additional posts and/or nested rail in methods 2, 3, and 4 are at no direct payment.

GUIDPOSTS

Placement. Guideposts should be placed along all roadways in accordance with the Nevada "Standard Plans for Road and Bridge Construction." Guideposts may be omitted from sections having longitudinal barriers if reflectors are included with the barrier system.

Additional guide posts are calculated along guardrail runs. See Standard Plans for details (R-9.2.2).

Type. Rigid guideposts are normally placed in heavy snow removal areas. Flexible guideposts are for all other areas in the state. Coordinate the type of post with District Maintenance.

Removal. There is no direct payment for the removal of guidepost. A note is placed in the General Notes directing the contractor to remove them at no direct payment. See Plan Preparation Guide for general notes.

HEADLIGHT GLARE SCREEN

General. Headlight glare screens are not installed routinely on median barriers or at other locations. Evaluation for its installation shall be made prior to incorporating in the plans. The evaluation should consider glare due to combined effects of grade, curvatures, heavy truck traffic, etc. Public complaints may also be an indication that glare screen is advisable.

MAILBOX

General. Replace mailboxes within NDOT right of way that do not comply with standards. Since the U. S. Postal Service is installing neighborhood collection boxes in many rural and suburban areas, the Designer should contact the responsible local postmaster to see if neighborhood collection boxes, to be provided and perhaps installed at Postal Service expense, could be installed within the confines of the project. If so, NDOT will provide turnouts at our expense to allow safe location of the collection boxes and convenient delivery and pick-up of mail.

On projects where we cannot arrange for installation of neighborhood collection boxes, replace the mailboxes removed or relocated to facilitate construction using only approved tubular metal supports, at NDOT expense.

Turn outs. Summarize the type and amount of base and surfacing in the plan sheets that is to be placed at mailbox turn outs according to the Standard Plans (R-12.1.1). At a minimum, the mailbox turn outs should consist of a 4" of aggregate base course. Heavily used or large number of mail boxes should consider a plantmix surface.

MAINTENANCE ACCESS

Roadway width. For controlled access facilities, provide maintenance access between fence lines (or right of way, which ever is less) to the adjacent fill slopes at the following widths:

SLOPE	WIDTH
3:1 fill slope or steeper	15'
3:1 fill slope or flatter	12'
3:1 cut slope or flatter	10'
3:1 cut slope or steeper	12'
Retaining walls	15'
Bridge structures	15'
Drainage structures	20'
Utilities	Determined by owner

Maintenance roads generally consist of a 4" aggregate base course. Paved maintenance roads should be evaluated on a case by case basis.

MILEPOST MARKERS

Milepost markers (posts only). The bid item is calculated for the location of mileposts in the field and is summarized in the plans. The milepost panels will be installed on the posts by the Department. The location of the panels is indicated on the Location sketch under the milepost tabulation. See location sketch and summary sheets in Plan Preparation Guide. There are two posts placed in the field, one in each direction, at each milepost location.

Post mile markers (posts only). The bid item is calculated for the location of post mile panels in the field. The post mile panels will be installed on the posts by the Department. These markers are only located on the interstate system, one in each direction, and start and end at the state lines. The numbering system runs continuously and does not break at county lines. The post mile markers (posts only) do not need to be summarized as part of the milepost markers.

OBJECT MARKERS

General. Object markers should be placed to warn motorists of hazardous objects near the roadway such as bridge rails, underpass abutments, utility poles, and drainage structures that are in clear zone that are not protected. To the extent possible, the marker should be located so that if the motorist avoids the object marker they will also avoid the object. For objects offset from the roadway, it may not be possible to place the object marker right at the hazard. In such cases, the Resident Engineer should locate the hazard marker based on an errant vehicle departure angle of 15-degrees.

Where an object is clearly a concern relative to the motorist who inadvertently strays off the paved roadway then placing an object marker should be considered if any of the following conditions exist within the "clear zone" and/or within the area that "may be so close to the edge of the road" that concern for safety is evident:

- A culvert exists that is equal to or greater than 30" internal diameter with no provisions to allow passage of a vehicle over the culvert end,
- Headwalls or wing walls protrude 4" or more above the graded slope, thus causing a snagging problem,
- The span between the wing walls, at a height of 4" above the fill slope, is greater than 30" and no provision has been made to facilitate passage of cars over the span.

PORTLAND CEMENT CONCRETE PAVING (PCCP)

General. For concrete paving, a 5' widening beyond the paving is required to facilitate the paving equipment. In areas where tight right of way requires steep slopes protected by barrier rail, this 5' widened area will be specified as miscellaneous concrete paving. Where barrier rail is not required the widened area will be filled with aggregate base after paving. When concrete paving abuts retaining walls, a 5' area of miscellaneous concrete paving will be required.

Extend cement treated base one foot beyond the concrete paving. Do not use coldmilled plantmix products as shoulder material on PCCP. Use of bituminous material adjacent to the concrete pavements has lead to water being trapped along the edge of the concrete slab which ultimately leads to a pumping action.

Divided roadways with Portland Cement Concrete Pavement (PCCP), separated by a concrete barrier should have the center of the crown coincide with one of the outside edges of the concrete barrier. This facilitates construction when constructing barrier rail on PCCP.

Longitudinal Weakened Plane Joints. For wide concrete pavement sections, the quantities for longitudinal weakened plane joints should be determined assuming that the contractor will pave in 24' maximum width pours. In the past, we have had overruns because the designer assumed the contractor paved half width freeway sections in the range of 56+' wide in one pass. It is Constructions opinion that a 24' width would be appropriate for the determination of the weakened joint quantity. On rural freeways (2-Lanes each direction), the total width of 38' can be assumed to be paved in one pass.

Profile grind. It is necessary to include Saw & Seal Longitudinal Joints and Transverse Joints bid items when profile grinding PCCP.

Sign Foundations within Concrete Paver Track. On projects that require sign foundations, such as spread footings for overhead sign structures, the Traffic Designers will more accurately calculate the pedestal heights so that paving operations are not severely disrupted when sign footings are constructed prior to paving operations. The pedestal heights will be set flush with the concrete pavement and the pole lengths will be calculated based on this elevation. This will allow the contractor to build temporary earth ramps to carry the paver tracks over the pedestals. In order to do this, the designers will have to get the concrete surface elevations at these locations to traffic in a timely manner. When there is sufficient room, the foundations may be offset 5' from the edge of concrete pavement.

PLANTMIX AND ASPHALT ITEMS

Shoulder dike. Shoulder dikes are paid for as wet tons of plantmix and a linear foot item "Shoulder Dike". Calculate tack and seal coat for the plantmix dike; sand blotter is not required. (Asphalt type and application rate determined by Materials.) See raised features in Section 2 for locations and restrictions.

Cold recycles. The bid items for cold recycles are covered under Section 404 in the Standard Specifications. Provide a bid item for sand blotter so traffic can run on the recycled surface. Include additional one foot of width on each side of when calculating recycled bituminous surface. Paving items will also need to be adjusted for the additional width. See Plan Preparation Guide for typical sections.

Roadbed modifications. The bid items for roadbed modifications are covered under Section 305 in the Standard Specifications. Provide a bid item for sand blotter so traffic can run on the modified surface. Include additional one foot of width on each side of when calculating processing for roadbed modification. Paving items will also need to be adjusted for the additional width. See Plan Preparation Guide for typical sections.

Rubblization. This is a rehabilitation process performed on failing concrete pavement that is deemed to be in a worse condition than concrete slated for a crack and seat procedure. A guillotine type of machine is used to destroy the concrete to the point of making into base material (it's no longer concrete). A prime coat is then placed and then the structural section plantmix is laid.

See section 410 in the Standard Specifications for more information on this operation and associated bid items.

Open grade. Open-graded plantmix surface wearing course will be placed on all facilities with speeds in excess of 40 MPH and facilities with speeds of 40 MPH and less where there is stop and go traffic and/or abrupt turning movements. Generally, this will be all arterial streets and highways. The open graded plantmix surface may be eliminated from such roads if it is demonstrated that an alternate wearing course type (chip seals, etc.) would be more cost effective. This is to be evaluated on a project-by-project basis by the Materials Division.

The open-graded must be flush with the top of surface drainage inlets on bicycle routes and bicycle lanes and/or where the inlets encroach into a travel lane. In some cases, special details will be necessary to modify existing drainage facilities. In snow removal areas the open-grade should be placed full width to eliminate drop-offs, grade breaks and other undesirable features that cause the snow removal equipment to snag and/or grade off plane (i.e. paved turn out's for chain up areas). Open grade is also to be paved flush with the lip of gutter in all cases.

Prime coats. Prime coats are applied between the base course and the first plantmix lift. Prime coats normally consist of MC-250; SS-1h may be used for prime coats in small areas. SS-1h requires two separate applications. (Asphalt type and application rate determined by Materials.)

Tack coats. Tack coats are applied between plantmix lifts. Plantmix lifts are placed in 3" maximum depths. (Asphalt type and application rate determined by Materials.)

Seal coats / sand blotter. Seal costs are normally placed on plantmix surfaces that do not receive open-grade. Examples of such areas may include approaches, paved islands, ditches, and dikes.

Mineral filler/ asphalt cement. See IFS Project Estimating Guide for items and percentages.

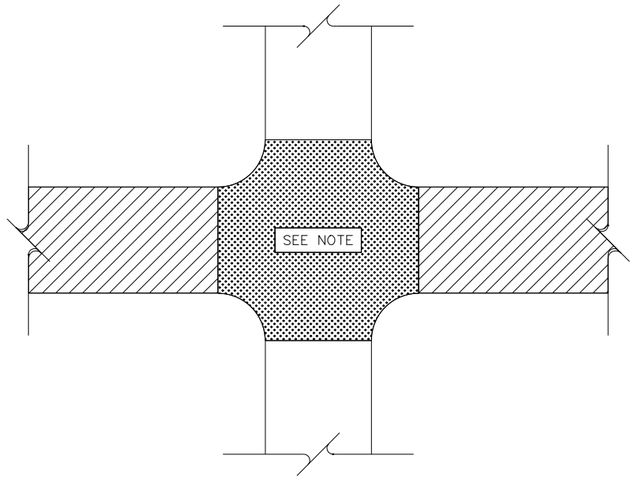
Miscellaneous paving. Limits of miscellaneous paving will be calculated as shown on page 29 in this Section.

STANDARD AREAS OF MISCELLANEOUS PAVING

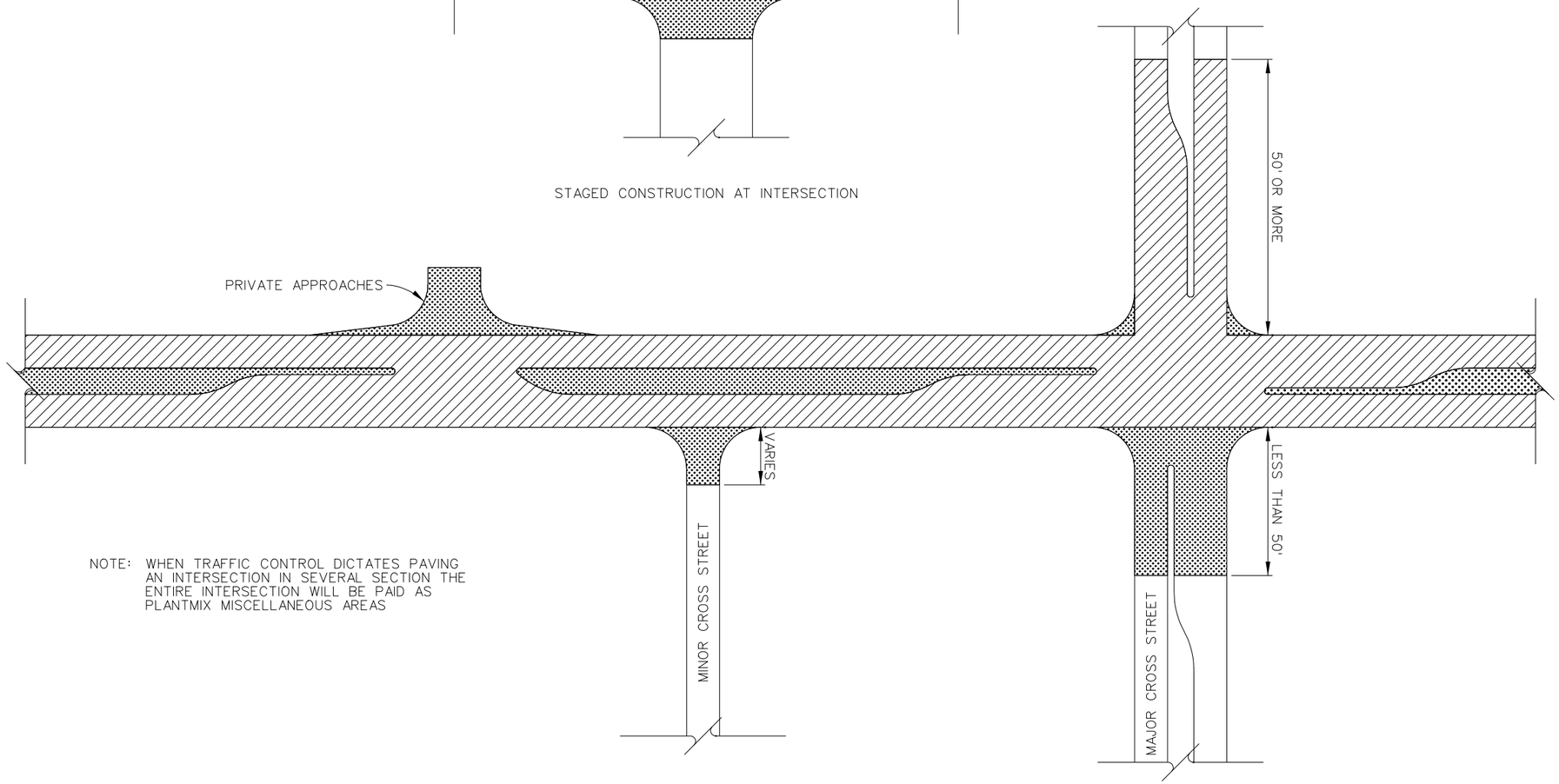
– LEGEND –

– LIMITS OF PLANTMIXING MISCELLANEOUS AREAS

– LIMITS OF NORMAL PAVING AREAS



STAGED CONSTRUCTION AT INTERSECTION



NOTE: WHEN TRAFFIC CONTROL DICTATES PAVING AN INTERSECTION IN SEVERAL SECTION THE ENTIRE INTERSECTION WILL BE PAID AS PLANTMIX MISCELLANEOUS AREAS

POLLUTION CONTROL

General. The Designer submits a project category score sheet to the Hydraulic Engineer generally before the Intermediate review submittal. The project category score sheet can be found in the Water Quality Manual (appendix A)

Hydraulics calculates the dollar amount to be included in the bid item for pollution control.

PRE-EMERGENT HERBICIDE

General. The use of a pre-emergent herbicide should be considered on plantmix surfaces that are 2" in depth in order to prevent vegetation from damaging the pavement. This should be discussed with the District Maintenance Engineer, Hydraulics, and coordinated with the Landscape Architect who will provide Specifications application rates. This is especially applicable to paved ditches, bicycle paths and other paved surfaces where excessive cracking would result in premature failure of an important design feature.

PULL BOXES AND LOOPS

General. To be developed.

REMOVALS

Clearing and grubbing. Clearing and grubbing items should be discussed with Construction and Specifications when selecting "Lump sum" versus "Acre."

Composite surface. Removal of Composite Surface is generally used to remove a combination of items such as concrete curb, gutter, sidewalk, plantmix surface, and aggregate base. Using this bid item eliminates the need to itemize removal of separate items. An example selecting this item is when trenching and widening in an urban area where all of these items would be encountered.

Detours. Any detours designated to be removed after construction will require bid item(s) for removal. Paved detours are usually removed under the bid item removal of bituminous surface and motor grader hours when the fill can be used to flatten slopes in the surrounding area. When this is not possible, such as in an urban area, the bid item roadway excavation or removal of composite surface may be used. Temporary "Sho-fly" detours with an aggregate base surface are generally removed with motor grader hours when the material can be utilized to flatten surrounding slopes.

Headwalls. When removing a headwall to extend a pipe, no allowance is given for cutting the pipe. Headwalls are to be removed without damaging the existing pipe (R.C.P. or C.M.P.) and payment for removal of the headwall is all inclusive. Cutting the existing pipe, while permissible, is not desirable (especially R.C.P.'s) and should be avoided when extending existing culverts. See Standard Specifications Subsection 601.03.06. In the case of extending R.C.B culverts, the headwall may be left in place as long as the existing headwall can be buried in the new roadway slope. See Standard Plans sheet (B-20.1.7)

Plantmix dike. On all 3R type projects, existing plantmix shoulder dike should be evaluated by Hydraulics to determine the necessity. Remove shoulder dike that is not warranted to remove roadside obstacles.

Traffic lines. Raised pavement markers do not need to be removed as a separate bid item when coldmilling and paving. Raised pavement markers will need to be removed with a bid item for slurry seals or other surface treatments.

RUMBLE STRIPS

Edge line. Rumble strips should be placed on all rural highways that have a shoulder width greater than or equal to four feet. In situations where the lateral offset of a longitudinal traffic barrier from the shoulder stripe is less than 5' then, in consideration of bicycle traffic, the placement of a rumble strip must be justified by an engineering study. The study should consider the consequences of omitting the rumble strip adjacent to the traffic barrier, and adjusting the lateral offset of the traffic barrier to provide at least five feet. Rumble strips normally will not require a seal coat unless otherwise directed from the Materials Division.

Rumble strips should be avoided within 1000' of residential areas.

Center line. At the request of Safety Engineering, center line rumble strips may be added to the project.

SHOULDER MATERIAL

General. Shouldering for new construction will be accomplished with the same material as the base course, not with shouldering material. Overlays outside of curb and gutter areas usually require a quantity for shouldering material. Shoulder material is not suitable for embankment, slope flattening, or backfill materials. Accordingly, it cannot be used to grade roadsides for guardrail, end terminals, crash cushions or contour fill over culvert extensions.

The use of milled plantmix material for shouldering material along concrete pavements and concrete pavement overlays is not allowed. Use of bituminous material adjacent to concrete pavements has led to water being trapped along the edge of the concrete slab that ultimately causes a pumping action.

Quantities. Shoulder material should typically be set up using the tons per station per side as shown in the table below. Quantities should be evaluated on case by case scenario and take into account excessive erosion or low shoulders.

SHOULDER MATERAIL (TONS PER STATION PER SIDE)

Height of overlay	Tons
2”	10
3”	15
4”	20
5”	25
6”	30

SIDEWALKS AND RAMPS

General. Schools, daycare facilities, senior homes, etc. can provide unusual pedestrian, bike, and motorized chair movements. Any observation of unusual pedestrian activity including high volumes, special needs or mobility issues should prompt the designer to obtain actual pedestrian traffic data from Inter-modal Planning. Traffic generators that create intermittent peak demands, such as schools, may require special design considerations. Issues such as capacity, access and inter-modal continuity should be considered when determining what data is required to design an appropriate facility.

When feasible, pedestrian under-crossings should be designed so that continuous lighting is provided through the structure. Along freeways or expressways where frontage roads intersect with local streets with walkways, it is desirable to construct walkways along the frontage road to provide continuity.

Width. As a general guideline, the desirable width of a walkway should be at least six feet, but in areas with heavy pedestrian activity walkway widths up to 12’ should be considered. The sidewalk must be a minimum of 48” wide with no wall or post-mounted objects that have leading edges between 27” and 80” above the surface protruding 4” or greater into it.

When determining the appropriate width for walkways, the designer should consider total pedestrian volumes, the presence of pedestrian traffic generators (i.e. schools, hospitals and banks), the proximity of vehicular traffic, the placement of street hardware (i.e. fire hydrants, light standards and street signs), and the nature of the pedestrians expected to use the facility most often.

Additional resources. Design issues are discussed in AASHTO’s A Policy on Geometric Design of Highways and Streets and FHWA’s Designing Sidewalks and Trails for Access, Parts I and II. Design considerations for access by disabled persons are discussed in AASHTO’s Policy on Geometric Design of Highways and Streets and the Access Board’s “Accessible Rights-of-way Design Guide” and “ADA and ABA Guidelines”.

Policy and Procedure. See Section 4 concerning ADA policy and procedures.

SLOPE FLATTENING

General. For projects that require slope flattening to bring slopes into compliance; accomplish the work with a borrow embankment/roadway excavation items. If encountering rock slopes and the material will be used as fill, consider using selected borrow or shoulder material to cap the roadway slope to provide a smooth surface. The depth of selected borrow or shoulder material should be discussed during the PDFS and consulted with Constructability. See roadside design in Section 2 for desirable roadway slopes.

Platform. When constructing new fill slopes adjacent to existing steeper fill slopes, the minimum proposed sub-grade width should be 10’ to allow construction equipment to construct “sliver” embankments. Geotech and Constructability should be consulted.

SOIL STABILIZER

General. New embankment or slope flattening projects not designated for landscaping should be treated with soil stabilizer. The calculated area includes the disturbed area and any maintenance roads or temporary access roads necessary to construct the project that will no longer receive traffic. Coordinate the use of soil stabilizer with the Hydraulics Division.

STOCKPILES

General. Maintenance stockpiles that are produced expressly for that purpose require a separate funding breakout and the FHWA will not participate in these costs. Normally such stockpiles are funded through the district's betterment program. Maintenance stockpiles that are produced incidental to the construction (such as with coldmilled product) require coordination with the district engineer to ensure that an area will be available to handle the amount of material when the contractor is ready to deliver it.

STRIPING

Striping width. On interstates and freeways, edge line striping shall be 8” wide, lane lines 6” wide, gore lines, auxiliary lanes and dotted lines leading up to the gore shall be 12” wide. All other roadway types, edge line and lane lines are usually 4” wide.

Bike lanes are striped 6” wide. See Standard Plans for other striping widths and markings.

Temporary striping. Temporary centerline and lane lines must be placed on pavement that is not the finished surface whenever traffic will utilize the pavement. If traffic will be on the new surface for more than 14 calendar days, then temporary striping should also be used for edge lines, crosswalks, stop bars, gore markings, railroad crossings, words, symbols, etc. The estimate of quantities must include the temporary striping for all lifts of asphalt that will carry traffic.

Temporary tape. Type 1 tape is more readily removable from the surface and is recommended for use on surfaces which are not designated to be covered or removed, and on temporary areas where traffic patterns are to be altered. Type 2 tape is much more difficult to remove from the surface and is recommended for use on surfaces which are to be covered or removed in which removal of the tape will not usually be required. The use of temporary pavement marking tape shall not be used on sections where cold milling conflicts with pavement markings. It will be necessary to paint pavement markings in these areas. The use of tape should be discussed during the traffic control meeting if it is determined to be used on the project.

Permanent striping. Combinations of striping and reflective and non-reflective pavement markers are used in Clark County. See standard plans for location of reflective and non-reflective pavement markers. For all other counties, epoxy paint for lane lines, shoulders, and gores are normally used on Interstates and NHS. Waterborne Type II is used for all other roadways unless requested by District.

Permanent pavement markings. For Stop bars, cross-walks, arrows, “ONLY”, and railroad pavement markings use Type 2 marking film for new paving projects to receive open grade. The use of thermoplastic is generally used on roadways that receive other surface treatments such as chip seals, micro surfacing, and PCCP.

TRAFFIC CONTROL

General. Use NDOT Standard Plans and the MUTCD for the development of traffic control plans. Often, such as for the design of work zone traffic control, it is desirable to analyze the impact that temporary measures are expected to have on traffic. Situations that require a lane reduction or detouring traffic onto a lower capacity facility are good examples of where the level of service will likely be reduced. By understanding the potential impacts of this reduction the design team can establish additional measures to improve the temporary condition such as:

- Adjusting signal timings
- Restricting the hours of construction operations to avoid peak volumes
- Providing adequate storage area for turning movements
- Adjusting lane assignments to match morning/evening directional peak flows

If hourly counts are needed to determine limitations of operations for work zone traffic control, the information should be requested for the anticipated time when construction is expected to occur. The Principal Traffic Engineer should be consulted for analysis of the data and recommendations regarding acceptable working hours.

Arrow Boards. See Standard Plans (T-35.1.1) for the type of arrow board used during construction.

Cones Vs Drums. The use of cones is normally used for traffic control in urban or rural areas where the speed limits is below 50 mph. Use drums on all interstate and NHS routes; rolling operations such as striping may use cones if approved during the traffic control meeting.

Portable barrier rail. The Designer is cautioned when using portable barrier rail around intersections and approaches. Check for site distance issues that may arise during construction when barrier rail may be installed. When lump sum traffic control items are used, note any potential site distance conflicts in the plans or special provisions. Select the appropriate end treatment from the Standard Plans.

Barrier rail is generally used when longitudinal drop offs exceed 3” with speeds greater than 35 mph. The use of portable barrier rail is evaluated on a case by case basis should be discussed during the PDFS and traffic control meetings.

Low profile impact attenuators. The use of low profile impact attenuators may be specified were sight distance is an issue such as around approaches or intersections.

Contractor furnished – lump sum. Projects in rural areas may use the lump sum method. Projects located in major urban areas, such as Las Vegas, Reno and Carson City, will be based on individual bid items and plans. Projects located in small urban areas such as Elko and Winnemucca may use lump sum if decided during the traffic control meetings. Lump sum traffic control requires formal approval from the Chief Traffic Engineer.

On contracts using lump sum traffic control plans a traffic control matrix and device summary is unnecessary since the construction phasing and staging requirements will be the responsibility of the contractor. The construction Division is responsible to provide the designer with the number of working days, project completion date, flagger hours and liquidated damages.

Refer to the Work Zone Safety and Mobility Implementation Guide 2008 edition.

Temporary lane width reductions. The reduction of lane widths to accommodate construction should be evaluated carefully and reducing lane widths to less than 11' requires approval of the Chief Road Design Engineer. Refer to over dimensional permits under Administrative services in Section 5 concerning lane width reductions.

Policy and procedure. See Section 4, project reporting, concerning traffic control minutes.

Speed reductions. Existing speed limits shall remain in effect through work zones on state highways except where those work zone activities would create a condition that would be aggravated by retaining the existing speed limits. On those types of projects, the plans or specifications shall specify speed limit reductions through the work zone. Such conditions could include:

- Reduction in lane widths
- Reduction in the number of lanes and/or shifting of lanes from the designed alignment
- Uneven surfaces
- Temporary surfaces such as roadbed modifications, cement treated bases, chip seals, etc.

A temporary reduction in the regulatory speed limit may be established as part of the traffic control plan, including those furnished by contractors. Temporary regulatory speed limit signs shall not be erected or uncovered until all appropriate work zone signs have been placed in accordance with the approved traffic control plans.

The regulatory speed limit in a project work area may be temporarily reduced by 10 mph or to 55 mph, whichever is lower; the Director must approve greater reductions based upon a recommendation from the Chief Safety/Traffic Engineer. In other words, the following speed limit reductions may be temporarily implemented for work zone traffic control without the director's approval: [a] any speed limit of 65 mph or more can be reduced to no lower than 55 mph and [b] any speed limit of 60 mph or less can be reduced by no more than 10 mph. Greater reductions must be reviewed by the chief safety/traffic engineer and require the director's approval on case by case basis. This policy applies to traffic control plans furnished by the contractor.

The temporary regulatory speed limit should be instituted when the daily operations begin and removed when the daily operations end but in no event more than two hours before or after the beginning and end of operations.

The temporary regulatory speed limit should not be left in effect beyond the daily hours of operations unless the condition for which the speed reduction was implemented continues to exist, or channeling devices are required to route traffic through the work zone area. Additionally, the temporary regulatory speed limit should not extend beyond the reasonable limits of the actual current work area regardless of the extent of the project area unless conditions exist elsewhere in the project area that requires a reduced speed limit.

Unless otherwise approved by the Director if a project is shut down for the winter or if no substantial work on the project takes place for 30 days or more, the project area shall be left so that the original regulatory speed limit may be reinstated without a significant safety hazard to motorists.

The original regulatory speed limit shall be resumed by posting new signs at the end of the work zone for each direction of traffic. Speed limit signs alone do not always reduce vehicle speeds in highway work zones. Law enforcement officials should be called on to discuss the application and to provide enforcement of work zone speed limits. The Resident Engineer or Maintenance Supervisor shall contact the proper authorities for notifications of dates, times, duration, and location for which the new temporary regulatory speed limit signs will be erected.

SECTION 4 POLICY AND PROCEDURE

This Section addresses specific policy and procedures for items that are the responsibility of Roadway Design. This Section also defines submittal requirements, project types, scope, and reports that are commonly encountered on capacity and 3R projects.

AMERICANS WITH DISABILITIES ACT (ADA)

Policy. Pedestrian facilities owned by NDOT undergoing alteration, as part of the project scope, must conform to current criteria where technically feasible. This policy includes adding new sidewalks to provide continuity when there is activity, need, and it is economically feasible. Where constraints (such as existing grades, buildings, walls, major utilities, etc.) prohibit full compliance the alteration shall conform to the maximum extent possible. Sidewalks owned or maintained by another agency or private property should be brought into conformance with current standards. However, these improvements are contingent upon the owner agreeing to pay for them. If the NDOT's offer is rejected or the party involved does not respond to repair their sidewalk as part of our project, NDOT proceeds without including that work. The letter should state they have 15 days to respond.

As an example of some of the deficiencies are narrow raised medians extended through crosswalk areas, push buttons for crosswalks are un-accessible to the handicapped, and curb ramps not constructed at intersections.

Any curb ramps within the limits of construction that do not meet the minimum ADA Accessibility Guidelines requirements shall be reconstructed to current department standards except that where the only deficiency is the absence of a detectable warnings; the curb ramp need only be retrofitted with a detectable warning. For ramps maintained by other entities: [a] the detectable warning may be constructed with products approved by that entity in lieu of the department's qualified products and [b] other local entity ADA compliance standards may be used instead of the department's if approved by the Chief Road Design Engineer. Raised median islands that encroach into a crosswalk shall be adjusted to allow unobstructed passage or be modified to have curb cuts and/or ramps constructed in accordance with current criteria.

Procedure. For badly deteriorated sidewalks, curbs and gutters being considered for replacement, the PDFS report must include photographic evidence of the condition. New sidewalks will be considered based on: [a] pedestrian activity and needs, [b] right-of-way and utility constraints, [c] environmental constraints, and [d] other applicable considerations.

The city, county or private property owners may construct and maintain walkways within the state's right-of-way but are subject to obtaining a permit from the State through the District Office.

All exceptions to the design standards shall be identified and justified, taking into consideration the effect of any deviation from design standards on safety. The project files must include this information. Approved exceptions shall be identified either in project correspondence or on the project plans. The Chief Road Design Engineer's approval must be obtained in writing for all design exceptions.

ADJUST COVERS

Procedure. The Designer submits 3 sets of plans to the right of way utility agent to obtain location of manhole and valve locations. See Estimation Guide for obtaining 3rd party agreement numbers. See Section 5 Right of Way/ Utilities for additional information.

APPROACHES

Policy. On preservation projects outside of urban areas and where no curb and gutter section exists, all existing un-permitted approaches will be improved to current minimum standards (at least Type 1), so long as the approach owner obtains the necessary encroachment permit for which the fee will be waived. This does not apply to situations where no defined and periodically used approach exists, such as at a seldom-used stock gate in rural areas or at an obviously abandoned approach. Do not encourage access where access is not commonly needed or presently used. Work on these approaches, which shall be at State expense, shall be the absolute minimum necessary to bring the approach to the minimum standard and shall be predicated on the owner making application for an encroachment permit in those instances where a permit has not been previously issued. If the owner does not make application for the permit, no work will be performed on the approach.

Procedure. During the initial field reconnaissance on any preservation project, the design squad shall locate all qualifying approaches and plot them on preliminary design plans. They will then correlate these approaches with those reflected on the permits maintained in Central Records. A set of the plans showing the approaches with those noted that are under permit will be submitted to the Right-of-Way Division. The Right of Way Division shall perform the necessary title work to determine the names and addresses of the property owners served by the approaches without permits and shall make the necessary contacts with the property owners.

Encroachment permits can be found under the respective District on SharePoint

BENEFIT COST ANALYSIS

General. To be developed.

BIKE FACILITIES

Policy. The bicycle elements of local master plans must be considered in the design process. A bicycle facilities checklist must be completed for all projects. Bicycle facilities developed by the department shall be designed for transportation, or commuter type, users (in contrast to recreational users). On roads designated as bicycle lanes and routes, the striping and signing shall conform to the appropriate standards. Adequate consideration shall be given to the perpetuation of existing bicycle traffic that will be affected during the construction of proposed improvements. These considerations must be reflected in the traffic control plan. Bicycles are not normally allowed on the shoulders of urban freeways. On any rural road that allows bicycle travel the shoulder shall be reasonably designed to accommodate bicycles.
NDOT does not eliminate vehicle travel lanes on existing streets in order to provide bicycle lanes.

NDOT builds short sections of paths that connect on-system bike lanes to other on-system bike lanes or paths where the missing section is on NDOT right-of-way. It is preferred that designers provide additional facilities to assist bicycle operators at destination points within the bikeway network. This can reduce conflicts with other transportation modes such as pedestrians at busy traffic areas like parks and transit terminals.

Procedure. At the request of the proper governing body, consideration may be given to provide for bicycle paths within the highway right-of-way. Of particular concern are those projects in urban, suburban, recreational areas, and areas of anticipated land use change that could affect the transportation facility. When the actual paths are not a part of the immediate design, sufficient room for their future construction should be considered and may be included in the right-of-way width requirement. Local government improvements that would interfere with the primary purpose of the right-of-way will not be allowed.

Information is requested through Inter-Modal Planning for bicycle facilities, bus lanes and turnouts, and missing ADA improvements.

CATTLE GUARDS

Policy. Existing approaches that enter a state highway within a project's limits in fenced areas should be reviewed for additional livestock protection, especially where such installations would not affect anyone adversely. During the design of new facilities attention must be given to approaches that intersect state highways, especially on controlled access facilities. Where there may not be livestock grazing in the immediate area, there might be livestock in the surrounding area that could eventually get onto the highway. If an existing approach is used for stock drives then a gate should be installed next to the cattle guard.

Painted cattle guards shall not be permitted at any location on or adjacent to a state highway where a cattle guard would be specified to prevent livestock from entering highway right-of-way; Existing painted cattle guards shall be removed as right-of-way fencing projects are undertaken or as funding becomes available and at that time non right-of-way fences shall be terminated at the right-of-way line(s). Additionally, cattle guards may be installed subject to the following conditions:

- In areas where right-of-way is fenced through grazing lands and where a gate on an approach is impractical: (i.e. local roads, driveways, approaches, etc.)
- On entrance and exit ramps or preferably on approaches (Cross Streets) to the Interstate or other controlled access highways in areas where grazing lands may be encountered.

In no case shall cattle guards be permitted across the travel lanes of any highway having full control of access. On the Interstate or other full control of access highway, gates may be permitted.

Procedure. The installation and removal of cattle guards will be the responsibility of the Road Design Division on a site-specific basis. Coordinate the installation or removal of these facilities with right of way, BLM, and the appropriate district.

DESIGN EXCEPTIONS

Policy. Where the "Green Book" or interstate standards apply, design exceptions are required for projects that do not meet standards for the following controlling criteria: [1] Design Speed; [2] Lane Width; [3] Shoulder Width; [4] Bridge Width; [5] Structural Capacity; [6] Horizontal Alignment; [7] Vertical Alignment; [8] Grades; [9] Stopping Sight Distance; [10] Cross Slope; [11] Super-elevation; [12] Horizontal Clearance (other than the "clear zone"); and [13] Vertical Clearance.

Although all exceptions from accepted standards and policies should be justified and documented in some manner, the thirteen controlling criteria noted above, require formal approval. Design exceptions to these controlling criteria can, in the most part, be easily identified and defined. However, two items, horizontal clearance and design speed, warrant some further explanation and discussion as indicated below.

Procedure. Design exceptions are addressed to the Chief Road Design Engineer, from the originating Project Coordinator or principal engineer, and recommended by the appropriate Assistant Chief Road Design Engineer. Design exceptions approved by NDOT for the FHWA are still subject to FHWA oversight through periodic process reviews. An outline for preparing design exceptions can be found on SharePoint.

Design exceptions are normally prepared and approved during the preliminary design phase but no later than setting right of way.

If the FHWA is involved in reviewing and approving plans, specifications and estimates for any interstate and NHS project, then FHWA must also review and approve design exceptions to the thirteen controlling criteria standards applicable to that project.

On all other projects, the Assistant Director, Engineering, must approve design exceptions for these thirteen controlling criteria. Evaluation and documentation requirements for those approvals will be as if doing it for the FHWA. The Chief Road Design Engineer may approve design exceptions for elements other than the thirteen controlling criteria.

All exceptions to the design standards shall be identified and justified, taking into consideration the effect of any deviation from design standards on safety. The project files must include this information. Approved exceptions shall be identified and kept in the workbook under project correspondence. Design Exception requests to FHWA should be addressed to the FHWA Division Administrator, from the Assistant Director, Engineering. Design Exception memoranda to the Assistant Director, Engineering, should be from the originating Project Coordinator or Principal Engineer. The Chief Road Design Engineer must review and recommend all design exception requests prior to submittal to the FHWA or to the Assistant Director, Engineering, for approval. All design exception documentation and approvals are to be kept in the project notebook. Approval letters are also to be kept in the Roadway Design "Design Exceptions" general file and in the central records project files.

Horizontal Clearance. This item refers to clearances designated in the Green Book or Interstate Standards. It does not refer to clear zones. While a recovery area clear of unyielding objects should be established for all projects, the criteria for clear zones comes from the AASHTO Roadside Design Guide and should be treated as guidance for setting individual project or statewide criteria. The Roadside Design Guide is not a national standard requiring a design exception if not met.

Design Speed. Design speed is a concept by which coordination of the various physical design elements is achieved. Design speed has a significant effect on the operation and safety of a highway because it is used to determine various individual design elements with specific dimensions such as stopping sight distance or horizontal curvature. Therefore, a "design speed exception" is really an exception to individual physical design elements (e.g., stopping sight distance, vertical curvature, super-elevation, etc.) and accordingly must be justified on that basis. For instance, if design speed cannot be achieved because it is impossible to get the proper stopping sight distance, the justification would be written around the stopping sight distance constraints.

Mitigation. Possible mitigation strategies for design exceptions can be found on SharePoint.

GEOMETRIC APPROVALS

Policy. Federal projects developed under partial oversight and all state projects with new or significant changes to alignments, super-elevations, velocities or AADT require a geometric approval. In all geometric approval requests the reasons for any changes and non-standard geometrics shall be included along with plan and profile sheets and striping sheets depicting the new or changed geometrics. This is essentially a method for summarizing the geometric design issues that were encountered during the development of the project in order to facilitate a one step formal approval process. Accordingly, there should not be any new geometric design issues introduced into the project at this step; all such issues should have been discussed with the appropriate managers and adequately documented during the preliminary, or occasionally the detail design phase of the project.

Procedure. Principal Road Design Engineer prepares a memorandum to the Assistant Director, Engineering. The memo shall include a "Concur and Recommend Approval" line for the Assistant Chief Road Design Engineer's signature and an "Approved" line for the Assistant Director, Engineering's signature. Always submit the prepared request to the Assistant Chief Road Design Engineer for concurrence prior to forwarding to the Assistant Director - Engineering. For full oversight projects the Assistant Director, Engineering requests approval by a letter to the FHWA division administrator.

The geometric approval must be prepared and approved before setting final right of way.

An outline for preparing geometric approvals can be found on SharePoint under standard project memo templates.

GEOMETRIC UPGRADES

Interstate and NHS. Evaluate geometrics that are significantly nonconforming to current standards including alignments, shoulder widths, gores, ramp lengths, and sight distance. Improvements to rural interchanges should only be made if the interchange services a significant traffic generator such as a rest stop, recreational area or business access or if the improvement can be justified by crash reduction.

Constructing emergency maneuvering areas on exit ramps where none currently exist should be considered. Ramp gores should be improved to the current minimum physical gore width.

The shoulders on ramps are commonly too narrow causing problems for work zone traffic control. The minimum width of shoulders should be 8' on the outside and 4' on the inside with an additional 2' of widening for each side that is adjacent to a traffic barrier.

Traffic barriers near intersections, median crossovers and approaches should be evaluated to determine if the installation obstructs the required sight distance and corrective measures should be taken as appropriate.

The profile grade must be corrected where a history of transitioning surface improvements at the beginning and/or ending of the project has rendered the profile grade substandard. An example of this is sometimes found where plantmix overlays meet Portland Cement Concrete Paving (P.C.C.P.).

The roadsides, including medians, should be brought into full conformance with the Road Design Guide. Some situations frequently encountered are:

- The clear zone may be different from previous contracts due to increased traffic volumes, increased running speeds, and/or recoverable slopes becoming non-recoverable slopes from shouldering operations. This may require redesigning the roadsides.

- Critical roadside slopes within the clear zone shall be flattened or shielded with a traffic barrier as determined by economic analysis. Right-of-way and environmental impacts must be considered when evaluating slope flattening.

- Non-conforming culvert installations should be evaluated and treated with an appropriate safety measure including installing safety grates, extending with contour fill, or shielding with traffic barriers as determined by economic analysis.

- Vertical clearance under existing bridge structures need to 16.5'.

- Mailboxes, lighting standards, and signs that are not crash worthy should either be moved outside of the clear zone or replaced with an approved system.

- Steel post 3-beam systems with 14" modified steel offset blocks do meet the NCHRP350 test requirements however the department no longer uses this configuration due to the 2" height difference between it and the other 3-beam configurations. Therefore any such installation that is being altered in any way, either permanently or for temporary construction purposes, should have the offset blocks replaced with an approved offset block from the QPL.

Non Interstate and NHS. Non-conforming items as listed above should be evaluated on a case by case scenario based on crash information.

OUTSIDE INFORMATION AND CONFIDENTIALITY

Electronic files. The external distribution of electronic project files requires the recipient to enter into an agreement with the department regarding the authorized use of the information. For entities generally known to the department (such as public agencies, utility owners, consultant firms, general contractors, etc.), and that are working closely with the department on the associated project, the "Disclaimer and Agreement" form may be used. The original signed document will need to be returned by the recipient to the department, however, the form can be faxed to the requestor for signature then faxed back to the department for the digital information to be provided.

The "Disclaimer and Agreement" can be found on SharePoint.

For large complex urban projects, or any project designated as a super project, a "supplemental certification and agreement provision of digital design information" must be processed through the Administrative Services Division.

Engineers estimate. A detailed Engineers Estimate will not be released to the public or construction industry from the time the project is programmed, until the end of the bid opening. During the advertisement period the bid items and quantities will still be included in the "Estimate of Quantities" that is generated by Administrative Services. The Department's Unit Bid Prices will be held confidential until the bid opening. The updated IFS CM 30 report can be used to provide bid items and quantities for anyone outside the Department who requests the information; such as, the asphalt producers, concrete manufacturers, CMP & RCB producers, contractors producing aggregates, etc.

PROJECT REPORTING

Example of the documents listed below can be found on SharePoint.

Airway-Highway Clearance Requirements. Any construction activities that interfere with FAA airport or heliport glide paths will require a "Notice of Proposed Construction or Alteration" (form 7460-1). General guide lines are (1) any construction or alteration of more than 200 feet in height above the ground. (2) Any construction or alteration of greater height than imaginary surface extending outward and upward at one of the following slopes:

- 100 to1 for horizontal distance of 20,000 feet from the nearest point of the nearest runway of each airport (as defined in the FAA guidelines) or with at least one runway more than 3,200 feet in actual length, excluding heliports.
- 50 to 1 for horizontal distance of 10,000 feet from the nearest point of the nearest runway of each airport (as defined in the FAA guidelines) or with at least one runway more than 3,200 feet in actual length, excluding heliports.
- 25 to 1 for horizontal distance of 5,000 feet from the nearest point of the nearest landing and takeoff are of each heliport as defined in the FAA guidelines.

Forms, instructions, and further explanation can be obtained online at www.faa.gov Contact Western Pacific Regional Office, Air Traffic Division, AWP-520, 15000 Aviation Boulevard, Hawthorne, CA 90260
Phone: (310) 725-6557

Preliminary scoping report. The Scoping Coordinator prepares a report describing the alternatives and their respective scopes and submits it to the Chief Road Design Engineer for approval. The report must also include any concepts that were dropped from consideration as an alternative and the reasons why. The report must contain a diagram of each alternative that indicates the locations of at-grade intersections, grade separations and interchanges. The diagram must also show the locations of any identified avoidance areas, proposed bridge structures, major utilities, and proposed major off-site drainage facilities. The report is based on the conclusions derived from the traffic operational analysis and any other pertinent information discovered while investigating the various design alternatives.

Design constraints. On capacity projects, this document is prepared by the Project Coordinator to summarize the design criteria to be used on the project and any constraints imposed upon the project by management. This document essentially summarizes the operating parameters the design team will use for the project.

Design exceptions. The Principal Design Engineer prepares a design exception memo. See Design Exceptions in Section 4.

Design notes to specifications. These notes are prepared by the Designer and are required to inform the specifications writer of special or non-standard construction materials or construction methods being used on the contract. They need to be of sufficient detail for the specifications writer to incorporate them completely into the contract as a Special Provision. When writing them it is essential to refer to the Standard Specifications to ensure that conflicting information is resolved and that the note conforms to the format of the Standard Specifications.

Dredge and fill report. The Designer prepares this information when requested by Environmental Services (as required under Section 404 of the Clean Water Act for dredging and fill within U.S. waters.) This report is issued when the roadway, bridge and drainage designs are sufficiently developed to generate realistic estimates of the related project impacts measured as the footprint (area of work within the high water mark) and the associated volumes of material. The report must contain a map indicating the locations involved, a summary of the locations with a description of the work, the area of impact, and the volume of material to be removed and/or deposited within U.S. waters.

Geometric approval memo. The Principal Design Engineer prepares a geometric approval memo. See Geometric approval policy and procedure in this Section.

Preliminary design field study (PDFS) report. The Project Coordinator prepares the findings of the field study, along with any recommendations and conclusions resulting thereof, shall be discussed in the report. The report includes a list of attendees; the proposed scope of work; the time and location of the study; and any related information that arises between the study and completing the report. Provide photographs of items or areas that are itemized in the report. The report should be reviewed and commented on by the PDFS team prior to the Chief Road Design Engineer's approval. A copy of the final report of forwarded to the Standard and Compliance Specialist.

Proprietary products. Specifying brand name products that have not been submitted to, nor approved by the Product Evaluation Committee (PEC), must be justified as being in the public interest by memo from the requesting Division or District to the Chief Road Design Engineer. On Federal Oversight projects, justification will be forwarded to the Federal Highway Administration for their approval with the Chief Road Design Engineer's recommendation. All public interest justifications must discuss why the product was not processed through the PEC. Specifying proprietary products for state and federally funded construction projects is generally prohibited. The state statute, NRS 338.140, Drafting of Specifications for Bids: prohibits specifications that call for a designated material, product, thing or service by specific brand or trade name (i.e. proprietary products) unless:

- Method 1. The product is designated to match others in use on a particular public improvement either completed or in the course of being completed: or
- Method 2. At least two brand or trade names of comparable quality or utility are included and are followed by the words "or equal." The NRS further states, "In those cases involving a unique or novel product application required to be used in the public interest or where only one brand or trade name is known to the specifying agency, it may list only one."

The use of Method 2, as noted above, is normally not allowed. If there are two or more known brands of the product that are potentially acceptable, it is expected that they will be submitted for evaluation by the PEC. If the product in question will be used infrequently, or is unique to a small number of projects, it may be inappropriate for inclusion on a QPL and Method 2 would apply. This must be documented in the form of a memo from the requesting Division or District to the Research Division Chief, stating why the product is not appropriate for a QPL. The memo must include a signature line for the concurrence of the Research Division Chief.

Requests to specify a brand name based on compatibility with other completed improvements or when only one brand or trade name is known to exist, must be justified in writing by the requesting Division or District for approval by the Chief Road Design Engineer.
Certain products may warrant a trial section (experimental construction) on an upcoming project in order to observe and evaluate performance under in-service conditions. Such requests must be made through the PEC. The requesting Division or District in cooperation with the Research Division must develop an acceptable Work Plan. Requests for exceptions to this procedure must be submitted for approval to the Assistant Director, Operations.

The Product Evaluation Program is detailed in Chapter 2 of the department’s Research Manual. The Product Evaluation Committee only meets once per quarter so schedule requests accordingly; failure to plan ahead is not justification for an exception.

Local agency projects administered under the stewardship agreement must follow state law but they are not required to utilize the department's QPL.

Project checklist. The project checklist is not technically a report, but is intended for the Designer to use during the development of the project. The intent of the checklist is to help guide the Designer on major items that are commonly done on most 3R and capacity type projects. The checklist should be periodically reviewed to make sure certain items of work are completed or requested on an as needed basis. The QA/QC checklist can be found on SharePoint. The checklist should be printed and placed in the front of the workbook.

Purpose and need statement. This document is prepared by the Project Coordinator during the planning process and is updated as the project evolves during the project development process. The document needs to clearly demonstrate that a "need" exists and defines that "need" in terms understandable to the general public including a clear description of the problem(s) the proposed action is to correct. The purpose and need lays out why the proposed action is being pursued and demonstrates the problems that will result if the project is not implemented.

A clear, well justified purpose and need explains to the public and decision makers that the expenditure of funds is necessary and worthwhile. The purpose and need define what can be considered reasonable, prudent, and practicable alternatives. If an alternative does not meet the project's purpose or satisfy the needs then the alternative is not prudent provided the purpose and need section can substantiate that unique problems will be caused by not building the project.

The purpose and need should be as comprehensive and specific as possible and include:

- Justification of why the improvement must be implemented
- Reexamined and updated as updated as appropriate throughout the project development process

Request for access change report. The Principal Design Engineer prepares the control of access report. The report shall document the extents of the investigation; any excluded subject matter and assumptions; references to any pertinent laws, regulations and policy; the results of the investigation; the conclusions to be drawn thereof; and appropriate recommendations. A guide for writing a request for access change report can be found on SharePoint.

Right of Way setting memo. The memo is prepared by the Project Coordinator and shall be addressed to the Assistant Director, Engineering from the Project Coordinator. Recommend approval signature lines for the Chief of the originating division. Chief Environmental Services Division, Chief Right-of-Way Agent, Chief Hydraulic Engineer, and an approval signature line for the Assistant Director shall also be included.

The right of way memo should address the following:

- Plans that identifies all of the areas and parcels to be acquired.
- What is the acquisition (i.e. Fee Title, Permanent Easement, Temporary/Construction Easement, Controlled Access, Permissions to Construct)
- What alternatives were evaluated to avoid right of way (i.e. Retaining walls, Shifting the alignment, reducing design speed or other design exceptions)
- What is the justification for pursuing this course of action (i.e. costs, slopes, avoidance of environmentally sensitive area)
- Were all the Divisions contacted to determine if the amount is appropriate (i.e. room for construction staging and utility replacements)
- Is there an anticipation of changes or options that Right-of-Way can use in the negotiations?
- Will there be subsequent right-of-way settings?
- Is the current request part of an overall phasing plan - outline the plan.

A right of way check list along with sample right of way memos are available on SharePoint.

Traffic control minutes. The minutes of the traffic control meeting are to outline the traffic control strategy and develop the limitations of operations. The minutes are drafted by the Designer and are to include a list of attendees; the scope of work; the time and location of the meeting; and information that arises during the meeting.

Traffic control/constructability meeting minutes are sent out to Traffic, Specifications, and Construction for review and comments. After comments resolved, the final report is rerouted and a copy is placed in the workbook. Lump Sum Traffic Control is not exempt from these meetings occurring.

Projects that are within urban areas will require the review and approval of the Chief Traffic Engineer. For the purposes of this requirement urban areas shall be the counties of Clark, Carson, Douglas, Lyon, Storey and Washoe. Projects outside of these counties can be advertised without an approval letter signed by the Chief Traffic Engineer. The processing memo shall indicate which projects require a formal review by the Chief Traffic Engineer.

Traffic control meetings with Road Design, Traffic, Construction, and Specification representatives develop the Limitations of Operations (Section 108.04), Liquidated Damages (Section 108.09), Accommodations for Public Traffic (Section 624) and Contractor Designed Traffic Control Plans (625.03.05) for all projects. The limitations of operations, liquidated damages and accommodations for public traffic imposed on projects

will aid the Contractor in establishing the types of traffic control measures that will need to be included in the Contractor's bid documents. The design team must determine any constraints and requirements that are needed on the contractor's traffic control plan and include them in the design notes to specifications or otherwise address them in the contract documents. The design team should consider:

- A requirement to furnish minimum quantities of certain traffic control devices such as changeable message boards, traffic drums, arrow boards, etc.
- Requiring the use of traffic barriers, such as portable concrete barriers, to shield traffic from longitudinal drop-offs, excavations, and other construction activities.
- Any constraints such as reducing the number of lanes, lowering the speed limit, diminishing the lane widths, traffic on the coldmilled surface, staging, and ADA issues.
- The impacts on adjacent property owners such as restricted access, hours of operation, length of work zones, pedestrian access, emergency response, and special events.

Transportation Management Plan. Refer to the Work Zone Safety and Mobility Implementation Guide 2008 edition.

Tree Memo. Any significant trees (25 years and older or 8” in Diameter) that are required to be removed will require approval from the Assistant Deputy Director.

Workbook. The project workbook is organized into established sections and is considered the projects documentation. These standardized sections can be found in Designs file cabinet. All required reports and documentation needs to be neatly organized so that it can be found easily and checked either by another design squad or during QA/QC. Work sheets and calculations are also stored in the workbook along with the approved scope and decisions made during the design.

PROJECT SCOPE

3R Scope – Resurfacing, Restoration, Rehabilitation. This type of project includes work to preserve and extend the service life of an existing highway, including any safety improvements justified by existing or potential accident problems. Low cost operational improvements are also encouraged such as lengthening storage lanes, adding turn lanes, etc. Work is generally limited to pavement rehabilitation along existing alignment, and can include correction of minor subgrade problems, minor shoulder widening, minor adjustment of vertical and/or horizontal alignment, provision of turning lanes at intersections, arterial driveway consolidation, lengthening acceleration/deceleration lanes and construction of bus turnouts, and pedestrian and bicycle accommodations. These projects may also utilize Intelligent Transportation System (ITS) measures, such as signal retiming and detection, ramp metering, overhead sign structures, and incident detection and management. Work may also include drainage improvement, slope work, and/or replacement of signs and signals, guardrail and other roadside appurtenances.

The following are typical non-compliant Roadside Design issues to be considered for improvements on 3R projects:

- The clear zone may be different than from previous contracts due to: [a] increased traffic volumes, [b] increased running speeds, and/or [c] recoverable slopes becoming non-recoverable slopes from shouldering operations. This may require redesigning the roadsides. Critical roadside slopes within the clear zone should be addressed where there is a history of roadside crashes occurring in the vicinity. Right-of-way and environmental impacts, such as those associated with earthwork and/or traffic barriers, must be considered in the benefit cost analysis.
- Existing traffic barriers may not be 3” or more inches below standard height after the roadway improvements are completed. Measures must be taken so those that would fall below the 3” allowance are restored to standard height.
- Traffic barriers should be brought into conformance with the current length of need. Obsolete crash cushions, guardrail end terminals, and barrier transitions (guardrail to bridge rail or guard rail to concrete barrier rail connections) should be upgraded to current standards. Steel offset blocks used on steel post 3-beam guardrail systems, other than the 14” modified steel offset block, did not pass NCHRP350 testing and should be replaced.
- Non-conforming culvert installations should be evaluated for appropriate safety measures including: [a] installing safety grates, [b] extending with contour fill, or [c] shielding with traffic barriers and treated accordingly if economically justified.
- Mailboxes that are not crash worthy should either be moved outside of the clear zone or replaced with an approved system.
- Signs and light poles should have crashworthy bases. Bases may be adjusted if shouldering or other project activities render them ineffective.
- Rumble strips shall be installed on any shoulder that is at least 4’ wide in rural areas. The rumble strip shall be eliminated through sections where the distance from the shoulder line to an adjacent traffic barrier is less than 5’. However, consideration should first be given to adjusting the lateral offset of the traffic barrier where the existing graded area is sufficient to attain the minimum clearance.

The following are typical non-compliant Geometric issues to be considered for improvements on 3R projects:

- Narrow shoulders may be contributing to run-off-road type crashes and consideration should be given to widening shoulders where it can be economically justified.
- Traffic barriers near intersections, median crossovers and approaches should be evaluated to determine if the installation obstructs the required sight distance and corrective measures should be taken as appropriate.

District contracts. Procedures and guidelines for District contracts are outlined on SharePoint.

Reconstruction and New Construction. These types of project includes work to replace an existing highway, including rebuilding to include current geometric standards, or construction on new alignment. Projects generally involve extensive rebuilding of subgrade, drainage systems, and utility work. These projects may also utilize ITS and ramp metering measures. These projects provide a full depth replacement of Portland cement concrete or plantmix bituminous surface.

Safety projects.

Surface treatment. Occasionally surface treatment projects are processed through design as headquarters contracts. It is desirable to field review these projects prior to final design. However, these reviews should be combined with project reviews for larger projects to save time and money. Surface Treatment projects include inexpensive preservation strategies such as chip seals, slurry seals and flush seals and do not require that other roadway or roadside features be upgraded to current standards regardless of the road classification.

Bridge replacement projects. The Bridge Program (formerly the Highway Bridge Replacement and Rehabilitation Program) provides funding to replace or rehabilitate substandard bridges owned by public agencies. Bridges that are privately owned, carry railroads, or are predominately for pedestrian/bicycle use are not eligible under this program. A bridge is defined as a structure that carries highway traffic and has a span (length) of 20 feet or more measured along the centerline of the road. A series of pipes or culverts can also be considered a bridge if the length is 20 feet or more.

The primary focus of the Bridge Program is to replace and rehabilitate deficient bridges. NDOT has determined 85 percent of Bridge Program funds will be used for replacement and rehabilitation projects. The remaining 15 percent will be used to administer the Bridge Program. Administration activities include conducting federally mandated condition assessment inspection, compiling federally mandated inventory data, developing and operating a Bridge Management System, and calculating load ratings for existing bridges.

At least 15 percent of Bridge Program funds must be spent on bridges that are Off the federal-aid system. A road's functional classification is used to define On and Off the federal-aid system. Roads On the federal-aid system includes roadways such as interstate, urban collector, and rural minor arterial while Off-System roads includes rural minor collector and urban local. Eligible project costs are funded at 95 percent federal and 5 percent local agency. Project costs eligible for Bridge Program funds include preliminary engineering, right of way, construction engineering, and actual construction costs.

Eligibility and priority for funding projects under the Bridge Program are based on a bridge's Sufficiency Rating. The Sufficiency Rating is a numerical assessment of a bridge's serviceability and is based on condition assessment inspection and inventory data. Its value varies from 0 to 100, with 100 representing no deficiencies. A bridge is eligible for replacement when its Sufficiency Rating is less than 50 and is eligible for rehabilitation when its Sufficiency Rating is less than 80. In addition to meeting the Sufficiency Rating requirement, a bridge must also be classified as either Structurally Deficient or Functionally Obsolete. A bridge is considered Structurally Deficient when key elements reach an established level of deterioration. A bridge is considered Functionally Obsolete when it no longer adequately serves the road it carries.

Replacement projects include constructing a new bridge in the same general highway corridor that the existing bridge serves. The bridge does not have to be built at the same location as the old bridge, but the old bridge must be removed. A nominal amount of approach work, sufficient to connect the new facility to the existing roadway or to return the roadway profile to an attainable touchdown point is also eligible.

Rehabilitation projects generally include widening, strengthening, and/or reconstruction of deteriorated elements. A rehabilitation project must correct the deficiencies making the bridge eligible for Bridge Program funds. Major safety defects must also be corrected as part of a rehabilitation project.

Betterments. Improvements that are beyond normal maintenance and outside the scope of preservation projects are addressed as betterments. Through its Betterment Program the department provides a district level budget for such improvements that covers a wide range of work. Much of the work in the betterment program is accomplished directly at the district level but some of these projects are designated for incorporation into a headquarters contract. If during the development of a betterment project it becomes apparent that a substantial change to the scope or cost is required, the project must be returned to the originating district for further disposition. Any proposal for a value added scope change to a betterment project must be submitted by the proponent, in writing, to the Assistant Director, Operations for approval. Betterment projects usually are not allowed to jeopardize the schedule of the headquarters contract.

Enhancements. Transportation enhancements are transportation-related activities that are designed to strengthen the cultural, aesthetic, and environmental aspects of the nation's Intermodal Transportation System. There are twelve eligible transportation enhancement activities. The most common of these are facilitates for pedestrians and bicyclists and landscaping. Program Development oversees the selection process for these projects. New projects are selected every other year. The funding for the project is limited to what was originally approved. The majority of these projects are completed under the Local Public Agency Program but some may be completed as a normal NDOT project.

Off-system. The more common types of off-system projects are bridge replacements, landscaping, lighting and sidewalks, and bikeways. Locally owned (off-system) routes for which NDOT is providing funding, be it federal or state, are to be designed to the local agency's current approved standards. If they have none, Green Book standards or the AASHTO publication, "Guidelines for Geometric Design of Very Low-Volume Local Roads" will apply.

PUBLIC INVOLVEMENT

Public meetings. The NEPA requires involving the general public in the development of capacity projects. These requirements are addressed during the engineering studies phase in cooperation with the Environmental Division and the FHWA. The following is the description of the general types of meetings:

Location public hearing is a public hearing held when the project involves a new location for which feasible alternatives can be developed before the route location is approved and before the department is committed to a specific proposal.

Design public hearing is a public hearing held for a project following a location public hearing and location approval, but before the Department is committed to a specific design proposal. It is held to ensure that an opportunity is afforded for effective participation by interested persons in the process of determining the specific location and major design features of a federal aid highway and it provides a public forum that affords a full opportunity for presenting views on major highway design features, including the social, economic, and environmental, and other effects of alternate designs.

Location / Design public hearing is frequently referred to as a "combination hearing," is a public hearing held for a project for which the alternatives are limited to a single feasible location as determined by public involvement or terrain or development restrictions, or there are a limited number of relatively minor alignment alternatives available on a basic location, or for an improvement on an existing facility when significant right-of-way acquisition is required or adverse impacts on adjacent property are anticipated or adverse social, environmental and economic impacts are recognized.

Opportunity for public hearing is a public notice that is provided to officially advertise a planned project when the proposed project has apparent local support and/or minimum impact. This is determined from public input to the intent-to-study notice and from informational meetings. The notice of opportunity for public hearing will advise the public of the pending project, where information is available, and how a hearing may be requested, including the time limitation on receipt of such a request. If a request is not received by the deadline, the project proceeds directly to the applicable approval action without a hearing. There may be occasions when only one or a few requests for a hearing will be received in response to the opportunity notice. In these instances, it will be permissible to meet with the parties at some convenient location to explain the project and answer any questions. If satisfied, the requesting party may withdraw the request for the hearing in writing. The proceedings must be documented and made a party of the project record. If the requesting party does not wish to withdraw the request, an appropriate hearing may be held. If not held, the Nevada Department of Transportation must document reasons for not holding a hearing and this will be made a part of the project record. Federal Highway Administration concurrence will be required.

Informational meeting is a meeting in either a formal or informal setting, depending on its intended audience, at which the objective is to present, receive, and/or exchange information. These meetings are useful for special interest groups, neighborhood associations, and advisory committees in particular. Informational meetings are noticed in a manner appropriate to the intended audience. Appropriate notice shall be no less than 15 days, in general circulation adjudicated newspaper(s) for meetings of general purpose; and could be several days' telephone contact for small, cohesive organizations. In general, these meetings are most effective early in project planning so that citizen responses can be evaluated prior to any commitment being made.

Intent to study letter is a letter describing the preliminary concept of the project (usually containing a location map or sketch of the project area), the details of any scheduled informational meeting, and requesting expressions of concern or special knowledge from the addressee. These letters are sent to all affected federal, state and local agencies, political leaders, recognized special interest groups, and known concerned/affected citizens.

Scoping is a study management technique specified in 40 CFR 1500 et seq. To provide "an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action." The use of a widely distributed intent-to-study letter, together with an informational meeting(s) if appropriate, constitutes the Nevada Department of Transportation scoping process.

Preservation projects. On preservation projects the department is occasionally obligated to coordinate certain improvements or project activities with the public. Any associated public meetings are arranged through the Public Meeting Officer and are usually very informal. The public involvement section on information meetings provides general guidance on this aspect of coordinating projects with the public. Some improvements that may require such meetings with the general public are:

- Changes to access
- Closing a median opening; leaving right in, right out access only
- Restricting left turn movements with a "worm island"
- Elimination of on-street parking
- Addition of lighting
- Establishing contractor working hours

Procedure. Once the need for a public informational meeting has been determined the Public Meeting Officer should be involved to provide guidance and assistance on the appropriate procedure. The public meeting officer must be involved with any informational meeting. They will find a place for the meeting and arrange to have a stenographer on hand to record public input. Their experience and skills are essential in planning, conducting and completing a public informational meeting process that meets departmental standards.

Requirements. On projects that require a public hearing, an intent-to-study letter will be sent to all affected agencies, political leaders, special interest groups, and known concerned or affected citizens. The intent-to-study letter is sent as early as possible in the project development process. The purpose is to identify the scope and significance of issues to be addressed.

Informational meetings will be held when deemed necessary and appropriate, usually early in the project development process. Information developed and obtained from these meetings is useful in determining whether or not a formal hearing is necessary or required. These meetings are very useful for informing the public of proposed projects and obtaining information on controversy and issues that may arise in the project development process.

Projects having significant social, environmental and/or economic impacts, or other significant impacts to abutting communities and resources will usually require location and design public hearing(s). These projects normally require an Environmental Impact Statement (EIS). Hearings will be held at a convenient time and location to maximize public participation.

On other projects that are processed with an environmental assessment or categorical exclusion, hearing requirements will be determined on a case-by-case basis. The following criteria will be considered in making a determination. Projects that require acquisition of significant right-of-way, or substantially change the layout or function of connecting streets and roadways, or substantially change the facility being improved, or have substantial adverse impact on abutting communities and resources, or otherwise may have social, environmental and/or economic impacts, will require either one or more public hearings or the opportunity provided for a hearing. Hearings will be held at a convenient time and location to maximize public participation.

Additional hearing opportunities are to be afforded when there have been substantial changes in the scope of the project, substantial unanticipated development in the area affected by the project, an unusually long lapse of time since the last hearing, and identification of significant social, environmental and economic effects not previously considered at earlier hearings.

RIGHT OF WAY SETTING

General. The right of way setting is a formal process to request the acquisition of right of way needed for a project. Generally the right of way setting should take place around the intermediate design when the scope of the project will not change but no sooner than the completion of NEPA approval and alternatives selection.

Procedure. On large projects, the Project Coordinator schedules a pre-right of way setting with the Chief Right of Way Agent to help orient the project team with the right of way and utility issues. Minutes of the meeting are distributed and incorporated into the final right of way meeting. Projects that require minimal right of way may skip the pre right of way setting at the discretion of the Chief Right of Way Agent.

The final right of way setting covers items generated from the pre-right of way setting meeting and finalized outstanding issues to set right of way. The need for right of way should be discussed and documented as to the location, the required limits, the duration, and the purpose the right of way is needed.

List and/or indicate on plan sheets, the various right of way takes, along with the existing property boundaries, and existing right-of-way widths. Further indicate all overpasses, alignment changes, and other features that will affect adjacent property owners and/or require additional right-of-way. List areas where multiple use of right-of-way is feasible and describe the possible use.

The different types and purposes of right of way to be acquired include:

- TE (Temporary Easement) – a temporary right of use over the property of another. Typical uses are construction, access, geotechnical testing, equipment or material storage, etc.
- PE (Permanent Easement) – a permanent right of use over the property of another. Typical uses are maintenance, drainage, access, utilities, slopes, hydrology retention and detention basins, etc.
- FEE SIMPLE – An absolute interest in land forever without limitation or condition.
- Slope easements – a permanent right to occupy property for the purpose of containing roadway slopes. The easement is dissolved if the property owner raises the grade and eliminates the slopes.
- P/C (Permission to Construct) – Written permission from an owner of land to accomplish specific construction upon that owner's land. Design is responsible for ensuring information pertinent to the P/C is included on the construction plans. Note: The only time NDOT can pursue a P/C is when the requested work is for the sole advantage of the property owner and is not necessary for the Department's project (i.e. repaving approaches.)
- "Prescriptive rights" means the Department has openly and continuously operated and maintained a highway for more than five years and though we have no documented rights to the land, we have a right through prescription to continue to operate and maintain the highway. The actual boundary of the Prescriptive Right would be the outer limits of the road surface, slope grading of shoulders, rehabilitation of ditches and dikes, maintenance of fencing and those areas regularly involved in the removal of bush, debris and rock; in short, whatever NDOT forces, or its contractors, have maintained.
- Prior rights is a right that has established a legal right to use real property. This right must precede and take precedence over the right of another. Types of documents that may be used to establish the "prior right" or compensable interest are, Franchise Agreements with a local government, Prescriptive Easements, Permanent Easements or Fee Ownership. A company will be reimbursed for its reasonable and necessary expenses only if it has "prior rights".

  The Department will perpetuate the existing rights of a utility which is required to relocate a facility because or in accommodation of a project of the department if the utility had a prior compensable interest in the property.

<u>Federal Highway Administration's "Highway Utility Guide", Federal Policies</u>

A "compensable interest" under the Federal Policies, means the relocation of meets Federal guidelines for reimbursement.

- The utility has a property interest (for example, ownership or an easement) in the land that it occupies before the relocation.

- The utility occupies privately or publicly owned land, including public road or street ROW (right of way), and the HA (Highway Administration) has a legal basis for making the reimbursement.

- The utility occupies publicly owned land, including public road and street ROW, and is owned by a public agency or political subdivision of the State, and is not required by law or agreement to move at its own expense, and the HA has a legal basis for making the reimbursement.

Utilities. Utilities that are impacted as part of the project need to be properly identified and determine if any replacement easements are required. The Utility Division will make determination of eligibility of compensable interests in accordance with 23 CFR (Code of Federal Regulations) 645 & 646, NAC (Nevada Administrative Code, Chapter 408 and NDOT's Utility Manual. Replacement easements are coordinated between the Project Coordinator and the Chief Right of Way Agent and are shown and described in the right of way setting memo. Identify the need for additional power sources for signals, lighting, irrigation systems, water and phone sources.

R/W Setting Memo. See Project Reporting in Section 4 for developing a right of way memo.

Control of Access (Freeways). Information for change in control of access can be found on SharePoint. See fencing in Section 3 for installation guidelines.

SAFETY IMPROVEMENTS

Policy. The need for including safety improvements in the scope of a non-interstate preservation project must be justified by documented history of crashes. Crash data shall be analyzed to determine appropriate counter measures and, if justified by economic analysis, incorporate them into the contract as funding allows.

Procedure. The analysis of crash history data in conjunction with developing the project scope provides the best opportunity to improve the safety of Nevada's roads by identifying locations where reasonable and effective countermeasures can be deployed. The Designer must work effectively with the safety engineer to ensure that adequate attention and effort is given to obtaining, analyzing and utilizing the crash history data, on projects that involve improvements to existing roads, in accordance with the following procedures:

- The Designer shall request crash information by email crashinfo@dot.state.nv.us for the project limits spanning a time frame of not less than three years, from the Safety Engineering Division. This request shall occur no later than four to six weeks prior to the PDFS to allow time for processing and analysis of the data and to locate the crash data on the PDFS plan set.
  Request forms can be downloaded at http://www.nevadadot.com/forms or at http://www.nevadadot.com/reports_pubs/nv_crashes/

- Safety Engineering will contact the Designer when the information has been processed. A safety review meeting should then be conducted to discuss analysis of the data, any noted problem areas, possible countermeasures and sources of funding.

- A safety-engineering representative will attend the PDFS if appropriate to discuss safety issues and associated counter measures.

- The Safety Engineering Division shall document any recommendations in writing by identifying the priority of a specific problem in relation to other areas Statewide and providing supporting data.

- Where a complete analysis of the project roadsides is required to evaluate the benefits and costs of the proposed countermeasures the Standards Compliance Specialist is responsible for performing such analysis using the AASHTO's Roadside Safety Analysis Program. The Designer shall assist the standards compliance specialist with the analysis by developing and providing the required input data. On low volume roads the time span of the crash history should be increased as necessary to normalize the software to the actual crash experience.

Road Safety Audits. Road safety audits are requested by the Safety Division. This request normally occurs around the time of the PDFS. The Designer provides plans for the safety audit team to review the project in the field. The Safety Audit Coordinator prepares recommendations to the Project Coordinator for items to be included in the scope of work. The Project Coordinator reviews the items are prepares a final recommendation to the Chief Road Design Engineer for final approval of items to be included in the project.

SPEED REDUCTIONS

Policy. Refer to the Work Zone Safety and Mobility Implementation Guide 2008 edition.

STRUCTURAL SECTIONS

Procedure. The Materials Division develops the structural section design for the project. The Chief Materials Engineer will transmit the approved structural sections to the Project Coordinator by memo. The structural design should be coordinated with the Constructability Engineer and Specifications Writer during the development of the traffic control plan. Identify special limitations for the proposed structural section such as the number of days traffic is allowed on the coldmilled surface, Roadbed modified surface, leveling course, etc.

SUBMITAL REQUIREMENTS

Preliminary plans (Conceptual thru Preliminary)

General. The purpose of the preliminary plans is to establish the roadway geometrics and to start the other divisions such as Hydraulics and Structural Design to evaluate the proposed alignment information, roadway widths, clearances, etc. Preliminary plans are to evaluate any sight distance issues and present the basic foot print of the project in order to begin indentifying impacts to utilities and right of way.

Submittal requirements require engineering judgment, depend on the type of project, and are subject to the needs of the Project Coordinator. The following are guidelines for what should be contain in a set of preliminary plans and the status of each sheet:

Sheet # and description		Status
1	Title sheets	Completed as practical. Items not needed may include design designation, mile posting, refined index of sheets, and length of construction.
1A.	Location sheet.	Completed as practical. Items not needed may include material sites, mile posting, and structure numbers.
2.	Typical Sections	Completed as practical. Items not needed may include stationing, exact widths, longitudinal sections.
3.	General notes, Summaries and Estimate of Quantities	Not needed.
4.	Plan sheets	Completed as practical. Items not needed may include plan notes, refined cut and fill lines, new right or way or temporary easements, island geometrics, curb ramps, slopes, curbs, gutters, dikes, begin/end construction, utility relocations, temporary detours, refined hydraulic layout, guardrail/barrier rail locations, and control of access.
5.	Profile sheets	Completed as practical. Items not needed are ditch notes and earthwork quantities.
6.	Grading plan	Not needed.
7.	Geometric sheets	Not needed unless it demonstrates any unique changes to geometrics and right of way impacts.
LC1	Location control	Not needed.
SD1	Special details	Not needed unless it demonstrates any unique changes to geometrics and right of way impacts.
SP1	Site preparation (removals)	Not needed unless it demonstrates any unique changes to geometrics and right of way impacts.
L1	Landscape details	Not needed unless it demonstrates any unique changes to geometrics and right of way impacts.
D1	Drainage plans	Refer to NDOT Drainage Manual.
RW1	Right of way	Not needed.
ST1	Permanent striping details	Completed as practical.
TC1	Work zone traffic control	Not needed unless it demonstrates any unique changes to geometrics and right of way impacts.
T1	Signals, lighting, and intelligent traffic systems	Not needed unless it demonstrates any unique changes to geometrics and right of way impacts.
TS1	Permanent signing	Not needed unless it demonstrates any unique changes to geometrics and right of way impacts.
B1	Bridge structures	Front sheet is completed.
S1	Structure list	Not needed.

Estimate. Estimates at this level can be accomplished with “Order of magnitude” which means that detailed bid items and quantities are usually not required. Costs are captured based on the major items that make up approximately 80% of the project costs such as, earthwork, base and surfacing, and concrete structures. Percentages are applied to other items such as traffic control, landscaping, signing, drainage, etc., that make-up the remainder of the project costs.

Intermediate plans

General. The purpose of intermediate plans is to refine quantities, geometrics, and incorporate all information from the other divisions to demonstrate the outcome of the project in more detail. The plans should contain the basic information for all of the possible types of sheets mentioned above. Any special details are also conceptually developed. Most importantly, the plans need to have sufficient information to identify all impact to right of way and utilities.

The following are guidelines for what should be contain in a set of Intermediate plans and what other divisions should have accomplished:

- Roadway design details the locations for barrier rail, guardrail, sound walls and retaining walls. All pedestrian facilities and bike plan facilities have been incorporated into the design. Roadway design along with Hydraulics and Structural design compile a list of locations for potholing utilities in conflict. Property boundaries, existing right of way, proposed right of way, and control of access have been sufficiently detailed.
- Any special structures such as retaining walls and sound walls have been forwarded to Structural design. Adequate bridge design and estimates have been completed and provided to Roadway Design.
- Refer to the Drainage Manual for required items and coordination for the hydraulic design
- Geotechnical exploration and analysis are conducted and the draft geotechnical report has been forward to Structures, Hydraulics and Design for design completion.
- The Construction Division along with Roadway Design and the Traffic Division develop a traffic control plan. A constructability meeting takes place and agreement has been reached and documented on how the project will be constructed. Limitations of operations are developed and a draft traffic control matrix is based on traffic control scenarios during each phase of construction. Preliminary time frames and construction sequencing is developed in the regard for the length of time temporary easements will be needed.
- Conflicts with underground utilities have been resolved, and any associated adjustments to the proposed project improvements are reflected in the design. Plans for utility relocation work are sufficiently developed to determine any right-of-way needs. Request for water, power and telephone sources for NDOT facilities have been forwarded to utility companies by R/W or District, and preliminary approvals have been returned. In addition, the utility companies have provided plans showing proposed utility relocations.
- Landscaping plans have identified the location were water, power and telephone lines will be located.
- NEPA process is complete and a final Record of Decision, FONSI, or Categorical Exclusion have been issued and approved.

Estimate. Estimates at this level are required to be entered into NDOT Integrated Financial System (IFS). Quantities should be refined as much as possible and unit bid prices should be preliminarily reviewed by the Principal Design Engineer.

QA/QC plans

General. This set of plans has addressed every aspect of the project and are ready for the QA/QC. The design squad has crossed checked the plans to ensure accuracy and completeness. The workbook is also updated and organized so it can be given to the QA/QC specialist for checking and cross referencing. The Designer has completed the checklist and is placed in the workbook. A copy of Designs QA/QC checklist can be found on SharePoint.

Estimate. Estimates at this level have been price checked by the Principle Design Engineer and updated in NDOT Integrated Financial System (IFS).

VALUE ANALYSIS

General. Value analysis (VA) establishes a program to improve project quality, reduce project costs, foster innovation, eliminate unnecessary and costly design elements, and ensure efficient investments by requiring the application of VA to all federal aid highway projects with an estimated cost of $25 million or more, and any federal aid bridge project with an estimated cost of $20 million or more. In accordance with the federal-state relationship established under the federal aid highway program, NDOT is responsible for conducting a VA on all applicable projects and ensuring that all resulting approved recommendations are incorporated into the plans, specifications and estimate. VA is based on the concepts of value engineering which is the systematic application of recognized techniques by a multi-disciplined team to identify the function of a product or service, establish a worth for that function, generate alternatives through the use of creative thinking, and provide the needed functions to accomplish the original purpose of the project reliably, and at the lowest life cycle cost, without sacrificing the safety, necessary quality, and environmental attributes of the project.

Value analysis can occur anytime during the design process and multiple studies are sometimes conducted on a project. An early VA can be used to help determine and develop alternatives for an EA or EIS and a second during the final design phase to fine-tune the project. The outcome of value analysis is often cost reduction, but the primary focus is value improvement.

More information from the FHWA on value analysis is available on http://www.fhwa.dot.gove/ve

Policy. It is NDOT's policy to conduct value analysis on any project on the National Highway System that has an estimated construction cost of $25 million or greater. Consider applying value analysis in all functional areas of projects having an estimated construction cost greater than $10 million.

The requirement is that a study be made during the project's design however, performing a study before the design is adequately developed does not meet the law's intent to "redesign the project using different technologies, materials, or methods" since these terms apply more to specific design features than to the development processes. Whether or not a VA adequately evaluates a project's design is made on a project-by-project basis by NDOT management and/or FHWA field office.

Procedure. The Operations Analysis Division staff coordinates and conducts the value analysis studies, maintain an on-call list of certified value specialists with the Administrative Services Division, and manage value analysis consultant agreements. The candidate projects should be selected after the Transportation Board's approval of the Statewide Transportation Projects Workbook (STPW), but not later than January 1 of each year.

Ideally, two studies should be performed on each qualifying project. The first analysis should be done early in the development phase to help minimize project impacts, develop an EIS or ROD, decide the best type of facility to build, and pinpoint its location. The second study should be performed before the right of way setting to address design issues (geometrics, drainage, construction staging, traffic control, signalization, roadbed design, structure details, etc.)

SECTION 5 ENGINEERING SUPPORT, DIVISIONAL RESOURCES AND OTHER AGENCIES

This Section describes the type of services and design support provided by each division. It also describes the type of correspondence or information that may be exchanged between the Design Division and the other divisions listed below. For a listing of all divisions, names of individuals, and work titles go to SharePoint and the respective Divisions.

ACCOUNTING

General. The Accounting Division is responsible for the overall administration of the accounting function within the department. The division is comprised of Operations, Payroll, and Project Accounting. The Accounting Division reports to the Assistant Director, Administration.

Agreement close out. An agreement report is issued from Administrative services officer on a quarterly basis. The Project Coordinator reviews the listing of agreements to see if they can be closed out or if they need to be amended. If the agreement is receivable, the Project Coordinator contacts accounting to see whether or not there are still any monies associated with that agreement that have not yet been received. At that point they will determine whether or not the agreement can be closed and if it can be, the Accounting Division will start the process. For all other agreements, the Project Coordinator needs to determine what the status of the agreements is. If the coordinator feels they should be closed, contact designs Administrative Assistant to see if a final audit is pending or was requested. If no audit was done, a memo is sent to Internal Audit requesting the final "post" audit review. (cc the office Administrative Assistant on that request). When Internal Audit agrees to close out the agreement, contact the office Administrative Assistant so they can start the agreement closeout process.

ADMINISTRATION SERVICES

General. The Administrative Services Division reports to the Assistant Director, Administration, and has six major areas of responsibility: the Building and Grounds Section; Purchasing and Reproduction Section; Records Management Section; Over-Dimensional Permits Section; Agreement Services; and Contract Services.

Agreement coordination. The Project Coordinator coordinates any agreements through the Agreement Services Section to ensure proper review and execution of the document as outlined in Section 6 develop agreement.

Over dimensional permits. The Designer is to notify over dimensional permits of any permanent design features and temporary traffic control measures that may limit certain vehicles, especially over-dimensional vehicles. Report the following situations to advise the Over Dimensional Vehicles Permits Office in writing at: OverDimensionalPermitsOffice@dot.state.nv.us:

- Separated and protected single travel lane; either direction including shoulders ≤ 20 feet.
- Opposing and unprotected single travel lanes; both directions including shoulders ≤ 30 feet.
- Separated and protected double or more travel lanes; either direction including shoulders ≤ 30 feet.
- Opposing and unprotected double or more travel lanes; either direction including shoulder ≤ 30 feet.
- Number, direction and width of each travel lane (not including shoulders).
- Maximum width and direction including all available travel lanes and shoulders, between planned temporary barriers and/or road cones (if applicable).
- Whether restriction is delineated by immovable walls, temporary walls, or road cones (if applicable).
- Height and location of highest barrier (if applicable).

Central Files. The central records section of the Administrative Services Division maintains the department's official records. These files include:

- A copy of the Design Division's archive of all pertinent project computer files on CDROM as they existed at the time the contract is awarded. All archives include the project design files and the special provisions and later versions also include the applicable standards.
- The complete project files are stored in central records, upon completion of the contract, for 3 years and select material is archived for 7 years such as construction change orders. These files include the project workbooks and any information that was not incorporated into the contract documents such as cross sections, mass haul diagrams and BMP provisions.
- A set of contract plans marked up by the resident construction engineer to note differences between the design and the actual construction of the project. These plans are commonly referred to as "as built" or "as constructed" plans.
- Copies of the contract change orders.
- A complete set of contract documents as awarded including supplemental notifications.
- The Resident Engineer's field books.

Central files keep a record of any archived material that has been checked out and annually notifies recipients to return any overdue files. The recipient has the option of returning the material or checking it out for a longer period of time, and is responsible for returning all archived material to its proper place and in good condition.

CONSTRUCTION

General. The Construction Division provides advice and assistance regarding highway construction, including engineering inspection of construction activities, constructability and guidance in the development and adoption of new and improved highway specifications. The Construction Division also provides the contract working days for inclusion into the special provisions for the contract. The Construction Manual and the Documentation Manual, which is on file with various design squads, details the division's operational policies and procedures. This division reports to the Assistant Director of Operations and has overall program authority, including the administration of statutory regulations and departmental policies that involves contract activities. As part of this overall program authority, the Construction Division provides assistance and advice regarding highway construction inspection and field testing; guidance in the development and adoption of new highway specifications; and oversight of contract change orders, dispute resolution, and claim resolution. This division is divided into four sections: Contract Compliance Section, Quality Assurance Section, Constructability, and Construction Administration Section.

Contract Compliance addresses Equal Employment Opportunity, civil rights and labor issues and administers the Disadvantaged Business Enterprise (DBE) program. Quality Assurance provides oversight of construction procedures and practices, field-testing and equipment, independent assurance testing, and training of field personnel.

The Contract Administration section provides oversight of contractor payments, project documentation and coordinates construction consultants.

Constructability. The Designer coordinates with the constructability section for the development of traffic control plans. This section also help develops the Limitations of Operations (108.04) and Accommodations for Public Traffic (624) in conjunction with the Designer, specifications and traffic. Complicated construction projects, such as urban 3R projects, capacity, and new construction, constructability should be involved early in the design to ensure the project can be constructed within existing or proposed right of way and proposed cut and fills, alignments, bridges, and drainage facilities need to be constructed in certain sequences.

Change orders. Changes requested by the Design Division come from the Chief Road Design Engineer who forwards a request to the Chief Construction Engineer requesting the initiation of the necessary revisions. A copy of the memo should be forwarded to the District Engineer and the Resident Engineer. The design squad prepares the construction details and quantities for these change orders, and any design related change orders requested by the Construction Division, upon approval of the Chief Road Design Engineer. The request shall include sufficient detail to convey the exact nature of the change and the affected work units. Additional drawings, quantity calculations and other supporting information should be attached to the request. If a change order requires reissuing a previous plan sheet with changes to that sheet, the top right corner of the new sheet should show a revised date and the word "revised." If the change requires a new plan sheet, the top right corner of the sheet will show the following information: CHANGE ORDER No. # (the number is provided by the resident construction engineer) and the date.

Pre-construction review. The Construction Division schedules pre-construction reviews to cover certain aspects of the contract documents with the contractor. The Designer and the Project Coordinator usually attend these meetings as they are scheduled. Roadway answers related questions and helps trouble shoot discrepancies in the plans.

Post construction review. When a contract nears completion, Road Design Administration automatically receives an email from the IFS. The Project Coordinator and the Standards Compliance Specialist are then notified in order to prepare for a post construction review meeting. Each appropriate division or section is normally invited to participate for contracts that have significant work on bridges, hydraulics, aesthetic and traffic facilities. Once construction of the contract has been completed the Construction Division will schedule the meeting to occur no later than 90 days after completion of the work. At the discretion of the Resident Engineer, the contractor may be invited to the meeting.

The goals of the post construction review meeting generally are to: [a] improve future designs through discussion of change orders, field adjustments, plan deficiencies and constructability problems, and [b] assess new designs, products and procedures by evaluating associated construction problems and successes. The Construction Division is responsible for scheduling, facilitating and documenting the meeting and its outcomes. The Project Coordinator may need to prepare a memo to the Chief Road Design Engineer to follow up certain issues as reported by the Construction Division. Copies of this memo are sent to the Resident Engineer, Assistant Chief Construction Engineer, District Engineer, Standards and Manuals supervisor, and Principal Design Engineer.

The Resident Engineer will keep a punch list of items during the life of the project that should be addressed during the post construction review. This punch list should be sent to all participants one week prior to the review so that appropriate personnel and information may be available during the review.

The Assistant Chief Road Design Engineer prepares an annual summary of the resulting design process improvements for the Standards and Manuals Engineer to incorporate into the Design Guide. If necessary, a meeting with design personnel will be conducted to further explain problems encountered and to brainstorm other potential solutions.

DISTRICTS

General. The state is divided into three districts with sub districts for the purpose of administering the transportation program on a local level. A District Engineer is appointed to manage each district and ensure that the state's interests are fully considered and protected in their district. The main responsibility of the district engineer is the administration of the transportation program's construction and maintenance elements.

Other responsibilities include encroachment permits, minor traffic studies and traffic control review. A Deputy Director is stationed in the Las Vegas metropolitan area to represent the department's general interests in that area.

Construction. Each district has an Assistant District Engineer that oversees the construction operations through the Resident Engineers that are directly responsible for the implementation and administration of construction contracts. This is generally to ensure that the contractors construct the various elements of the contracts in accordance with the plans and specifications. The headquarters construction office establishes the policies and procedures used by the districts for the administration of construction operations.

Field visits. If it is necessary to review the project during construction, the Project Coordinator notifies the Resident Engineer prior to the review.

Maintenance. Each district has an Assistant District Engineer that oversees the maintenance operations through the maintenance superintendents that are directly responsible for maintaining the condition of the state's road system. The headquarters maintenance office establishes the policies and procedures used by the districts for the administration of its maintenance operations. Each district has remote maintenance stations to facilitate the upkeep of Nevada's extensive road system.

Pipe condition. The District Engineer is responsible for identifying deteriorated culverts prior to the PDFS and providing that information to the design team. The Designer provides the District Engineer a set of plans along with a written request to examine the pipes within the project limits to locate any culverts that are in poor condition or that may not be properly functioning. Example documents can be found on SharePoint under standard project memo templates.

District contracts. Instructions for developing district contracts can be found on SharePoint.

ENVIRONMENTAL SERVICES

General. Responsibilities of Environmental Services during the preconstruction phase it to ensure the Department complies with the National Environmental Policy Act (NEPA) process. This includes preparing and processing Categorical Exclusions (CE), Environmental Assessments (EA), Environmental Impact Statements (EIS), and Record of Decision (ROD). Other work performed includes:

- Completing environmental studies, documentation and coordination for permits and clearances.
- Determining mitigation measures for environmental impacts from NDOT projects and ensuring they are included in project construction contract documents.
- Arranging, advertising and conducting public involvement activities in accordance with NDOT policies and Federal-aid project requirements for projects processed under NEPA.
- Obtaining permits and clearances for material sites.

Coordination. The Designer is to provide Environmental Services a set of plans along with the approved PDFS report so they can obtain necessary permits or clearances. For complex projects such as new construction, capacity projects, sound walls, etc., early and periodic coordination will need to occur during the preliminary design phase in an effort minimize environmental impacts.

FINANCIAL MANAGEMENT

The Programming Section schedules the project in PSAMS; programs, monitors, and revises federal aid and state-funded preliminary engineering, right-of–way and construction projects; prepares requests for special federal aid funds; formulates, monitors, maintains and controls a complete accounting system of apportioned and allocated federal aid highway and transit funds and all state funds authorized for preservation and/or improvement projects; maintains and controls project index and scheduling systems; and prepares quarterly FHWA audit reports.

The Budget Section is under the general supervision of the Director and the Deputy Director, plans and organizes the activities associated with NDOT's budget planning, revises departmental annual budget work program and executive biennial budget, preparation, and execution. They also prepare financial forecasts of gas and motor vehicle tax revenue, highway funds and project expenditure rates. Funding for the department's operation is controlled by a line item biennial budget. This budget is prepared by the Financial Management Division and approved by the Director, Transportation Board and the Nevada State Legislature. Although the legislature approves a biennial budget, expenditure allocations are assigned on a fiscal year basis (July 1 through June 30). Annual budgets are used to plan and control expenditures for a fiscal year unless modified by the Interim Finance Committee.

Programming. When a project is ready for engineering and related services to start, the Project Coordinator submits a programming and scheduling form to Financial Management. A project must be on the STIP to be programmed for federal participation and must either be in the annual work program or have written approval from the director to be programmed for state funding. Financial Management then assigns a project identity number and a project number, and allocates appropriate funding to the project. Newly scheduled construction projects should appear on the next project status report.

The programming and scheduling form and instructions can be found on SharePoint.

Cost change form. Any additional cost from the time the project is first programmed, a budget and scope form is issued to make updates to costs. Changes in costs greater than $250,000 or 20% of the project, whichever is less, are prepared by the Project Coordinator and forwarded to Program Development and Financial Management for approval using the budget and scope change form. The form must also be completed by July 1, for federal projects scheduled for advertisement before October 1 of that same year.

The Right of Way Division may request the Project Coordinator to update the cost for right of way acquisitions and utilities as their estimate is developed.

The budget and scope change form and instructions are found at SharePoint.

Preliminary estimates. When the processing memo has been issued and a contract number has been assigned to the project, a preliminary estimate (CM 18) is generated and submitted to the Management Analyst for their review. The analyst will usually make comments concerning breakouts and makes necessary changes to the financial screens.

Instructions and procedures for developing estimates are found on SharePoint.

LEGAL

General. The Legal Division is essentially NDOT's attorney. The division reports to the Director or Deputy Director and can be involved in almost every aspect of work being done by NDOT. It handles such issues as eminent domain, tort litigation, personnel matters, construction contract matters, project design and related issues, property acquisition and property disposals. Personnel matters may include civil rights, dismissals, demotions, and sexual harassment. The Legal Division provides counsel, advice and opinions for all divisions of NDOT. It prepares or reviews all agreements for the department and furnishes assistance to District Engineers and Resident Engineers in any legal problem that may arise. It also furnishes assistance in preparing for, attending, and defending the adequacy of public hearings and administrative regulations. In cooperation with other department personnel, the Legal Division develops proposals for legislative action to amend, add or repeal portions of the Nevada Revised Statutes to conform to federal legislation, regulations, or directives and to further enable the department to carry out its required duties. This division defends against all inverse condemnations, injunctions and restraining orders and represents the state in personal injury and property damage cases (torts) including those citing improper highway design. It also reviews manual changes, advises on how to handle collections, reviews specifications when necessary, and reviews wording in deeds, contracts and other right-of-way actions.

LOCATION

Mapping request. The Designer requests mapping through the Chief Location Engineer with a copy to the Chief Surveyor. The requests for location services should be in memorandum form, stating the nature of the services and timeframe for delivery. For additional information when requesting mapping, refer to the Special Instructions for Survey, Mapping or GIS Consultants Manual The Location Chief will normally respond to the request of services within 3 business days from the initial quests, or respond as to the reason for the delay in delivery of the estimate.

Request alignments. Existing alignments and retraced centerline alignments are requested from the Chief Location Engineer. Location control sheets are accompanied in the plans. See Plan Preparation Guide sheet LC1 for examples Location does not normally provide ramp alignment information; the Designer will need to best fit the ramp alignment from previous contracts to the retraced mainline alignment.

Alignment coordination. Office generated alignments and modification to existing alignments need to be checked by the Chief Geodesist around the intermediate design level. Location will verify that the correct control sheets are in the plans during the intermediate review. It is important to make certain that any right of way acquisitions use the same adopted centerline alignment.

Monuments. The Location Engineer is responsible for the establishment and preservation of monuments. The Designer reviews the control sheets provided by Location and determines if any monuments will be disturbed by the propose scope of work. A bid item to perpetuate survey monument is listed in the structure list with the appropriate station and offset.

MAINTENANCE AND OPERATIONS

Traffic operations. When determining what traffic planning information is applicable to the project, the needs of pedestrians, bicycles, mass transit and motor vehicles during permanent and temporary (work zone traffic control) circumstances should be considered. The analysis of traffic operations is normally carried out by the Principal Traffic Engineer over traffic operations analysis. The types of traffic information that can be requested includes:

- Traffic Impact Study Reviews & Comments
- Speed Study Reviews & Approvals
- Signal Warrant Reviews & Approvals
- All Related Highway Capacity Analysis
- Coordination with Planning for B/C Analysis on Major Projects
- Concurrence with Safety/Traffic Division on Traffic Control Approvals Prior to Advertising
- Input on Traffic Management Plans Associated with the NDOT Work Zone Safety & Mobility Implementation Guide
- Review and Comments on Change-In-Access Reports
- Participation in Performing & Reviewing Project Related Traffic Analysis

The analysis of traffic patterns is necessary to determine the features that will provide efficient operation of the roadway. Once the appropriate number of through travel lanes has been established, the need for special and exclusive use lanes is analyzed to optimize the level of service. The design team coordinates with the Principal Traffic Engineer and incorporates the results into the design. Some conventional design features that require such analysis are:

- Exclusive lanes for turning vehicles
- Adequate storage lengths for turning lanes to avoid blocking through lanes with overflow
- Providing additional length for deceleration outside of the through travel lanes
- Bicycle lanes or paths
- Walkways
- Improving or verifying passing sight distance based on current criteria
- Truck climbing lanes for roads with steep grades
- Turn-outs for roads with heavy recreational vehicle or truck use and few passing areas
- Improving approach geometry or relocating approaches to better locations
- Preventing cut-through traffic with traffic calming techniques
- Turn-out bus stop designs
- Widened shoulders for providing a multitude of operational benefits

AADT projections are needed for three intervals over a 20-year life cycle period: The current, mean and design years. The current year is when the project is expected to open to traffic after all construction is complete. For example, if an interchange project is expected to advertise in 2977 and take two years to construct, the current year would be 2979 and the mean and design years would be 2989 and 2999 respectively.

Any observation of unusual bicycle activity, including high volumes, should prompt the Designer to obtain actual bicycle traffic data. Traffic generators that create intermittent peak demands, such as schools, may require special design considerations. Issues such as capacity, access and inter-modal continuity should be considered when determining what data is required to design an appropriate facility. Refer to Section 4 policies and procedures, and Section 2 Lanes - Bike Lanes, regarding the design of bikeways.

ITS. This subdivision of Operations is responsible for planning, designing, and reviewing projects associated with intelligent transportation systems. The section is responsible for hiring and managing consulting engineering firms that specialize in this type of transportation engineering. The section also prepares plans for the installation of devices associated with ITS such as ramp meters, dynamic message signs, highway advisory radio, power and communication. They also coordinate with FAST and Southern Nevada RTC and assist Safety/Traffic on Rewriting Sec. 623 of the Standard Specifications.

MATERIALS AND TESTING

General. The materials engineer provides advice and assistance in the exploration, testing and quality control of all material used for construction or maintenance; recommends structural designs for new roads and structural repair or improvement strategies for existing roads; makes chemical and physical tests and investigates failures in trouble spots and determines the causes. The Materials Division reports to the Assistant Director, Operations and is divided into eight sections: Structural/Chemical, Aggregate/Asphalt/Bituminous Testing, Foundations/Geotechnical, Roadbed Design/Pavement Analysis, Laboratory Services, Las Vegas Testing Facility, and Research.

Aggregate/Asphalt/Bituminous Testing Section. This section is responsible for processing and analyzing all soils and aggregates samples for specification compliance, providing and approving all bituminous mix designs for maintenance and construction projects, conducting asphalt research, and calculating structural support characteristics of soils.

The Project Coordinator can request updated material site information or new site locations for major projects from the aggregate testing section.

Roadbed Design/Pavement Analysis Section. This section is responsible for collecting International Ride Index data and friction values for the Pavement Management System, which is used for project prioritization. The data is also used when calculating the Present Serviceability Index, which is a measure of pavement performance. In addition, the Pavement Analysis Section is responsible for researching project histories, conducting Falling Weight Deflect-o-Meter testing, and taking cores of the existing asphalt layer. This section also designs roadbed structural sections and also manages the 3R program.

The Materials Division recommends a structural section for all project roadbed improvements. If additional work is added to a project, such as a detour or turn out, the design team needs to request additional recommendations for each proposed improvement. While the materials recommendations are normally used, if the proposed improvement will compromise a critical clearance, weight restriction, budget ceiling or other project limitation the structural design may be modified, in cooperation with the Materials Division, with approval from the Chief Road Design Engineer. Structural sections are provided to the designer within 60 days of the PDFS.

Geotechnical. The geotechnical section is responsible for exploring, sampling, and testing soils; underlying new and existing roadbeds and structures; locating and performing exploratory sampling of material sites; and conducting special studies. This section also conducts pile load and embankment settlement tests and provides technical support when foundation or soil stability problems are encountered. It also submits depth checks of existing pavement structures, culvert condition surveys, and material deposit survey ties and sketches to the Roadbed Design Section.

The Designer coordinates ditch information (cut and fill slopes), horizontal and vertical information, drainage facilities, and proposed bridge locations on new projects for field exploration. On earthwork projects, Geotech provides the Designer shrink or swell factors.

PLANNING

INTER-MODAL. The designer requests information from Inter-modal Planning before the PDFS. Inter-modal Planning can provide information on projects such as any proposed bus lanes or turn outs, ADA improvements and missing pedestrian facilities that should be considered in the scope, and bicycle facilities that are on NDOT's and other Metropolitan and local bicycle plans. They will also provide any known special events that could impact traffic during construction such as bicycle races, triathlons, etc.

TRAFFIC INFORMATIONS

Traffic counts. In addition to the annual traffic report, Traffic Information can provide updated traffic counts and can also accommodate special requests for traffic volume information. This information can be used for developing traffic control strategies, establishing hours of operations, predicting detour traffic volumes and many other design related tasks. The traffic information analysts also provide additional design designation data for developing designs and establishing criteria levels such as traffic mix percentages and average running speeds. Note that all requests for traffic projections should be coordinated through the traffic Operations Engineer of the Maintenance and Operations Engineering section.

Speed studies. Traffic Information can obtain empirical speed data on existing roads using special equipment and methods. This is especially important when establishing design speeds on roads that have different characteristics than the original design such as changed speed limits, increased traffic volumes or adjacent land development.

Traffic loop locations. Contact Traffic Information for guidance if any existing traffic counting loops will need to be replaced or installed as part of any 3R or new construction project.

ROADWAY SYSTMES

Milepost index. The Roadway Systems maintains the statewide milepost index. The milepost index relates the field location of milepost panels with the actual mileage and the engineer's stationing. This should be taken into consideration when contemplating new alignments over existing facilities.

Road-life history. The Roadway Systems maintains a history of all improvements made to each section of roadway including all maintenance and contracted work. This is helpful when the Designer needs to know what is there before the materials core report is available.

Road-way systems. Roadway Systems checks title sheets and cumulative mileposts. The Designer provides the project title sheet to the transportation analyst. To evaluate striping on existing roads for appropriate passing zones the Designer can request passing zone data from the Roadway Systems Section of the Planning Division.

Passing studies. Roadway Systems can obtain empirical passing sight distance data on existing roads using specially equipped vehicles. This is especially important when establishing striping details on roads that have different characteristics than the original design such as increased or decreased speed limits. Coordinate any changes to existing passing lanes with District, Traffic/Safety Division, and the NHP.

PROGRAM DEVELOPMENT

Overview. The transportation program is the planning and implementation involved in the development of the state's public transportation infrastructure.

Statewide Transportation Planning Process. The state, in cooperation with local governments, develops the Statewide Transportation Improvement Plan (STIP). Each urbanized area with a population of more than 50,000 individuals may be designated a Metropolitan Planning Organization (MPO), usually titled as a Regional Transportation Commission. An MPO is required to maintain a 20-year Regional Transportation Plan (RTP) and a three-year Regional Transportation Improvement Program (RTIP). The RTIP is usually incorporated unchanged into the STIP. Additionally, the STIP is coordinated with federal, state, regional, Indian tribal and smaller local governments through the Statewide Transportation Technical Advisory Committee (STTAC).

Statewide Transportation Improvement Plan. The Statewide Transportation Improvement Program (STIP) is the instrument used to implement plans resulting from the statewide transportation planning process and must comply with federal guidelines to be eligible for federal participation.

Annual Work Program. The Annual Work Program (AWP) is a project listing by county for the current fiscal year and also includes information for the short range (3-year) and long range (10-year) elements. The list includes construction projects that NDOT intends to start work on, participate in, or award, as well as any major maintenance initiated by NDOT for the given year(s). The AWP is approved by the State Transportation Board and is considered the department's capital improvement program.

Transportation System Projects Workbook. The STIP, AWP, the Short-Range Program and the Long-Range Program are all contained in the Transportation System Projects Workbook (TSPW). The TSPW is updated each year and covers a period of 10 years.

Stewardship Program. The Nevada Department of Transportation (NDOT) and the Nevada Division of the Federal Highway Administration (FHWA) have entered into a Stewardship Plan (see appendix I) allowing NDOT to assume the responsibilities of the FHWA under Title 23 of the United States Code for design, plans, specifications, estimates, contract awards, and inspection of projects. The Stewardship Plan allows NDOT, under certain circumstances, to further delegate project review, oversight, and administration to capable local agencies. The Stewardship Program, as established under the plan, allows for the delegation of project review, oversight, and administration for any project involving federal funds that is not located on the National Highway System (NHS). Examples of projects that can be completed under the Stewardship Program include: bicycle facilities, landscaping, lighting, sidewalks, and capacity projects. In addition to traditional transportation projects, compressed natural gas fueling sites or equipment, if eligible for federal funding, may be completed under the Stewardship Program. A Stewardship Committee comprised of the chief road design engineer, NDOT's federal aid manager and two FHWA representatives manage the Stewardship Plan and determine which projects are suitable for the program.

Each stewardship project is managed through an agreement between NDOT and the local agency. The design (including the development of plans, specifications, and estimates), advertising, awarding, and construction monitoring of a contract can be completely delegated to the local agency. The local agency is also responsible for completing the necessary surveys and permits required for compliance with NEPA. NDOT, however, retains responsibility for certifying the right-of-way and certifying compliance with environmental requirements. The FHWA has the ultimate responsibility when it comes to the NEPA process. In many cases, the design and construction of a stewardship project can be completed to the specification of a local agency's standards. Bicycle facilities including shared use paths must be designed to the American Association of State Highway and Transportation Officials (AASHTO) standards. All projects must also meet the Americans with Disability Act (ADA) requirements. Rarely, there are stewardship projects that are major capacity projects with various levels of federal funding such as the Reno Train Trench or the modification of the Clear Acre/McCarran/Sutro interchange. Here the local entity is responsible for design, the EIS or EA process and sometimes right-of-way acquisition (only under close review by the Right-of-Way Division). Unlike other stewardship projects, as these projects can involve private railroad facilities or state and federal highway facilities, the standards of the particular facility owner must be followed.

The Stewardship Program is not a funding program nor is it a mechanism for creating a project. It is, however, a method for completing an approved project on a reimbursement basis. The local agency must incur the costs of the project and then seek reimbursement from NDOT. The stewardship agreement may be written to allow for reimbursement payments on a monthly, quarterly or upon completion basis. The total reimbursement is limited to the federal amount programmed minus the costs incurred by NDOT in overseeing the project. NDOT has a stewardship coordinator in the Roadway Design Division to manage the stewardship projects. The stewardship coordinator arranges the initial meeting to discuss the project and generates the stewardship agreement, processes the invoices and is the main NDOT contact for the local agency. Part of the NDOT & FHWA stewardship plan is a regularly updated listing of full oversight projects, which are usually major or freeway-type projects that require FHWA review of the plans specifications and estimates. These full oversight projects are those projects that FHWA retains oversight responsibilities.

PROJECT MANAGEMENT

General. Project management will normally manage "major projects" with services provided by a consultant or projects that will be designed by Road Design. When a project is designed by a consultant through the Project Manager, Design will provide technical review as requested. Projects that are managed by a Project Coordinator will accept full responsibility for external and internal coordination.

Coordination. The Project manager will coordinate the exchange of information with external entities such as counties, cities, and stakeholders. Road Design will provide technical support and/or engineering services and will coordinate internally with divisions such as Hydraulics, Materials, Environmental, Construction, etc.

RIGHT OF WAY

Right of way verification. The Designer requests right of way verification once the base plans have been developed with alignments and existing right of way limits. A set of plans is forwarded to the Chief Right of Way agent with a memo requesting this service. The plans are usually red lined with corrections and sent back to the appropriate Designer to update the right of way.

RIGHT OF WAY / UTILITIES

General. The primary purpose of the Utilities Section is to determine and arrange for the resolution of conflicts between proposed highway construction and existing and proposed utility facilities. Additionally, the section coordinates construction of highway projects with railroads that may be affected and arranges for the extension of new utility service lines, or modification of existing utility lines that provide service to highway facilities, such-as electrical power to signal or lighting systems. This Section also coordinates the permitting of undocumented rural approaches on reconstruction projects.

The Utilities Section does not provide an engineering function, but serves as the liaison between NDOT Design engineers and utility and railroad company engineers to ensure that all potential conflicts are noted and that suitable arrangements are made to resolve the conflicts either through the relocation of utility or railroad facilities, or the modification of NDOT design proposals to avoid conflicts, whichever is most cost effective for all parties. Although not engineering personnel, Utilities Section representatives do have experience and a basic understanding of the general requirements and capabilities regarding a wide range of utility facilities and engineering practices.

Coordination. Early in project development, the Utilities Section needs 3 or more sets of plans that include includes information such as alignments, edge of oil, cut and fill lines, design mapping, right of way lines and section net in order to locate and provide alignments of all utilities within the project limits. These plans will be sent to either the Utilities Section in headquarters for northern projects, or the District Right of Way office in Las Vegas for southern projects. The plans will then be provided to the appropriate utility inspector who will locate and plot the utility facilities (type, size, horizontal locations) on the plans. The inspector, in conjunction with the assigned right of way agent, will utilize a combination of field surveys and utility company as-built plans to develop the location information. One set of the marked-up plans will be provided to the project Designer so the utilities can be indicated on the reproducible plan sheets, and one set will be retained by the utility inspector and one by the right of way agent for future reference.

In order to successfully complete the utility relocation function, it is imperative for the project Designer to keep the Utilities Section advised of proposed and adopted design changes and for the Utilities Section to keep the Designer informed of utility information as it becomes available. It is helpful if the Utilities section or the District I Right of Way office is invited to all PDFS's on projects and if the Designer can be available for joint field reviews with the right of way agent, utility inspector and utility company representatives to review the project on-site. The most important facet is to establish and maintain continuous and effective communications between the design and right of way representatives to ensure that needs are fulfilled, changes are transmitted, and problems are identified and resolved as early as possible.

Other activities that must be considered and coordinated through the Utilities Section are the drafting of special provisions that accurately describe the potential utility conflicts and concurrent work requirements so prospective bidders and the successful bidder are aware of potential disruptions or special work requirements due to utilities, the arrangement for acquisition of replacement rights of way for relocated utility facilities by NDOT, and the continuing coordination of utility relocation and location functions during NDOT project construction.

When the utility company plans and estimates are provided to the Utilities Section, the right of way agent will provide a set of the proposed relocation plans for each company to the project Designer for his review to ensure that the proposed relocations or adjustments will indeed resolve the conflicts. These plans will be submitted under a checklist that is designed to ensure that all appropriate points of conflict are reviewed. While the design reviews of the plans are being conducted, the agent will review the companies' claims for reimbursement and prepare the appropriate relocation agreement which will govern the relocation work and reimbursement.

When a project requires utility adjustments (valve covers or manhole covers) or there are relocations, Las Vegas Valley Water District (LVVWD), Southern Nevada Water Authority (SNWA), and Clark County Water Reclamation District (CCWRCD) require a signature and date line on the plans. If a plan sheet is too cluttered, place the signature line on the separate note sheet. When any of the above listed utility companies require relocations, generally, this information will be shown on utility sheets. In such a case, place the signature line on these sheets. These signatures are in addition to the necessary utility agreements.

Subsurface Underground Exploration (SUE). Upon receipt of the utility locations from the utilities Section and indicating of the utility locations on the reproducible design plans, the Designer must assess the information to determine the areas of apparent conflict and provide this information to the Right of Way Agent assigned the utilities function. It is extremely important to have hydrology information and proposals available by this time as our drainage facilities cause more disruption of underground utilities than any other facet of most projects. At this point, determine locations at which potholes will be necessary to determine precise depths of underground utilities to further assess conflicts and relocation needs. We typically do not perform wide-spread potholing without first determining the actual need for it and the locations where it is needed as potholing is an expensive and time consuming process. Potholing typically costs $500.00 or more per location, involves coordination of company crews that are most often committed to other company priorities, causes disruption and inherent hazards to the motorists and workers involved in the operation, and invariably results in tearing up the existing streets and highways. For these reasons, we prefer to minimize potholing as much as possible although we do want to perform it wherever necessary. When required potholes are performed and needed locations are provided by the utilities Section to Design, all three sets of utility location plans will be updated with the additional data and the depth locations will be indicated on the design reproducibles. Insofar as practicable, the location of underground utility lines should be indicated on the profile sections in addition to the plan sections of our design plans.

If the Designer determines there is a conflict with the proposed work, a sub surface underground exploration (SUE) is requested from the Chief Right of Way agent.

Relocation. When all pertinent utility location data is displayed on the design plans, the Right of Way Agent will order enough sets of the plans to provide them to each affected company and a set to the utility inspector so the companies can get a clear picture of the highway project to enable them to confirm the conflicts and to engineer their required adjustments. At this point, the Utilities Section needs to know and the plans must show typical sections to assess areas where excavation is proposed for subgrade purposes, storm drain alignments and profiles along with laterals and drop inlets, and location of light poles, signal poles and sign foundations. All these items can impact the utilities and must be presented for their information.

The Utilities Section now authorizes the affected utility companies to proceed with their preliminary engineering to provide detailed plans and estimates for their required utility relocations. During the utility engineering process the utilities Section will provide liaison and coordination between the utility companies and NDOT. Specific cross sections or other detail drawings may be requested from design, and company requests for possible NDOT design changes may be coordinated to mitigate even greater utility disruptions. Provisions to accommodate utility company needs may be requested of Design or Structural Design as needed. It is important to bear in mind that the utility companies need virtually complete highway design information in order to adequately perform their internal engineering functions, and that they also need adequate time to perform these functions. Often the disruptions and demands our projects cause on utility facilities and manpower are equal to or greater than demands of the project on NDOT resources. We must consider not only the project we are constructing or reconstructing, but also our detours and any other construction outside the immediate roadway work we are doing as any other work or use we are proposing can adversely impact the utilities.

Upon completion of the reviews and agreement process, the right of way agent will authorize the utility companies to proceed with actual work.

Utility agreements. There are inherent time requirements necessary for the Utilities Section to process an agreement to a point where they can supply specifications to the utility owner with meaningful information. A period of 60 days from receipt of estimates from the utility companies for FHWA approval is not uncommon. This involves the various reviews and, because of pre-agreement review by Audit, the need for rebuttal and supplemental information can result in an even more time-consuming procedure. Railroad agreement processing can require six or nine months after receipt of design information and requirements. In order to comply with completion date schedules, it is prerequisite that the Utilities Section has adequate lead-time to accomplish their pre-construction activities. This means that they will need the basic utility or railroad package sufficiently in advance to have completed agreements by the document date. Please bear this in mind when determining schedules.

When preliminary plans have been prepared to the extent utility adjustment work can begin, plans will be delivered by memo from the Principal Road Design Engineer to the Chief Right-of-way Agent advising that plans are sufficient for necessary utility adjustment work to begin. Copies of the memo shall be forwarded to the Supervisory Right-of-Way Agent responsible for utilities and the Chief Road Design Engineer. For all projects in the Las Vegas area a copy of the memo will also need to be forwarded to the Las Vegas Supervisory Right-of-Way Agent. For projects with no apparent utility involvement, other than adjusting covers, the memo will indicate that no utility adjustments are anticipated.

In critical problem areas where sufficient data cannot be developed to totally define the work in a normal time frame, contact the Utilities Section to review the matter with them. This way they will at least be aware of the problem and in many instances they will be able to accomplish considerable “leg-work” prior to our submittal.

Railroads. Right of Way/Utilities also coordinates with the railroad. The railroad coordinator prefers to have only one contact per project however the NDOT Utility Section will coordinate administrative aspects such as obtaining permits and the Project Coordinator will coordinate the technical aspects. Railroads should also be considered for inclusion as party to agreements where they are involved.

Guidelines for Railroad Projects can be found on SharePoint.

Some pointers in processing railroad submittals are:

- Narratives should include construction sequencing, clearances, etc.
- Describe and annotate utility impacts, right-of-way and existing track profile.
- Include necessary local entity approvals.
- Provide a drainage plan (existing and proposed).
- Local reviews versus headquarters reviews affect the schedule. Local reviews can occur in two to four weeks if they are clean.
- For projects with multiple crossings a separate submittal is required for each structure.
- Keep submittals brief but complete; do not include unnecessary back-up data.
- Railroads can do an initial review with intermediate design plans.
- Railroads use more preliminary plans to resolve issues like clearance problems.
- Railroads require wet stamped copies of finals.

Do not use NDOT structure numbers or mileposts when referring to railroad crossings and structures; they have no meaning to the railroad staff. The UPRR prefers USDOT milepost numbers, but their mileposts or subdivision names are suitable as well. Obtain R/R dot numbers and milepost from the Traffic/Safety R/R section. It may be necessary to include special provisions when disruption of service is possible on industrial spurs. When a temporary at-grade crossing is needed and only the contractor and NDOT will be using it, then it is considered a private crossing and either NDOT or the contractor must enter into a private crossing

agreement. Private crossings need not involve the PUC or USDOT-FRA. The railroad will usually install the required concrete panels. However, NDOT can purchase and reuse them when needed. When considering construction phasing, use the following schedule for temporary crossings:

- 30 days to develop plan and estimate
- 30 days for administration
- 30 days to get it on the ground (two days of actual construction time)

If the crossing is for light-duty vehicles only, a 9' crossing is adequate but a 10' crossing is required for heavy-duty vehicles. The 10' crossing requires removal of the existing ties to install longer ones.

Permits and approaches. A complete file of all permits issued by the department is maintained in the Utilities Section. Upon request, the permit coordinator will provide the Designer with a copy of each permit located within the project limits. Designers should review the master index and provide the permit coordinator with a list of only those permits that are pertinent to the project design; otherwise the sheer volume of work would create a bottleneck and cause delays throughout the work program. Designers can request permits categorically within a range of mileposts, for example all approaches and underground utilities between SR430: WA-0.00 to WA-10.37. Designers should also ask for any information on pending permits within the project limits.

Regarding approaches, the NDOT policy requires that on highway reconstruction projects outside of curb and gutter section, we review the project to identify all approaches that are to be perpetuated and brought up to current standards (basically at. least a paved Type 2A approach). Only regularly used approaches, not those infrequently or seasonally used, such as an approach allowing access to a farmer's fields, will be improved. The Designer must then check the Department's records to determine which of the approaches that qualify for perpetuation are currently located under an encroachment permit. All permitted approaches are to be paved. The Designer provides a list of the undocumented approaches that should be paved, along with a set of plans with the undocumented approaches plotted on it, to R/W Engineering to enable them to perform assessor's checks to determine the property owners served by the undocumented approaches. The Right of Way agent furnishes the set of design plans with both the undocumented approach locations and the assessor's information on property ownerships to the Utilities Section where the assigned right of way agent contacts the property owners to get the undocumented approaches under permit. The incentive that is offered to the owners is the paving or repaving of the approach to at least our minimum standards at our expense, rather than at the expense of the owner. We also waive the minimum permit fee. This information is needed at the earliest possible time as any owner who refuses to get the permit does not get his approach paved. The ultimate purpose of this policy is to get complete segments of roadway brought up to current standards as to construction and permitting of approaches, after which the individual Districts can more easily maintain that status.

Encroachment permits can be found on SharePoint.

Permit reviews. If the Designer receives a permit from the Project Management Division that is doing a technical review for a particular project, email the Design Administrative Assistant so that they can log in the information (who the project manager is, permit number, permittee, and the description on the permit). Once the permit is returned to the Project Management Division, let the Design Administrative Assistant know and they will then log back out to the Project Management Division.

ROADWAY DESIGN

General. This division reports to the Assistant Director of Engineering and is divided into five sections. Two of the sections are identical Roadway Design sections responsible for the preparation of highway construction plans utilizing in-house personnel. However, one section is responsible for the local public agency (LPA), where NDOT assumes the role of the FHWA and projects are funded by various federal sources such as enhancement funding and are designed and built by the public entity to which the funds were awarded. The second section is the Landscape and Aesthetics section. They develop and implement the Landscape and Aesthetics Master Plan for the State Highway System and manage the community match program. The third section is the Specifications Section, which maintains the standard specifications; the specifications pull sheets, the standard plans, this policies and procedures manual, CADD standards, and writes of the contract special provisions. The fourth section is the Hydraulics section and is responsible for determining water flows, drainage structure sizes, impacts to floodways and flood plains, slope renovation, road surface water treatment methods, and erosion control. The fifth section is project scoping which develops preliminary scopes for 3R and capacity projects.

The Road Design Division is responsible for the following:

- Prepare, check and certify plans and special provisions in conformance with applicable policies, regulations, laws and engineering judgment.
- Design, coordinate, and determine necessary right of way on roadway projects.
- Develop and maintain Design Guidelines, Standard Plans, and Standard Specifications.
- Make recommendation for regulatory speed limits.
- Coordinate with the various divisions in development of project priorities.
- Coordinate with Environmental Services in the development of environmental documents and prepare purpose and need statement for the project.
- Participate in informational, location and design public hearings and prepare location and design recommendations for management approval.
- Determine need for design consultants and negotiate and administer required contract agreements.
- Investigate new products and engineering techniques.

- Coordinate design with private developers, local entities and governmental agencies and prepare related agreements.
- Obtain necessary permits from local, state and federal agencies for project construction (i.e., TRPA, US Corps of Engineers, FEMA, FAA).
- Prepare economic analysis such as benefit costs for inclusion of safety work in state 3R projects.
- Prepare necessary engineering estimates for future project work programs.
- Coordinate with other divisions and management to set project advertising dates. Prepare documentation to insure all steps have been completed prior to advertising.
- Review contract bids for accuracy, any indication of detrimental unbalancing, analyze low bids in excess of 7% of the Engineers Estimate, and recommend awarding of contract.
- Prepare memorandums for or recommend approval of change orders on contracts and prepare supplemental notices for contracts.
- Serve as chairman of guardrail review committee and serve on appropriate Department committees such as high hazard and safety, surplus property, project prioritization, pit review, state 3R, and contract claims board, serve on appropriate state and national committees.
- Prepare engineering portion of the Departments defense for tort litigation and condemnation cases. Act as expert witness when needed.
- Provide assistance to Districts in areas as design, traffic engineering, hydraulics, landscape and erosion control.
- Review for compliance all encroachment of right of way permits.
- Prepare and conduct training courses for design personnel as well as districts, other divisions and local entities.

Estimation Section. The Project Estimation section provides guidance and instruction to staff for efficiently and consistently developing project cost estimates and inputting that estimate into the Contract Management Subsystem. Project Estimation Specialist teaches classes on Project Estimate Building, the Contract Management Subsystem, and checks project cost estimates before Preliminary Agreement Estimate and Agreement Estimate submittals.

Hydraulics Section. Hydraulics provides design input for Environmental, Roadway Design, Bridge, Safety and district projects. It also initiates bridge scour, river training, erosion control, water quality, and flood control projects. The section also reviews encroachment permits and drainage studies; deals with litigations, flooding complaints and maintenance issues; participates in research projects; and evaluates drainage products.

The Designer coordinates new roadway geometrics as they are developed to verify both designs work and do not conflict with vertical clearances, cut and fill slopes, location of drop inlets, and other roadside features. Culvert extensions, location of plantmix dikes, erosion control are other items that are coordinated with Hydraulics.

Quantities are coordinated between the Designers for inclusion in the structure list and engineers estimate.

Landscape and Aesthetics. The Landscape and Aesthetics Section oversees improvements to landscape and aesthetic treatments associated with all components of the state highway system, including NDOT-managed rights-of-way, road services, maintenance stations, headquarters, and District Offices. The section manages the Landscape and Aesthetics Program, maintains the L&A Master Plan, develops L&A corridor plans, and coordinates their implementation with the state. In addition, the section directs, supervises, or develops L&A designs for all aspects of the L&A program; reviews all project plans and encroachment permits for impacts to the landscape and for consistency with corridor plans; reviews all developer, cooperative, and interlocal agreements related to Landscape and Aesthetics. Finally, the LA section participates in all design consultant, construction contractor, and maintenance contractor selection and oversight processes that contain or affect an L&A component.

The Project Coordinator coordinates with the Landscape Architect Supervisor on all matters pertaining to landscape treatments and aesthetics. The Project Coordinator is responsible for obtaining reviews from the Landscape Architecture Section on all new construction, capacity improvements, and stewardship projects. Landscape and aesthetics (L&A) must be integrated into planning, design, construction, and maintenance at the beginning of every project, not added as an afterthought. Engineering design should incorporate L&A to create highway structures and facilities that are effective, safe, and aesthetically appealing. The ability of a roadway and other facilities to blend successfully into the surrounding landscape or integrate appropriately with surrounding land uses should be addressed at the outset of every project.

Scoping Section.

Specification Section. The Chief Specifications Engineer controls the listing of work units that can be used in the department's contracts. This authority includes adding, deleting and modifying the work unit database and identifying and documenting special considerations that accompany the various work units. The project estimation module of the department's computerized contract management subsystem is administered through the Standards and Manuals Section accordingly. The specifications division also maintains the department's standard plans that include construction details for road design, lighting and signals, roadside signs, work zone traffic control, railroad crossings, permanent striping, and bridges.

The Specification section is divided into 4 subsections as follows:

Specification Writers. The Specifications Writers develop the Special Provisions for items that are not covered in the Standard Specification or plans. Traffic control minutes along with any special items that need to be included in the special provisions are coordinated with the specification writers.

Quality Assurance. The Quality Control Specialist is responsible for the QA/QC for both the plans and specifications. The Quality Control Specialist reviews both intermediate and final plan submittals and provides comments and recommendations to the Designer. The QA specialist also:

- Meet with the Designer at the end of the quality assurance review to discuss the findings of the review and discuss any proposed changes.
- Ensure that the final plans correctly reflect any changes expected and agreed upon during the quality assurance review meeting and that all changes were fully implemented.
- Ensure that all written comments received from other sections or divisions are returned to the Project Coordinator and that the agreed changes have been incorporated into the plans.

Standards and Manuals. The Standards and Manuals Section evaluates all contracts for roadside safety and ADA compliance early in the design process, and therefore should be invited to attend the PDFS on all contracts. If unable to attend, the Standards Compliance Specialist will independently visit the project site and submit written observations to the Project Coordinator. These comments should be incorporated into the PDFS report when possible. The Standards and Manuals Section, amongst other duties, insures the department's standards are up to date and are being implemented.

The Standards Compliance Specialist reviews the intermediate design on all contracts. This review should occur prior to the intermediate design review meeting early enough to allow for discussion of any findings at the review meeting. The Resident Engineer and Project Coordinator and/or Designer are expected to attend. The Project Coordinator should inform the Standards Compliance Specialist when a contract's roadside and pedestrian facility intermediate designs are sufficiently complete to initiate this review. Designers should be prepared to furnish copies of relevant worksheets and CADD files.

Procedures:
Scoping:

- A list of 3R and new construction projects will be provided to the Standards and Manuals Section and the Road Safety Audit (RSA) coordinator.
- The Standards and Manuals Section will review projects for compliance with standards and will request the crash data from the RSA coordinator.
- The Standards and Manuals Section, the RSA coordinator and the Scoping Section will conduct a safety field review of the 3R and new construction projects. The field review will be set up by the Scoping Section.
- The safety field review will be conducted during the scoping process, prior to the PDFS. The Standards and Manuals Section will provide roadside safety and ADA improvements to the Scoping Team for inclusion in the Scoping Report.
- The Designer will incorporate the suggestions into the PDFS report as part of the Final Scoping Report.
- The Designer will provide the Standards and Manuals Section with a copy of the Final Scoping Report.

Design:

The Designer will submit a copy of the intermediate plan set on every project to the Standards and Manuals Section for review and comment.
The Standards and Manuals Section will review the intermediate and provide a report on the plans compliance with Department Standards, including but not limited to roadside safety, ADA, pedestrian and bicycle issues.

Construction:

- The Resident Engineer will request an implementation field review of barrier rail and guardrail prior to installation. The Resident Engineer will have the locations of barrier rail and guardrail marked in the field prior to the implementation field review. The Standards and Manuals Section will inform the Designer and the Resident Engineer when they will conduct the implementation field review. ADA concerns may be made available during the field visit.
- If field adjustments are necessary, the Standards and Manuals Section will provide those adjustments to the Resident Engineer and copy the Designer and the Senior Designer. If a change order is necessary, the Standards and Manuals Section will discuss the change order request with the Designer, Senior Designer and the Chief Roadway Design Engineer. The Designer will calculate and draft the plan changes for the change order. The Senior Designer will write the change order for approval by the Chief Roadway Design Engineer.
- The Standards and Manuals Section will also conduct a field review of the project after the guardrail and ADA installations are completed. If the installations are not found in compliance, the Standards and Manuals Section will write a memo to the Resident Engineer citing the issues. The Resident Engineer must work with the contractor to bring those installations into compliance with Department Standards. If there are other deficiencies, the Standards and Manuals Section will write a memo to the Chief Road Design Engineer outlining issues and possible solutions. The Chief Road Design Engineer will determine if a change order is needed. If a change order will be issued, the Designer will calculate and draft the plan changes. The Project Coordinator will write the change order for approval by the Chief Roadway Design Engineer.

The Standards and Manuals Section insures compliance with the standard plans. It is the responsibility of the Designer and Senior Designer to design projects. To this end there may be standard compliance issues that arise other than those mentioned above. In those cases, the same procedures will be followed.

SECTION 5 ENGINEERING SUPPORT, DIVISIONAL RESOURCES AND OTHER AGENCIES

CADD Standards. This section is responsible for developing and distributing CADD Standards and Procedures. See additional information regarding CADD Standards.

SAFETY/TRAFFIC ENGINEERING

Accident data. The Designer can request crash information by downloading the crash data request form from SharePoint and email to crashinfo@dot.state.nv.us for the project limits spanning a time frame of not less than three years, from the safety engineering division. This request should occur no later than four to six weeks prior to the PDFS to allow time for processing and analysis of the data and to locate the crash data on the PDFS plan set.

Signing and Striping. This subdivision of Traffic Engineering provides the Designer new sign location sheets and quantities. The Designer coordinates the striping and traffic control layout during the preliminary design phase. The Traffic Engineer assigned to the project also checks the traffic control and striping layout before submitted to QA/QC.

It is important that on new construction or capacity projects the Designer coordinates signing of the posted speed limits based on design criteria used in the design.

Quantities are coordinated between the Designers for inclusion in the structure list and engineers estimate.

Signals and Lighting. This subdivision of Traffic Engineering provides the Designer signal and lighting sheets and quantities. The Traffic Engineer to coordinates power sources with the Designer and the Right of Way Utility agent.

Railroad. This subdivision of Traffic Engineering provides the Designer information such as R/R DOT numbers and mileposts.

Road Safety Audit. This subdivision of Traffic Engineering coordinates with the Designer to perform road safety audits. Safety audits are usually performed independent of the PDFS and recommendations are forwarded to the Project Coordinator. The Project Coordinator prepares a recommendation for the items to be included in the project scope and is approved by the Chief Road Design Engineer.

STRUCTURAL DESIGN (BRIDGE)

General. Structural Design is responsible the design and maintenance of bridge structures. They also provide additional services such as designing retaining walls, sound walls, and special hydraulic structures.

Coordination. On new capacity projects, roadway design coordinates horizontal and vertical alignments in the preliminary design phase.

The location of retaining walls and sound walls requires coordination of ground profiles and top and bottom alignment and elevations. Roadway Design will provide to the Geotechnical Section and the Bridge Division alignment and profile of the wall and cross sections at 25’ intervals for the length of the wall. Cross sections will include elevations of top of the wall, existing ground intersecting the plane of the wall, proposed ground at the exposed face at the base of the wall, bottom of the slope in front of the base (the slope supporting the wall), and the top of the slope above the wall (slope being retained by the wall). In addition, show any ditches behind or in front of any proposed walls. Topographical information for the existing and completed condition should be at least three times the wall height in front and behind the wall.

On 3R projects, the Designer requests bridge sheets for any proposed improvements on structures such as striping the deck of plantmix, replacement of strip seals, concrete repair, etc. Box culverts that span 10’ or greater are assigned a structure number by the maintenance section of bridge. The span of the culvert is measured along the roadway center line.

Quantities are coordinated between the Designers for inclusion in the structure list and engineers estimate.

GOVERNMENTAL AGENCIES

Airports. See Airway-Highway Clearance Requirements under Project reporting in Section 4.

Adjacent states. When a project limit occurs at the boundary to an adjacent state, the department is required to coordinate the work with that neighbor. The minimum impact to that state’s road system will be traffic control, but drainage and other components may become involved as well. The Project Coordinator must contact the appropriate agency representative. See contact information on SharePoint for the various out of state counties.

Commission / Boards. Occasionally a project will involve a state commission or board and the Project Coordinator must represent the project to them on behalf of the department. When attending an official meeting, the Project Coordinator should keep in mind that these proceedings are always on record (and often covered by the media) and should prepare accordingly. It is usually necessary to make contact at least four weeks prior to a meeting to be placed on the agenda for an action item. If the commission or board has some authority over the project, the Project Coordinator should provide them with appropriate material in advance for them to study so they may take informed actions at the meetings.

Federal Highway Administration (FHWA). The department is entered into an agreement with the FHWA regarding the level of oversight required on federally funded projects. This stewardship agreement allows the department to develop most projects with little federal involvement; however certain projects are designated as full oversight projects and are subject to full participation of the FHWA local office in the project's development.

Irrigation districts. In most cases the department is exempt from obtaining permits from irrigation districts, but is required to coordinate with them on activities that will affect their systems. The irrigation districts have a special status with the EPA regarding water quality and are usually concerned about protecting that status. Care should be taken to inform the irrigation district of the exact nature of work affecting their facility. The contractor should also be required to coordinate with the irrigation district during construction.

Native tribes. Any project occurring on tribal lands requires some coordination with the tribe. Certain requirements, such as the Tribal Employment Rights Ordinance (TERO) tax, may be applicable and should be stipulated in the contract documents. The tribe may also have cultural considerations that could be affected by the project. The Legal and Environmental Divisions should be included when a project becomes involved with a tribe to ensure that the tribal considerations are adequately and appropriately addressed.

Tahoe regional planning agency (TRPA). Generally any project in the basin, regardless whether public or private, must be permitted by the TRPA. Its jurisdiction extends from the upper rim of the basin to the shoreline of Lake Tahoe. The TRPA is generally concerned with water quality, hard coverage, soft coverage land capability, riparian zones, erosion and aesthetics, however all aspects of environmental quality are potential issues. The department and the TRPA signed a memorandum of understanding that defines what activities the department can undertake without needing to obtain a permit.
The process of coordinating with TRPA can vary by project but the general process is:

- Notify TRPA of the project immediately so it can assign the project to one of its staff
- Invite the TRPA representative to the PDFS
- Acquire a TRPA permit (typically requires two to three months)
- Obtain and complete a permit application
- Submit application along with complete plans (TRPA is flexible on this)
- TRPA staff review (two to three weeks); may require supplemental information
- TRPA staff writes recommendation for approval or denial
- TRPA staff presents project at monthly TRPA board meeting
- If approved, TRPA staff stamps three sets of plans for use during construction

During construction a set of stamped plans must be on the project site at all times. One set remains with TRPA, another is given to the resident construction engineer and the Project Coordinator keeps the third. All TRPA issues will be resolved using these sets of plans. Contact information for Federal, State, City, and Counties can be found on SharePoint.

Coordination. Coordinate with the Hydraulic Section for all TRPA permits.

SECTION 6 WORK FLOW

This Section describes the major steps for developing capacity and 3R projects. These steps are generally in the order in which they occur. The terminology listed below follows the PSAMS dashboard in an effort to reduce confusion across inter-divisional departments within NDOT.

PLANNING LEVEL SCOPING

General. Planning level scoping consists of a very broad look at a project to document the reason for the project, the major project components and to develop a reasonable cost estimate for a project that is being placed in the Transportation System Projects (TSP). Initially a Metropolitan Planning Organization (MPO), Regional Transportation Commission (RTC), city, county, Native American Tribe or developer will submit an application to NDOT for review by an Evaluation Committee. The applications will be evaluated and scored based on the established criteria in the urbanized, non-urbanized and 3R checklists. They will then be given a ranking of low, medium and high. If the project is ranked high it is then forwarded to the Project Scoping Committee for review. After review it is then returned to Program Development for distribution. If the project is selected by the Director it is then presented to the Statewide Transportation Technical Advisory Committee (STTAC) for recommendation to the State Transportation Board for approval. If it is an urbanized review of projects and the MPO or RTC projects are located on a state or federal roadway and are to be included in the Statewide Transportation Improvement Program (STIP) within the next four (4) years, they will be evaluated using an application/checklist developed as part of linking planning and NEPA to Planning process. This form is called a Stage 1 Project Development Checklist for Funding Request and NDOT Preliminary Risk Assessment form. It is completed by the sponsoring agency requesting project inclusion in the NDOT State Transportation Improvement Program (STIP).

Scoping process. The Scoping Manager forms a scoping team which will be comprised of a Project Coordinator and a Design Squad and all necessary major disciplines and stakeholders which is determined by the purpose and need statement on the Stage 1 checklist. The Scoping Manager will facilitate the process, manage the meetings and keep the Project Coordinator and the Roadway Chief involved with details and updates for each project. The scoping team will gather existing and available historic data to prepare the initial package. This team takes a detailed look at a project by gathering all of the existing and available data, reviewing this information, conducting field studies, coordinating with all major disciplines to include stakeholders, developing alternatives, determining the risk and preparing a cost estimate on the most likely alternative. This information is documented in a Project Scoping Report (PSR). This report will include the Stage 1 Project Development Checklist for Funding Request and NDOT Preliminary Risk Assessment form previously prepared. The project scoping report should be completed prior to projects being added to the State Transportation Improvement Plan (STIP).

Conceptual development. Conceptual alignments and profiles are generated by Roadway Design to a minimal alternative analysis level. The main purpose of this milestone is to establish potential corridors or alternative design features so they can be studied to determine which have the least amount of impact to the surrounding environment, utilities, need for additional right of way, while balancing the needs of the project. Design distributes conceptual alignments, profiles, and modeled surfaces to Hydraulics, Geotech, Utilities, Right of Way, Bridge, and Traffic so they can start preliminary research, design, and cost estimates for each alternative.

Coordinate with the Traffic Operations Analysis Section while developing each alternative to ensure they meet minimum traffic capacity.

Design compiles the design work from the other divisions and develops cost estimates for each alternative design (i.e. Environmental, Right-of-Way, Utilities, Bridge, Safety/Traffic, and Hydraulics.) A brief summary of the alternatives and costs are submitted to the Chief Road Design Engineer for concurrence.

PRELIMINARY DESIGN

Project initiation. The Project Coordinator contacts the appropriate divisions to form a project team. A meeting is held to establish who will be the point of contact and go over the scope of the project. The Project Coordinator also invites project stake holders such as the county, city, FHWA, public utility, etc., to identify whether any other agencies will have input into the design process and to develop a contact list of local agency personnel as needed. The existence of local area master plans and any associated project impacts should also be determined in this meeting.

Program and schedule. When a project is ready for engineering and related services to start, the Project Coordinator submits a programming and scheduling form to Financial Management. A project must be on the STIP to be programmed for federal participation and must either be in the annual work program or have written approval from the Director to be programmed for state funding. Financial Management then assigns a project identity number and a project number, and allocates appropriate funding to the project.

The programming and scheduling form and instructions can be found on SharePoint.

If significant changes occur to the scope during the project development, notify Financial Management of items such as need for right of way, utility relocations, change in project scope or limits, and costs.

Newly scheduled construction projects need to be entered into PSAMS by the Project Coordinator once the project has been programmed.

Request for information. The Designer sends out requests for information to various divisions to gather specific information to incorporate into the base design. The various requests can be found on SharePoint in the QA/QC Checklist under "correspondence." Example documents are also found at this same location. The timing of this step will vary on the complexity of a project and may come after project scoping once the preferred alignment has been established.

See Section 5 for Engineering support and requesting information from other divisions.

Contract research. The design team researches as-built contracts to incorporate into the base plans. As-built plans are available through central records. As-built contracts document changes that were made during construction that would not otherwise be known when developing a project.

Contract Search can be found on SharePoint. This document lists related contracts that performed work on a specific section of roadway.

PROJECT SCOPING

Alternatives analysis. The alternatives from the conceptual alignments are studied in the field to determine potential impacts to infrastructure, right of way, and the environment. Prior to and during the field study a set of plans is required to facilitate review and discussions by the key project contributors so they can identify issues with the various alternatives. The Project Coordinator distributes a comment sheet to all parties, and collected at the end of the review. The comment sheet will allow input of critical field-observed data to help set a first-draft list of project priorities addressing the concerns of each contributing party or agency. An Alternative Analysis Field Study report documents the potential impacts discovered during the field review.

Alternatives are studied further with the various divisions to determine if there are flaws or if refinements can be made. Alternatives should provide sufficient information so they can be studied in the field to determine impacts to features on the ground such as utilities, right of way, drainage features, traffic control, adjacent developments, etc. The alternatives are evaluated based on input from the public, public agencies and regulatory agencies. This may include studying additional proposed alternatives, which may not have been considered and presented at the public informational meeting. Based on the Public Information Meeting input and sound engineering judgment by all divisions a “preferred” alternative is selected through the NEPA process, during preliminary design and proceeds to Intermediate Design phase. Consult the FHWA for any changes to the control of access as part of the alternative analysis.

Conceptual alignment development is usually not applicable on 3R projects and proceeds to the roadside safety audit and PDFS.

Value analysis. Projects requiring a value analysis are usually scheduled during the alignment development period. For additional information see Value Analysis under Section 4

ALIGNMENT DEVELOPMENT

Refine alignments. Roadway Design develops horizontal and vertical alignments, performs modeling to define cut and fill slopes, establish roadway widths, superelevations, interchanges and intersections, changes in access points, control of access, and analysis of retaining walls versus the need for additional right of way.

Design coordinates with the Traffic Operations Engineer to analyze each design alternative and determine their optimum configurations. Sight distance is checked at all intersections, ramps, mainline alignments, etc.

Structural design begins the preliminary selection for the type of bridge and a front sheet is developed. Structures spanning over rivers and canals are checked by Hydraulics to ensure they meet adequate freeboard and foundation scour analysis.

Hydraulics begins preliminary design for on site and off site drainage features. Roadway profiles are verified and adjusted accordingly to accommodate proposed drainage structures that cross the roadway prism. Major drainage features have been designed to a level to established final grades. Preliminary special drainage structures have been sent to Structures for review. Refer to the Drainage Manual for Hydraulic coordination and deliverables.

Construction has identified any areas that may require staging areas or platforms for construction.

The Traffic Division locates overhead sign structures that may be required on the project and are examined for impacts to utilities or other design features.

Landscape and Aesthetics alternatives have been reviewed by the public entities and an alternative has been chosen. Preliminary landscape and aesthetics design proceeds to a level, which will provide a proposed “toe of slope” or an area of impact to related design features. Proposed landscape and aesthetic features should be checked for sight distance issues when refining alignments.

For 3R projects and other maintenance projects, alignment refinement is usually not applicable and progress up to the Intermediate design level before there is a submittal requirement.

Identify preferred alignment. Once the preferred alignment(s) is select through the NEPA process, the project is formally field investigated through a Roadside Safety Audit and PDFS.

Roadside safety audit. The Safety/Traffic Division conducts an audit for most 3R and capacity projects around the time of the PDFS. Safety coordinates with Roadway Design for obtaining information and plan sets so they can conduct their audit. Recommendations are forwarded to Design for approval by the Chief Road Design Engineer. The Standard Compliance Section will also attend the road safety audit to ensure non compliant roadside features and ADA issues are addressed in the report. The Project Coordinator should check with the Safety/Traffic Division if any safety funds are available to mitigate high crash locations.

Preliminary Design Field Study (PDFS). Prior to holding the PDFS, crash information, pipe condition survey, and planning information is requested and received from Safety, District, and Inter-Multimodal Planning respectively. See Section 5 for information requested from other support Divisions. Allow 20 working days for the support divisions to process the requested information.

The Project Coordinator schedules a PDFS with the appropriate divisions. The Project Coordinator should determine the approximate number of attendees. If more than a van full of people is going to attend, the Project Coordinator should consider limiting each entity to one representative, holding a meeting prior to the PDFS to address some of the issues, or scheduling two reviews.

A PDFS comment sheet and check list should be distributed to all parties, and collected at the end of the review. The comment sheet will allow input of critical field-observed data from all involved to help draft a list of project priorities addressing the concerns of each contributing party or agency. Every entity involved with project development should be made aware of the review so they have the opportunity to be represented. Plans of the preliminary design should accompany the PDFS invitation memo.

PDFS requests can be found under standard project memo templates are available on SharePoint.

Final scoping reports. The PDFS report is completed by the Project Coordinator and approved by the Chief Road Design Engineer. A draft copy should be distributed to the PDFS team to allow comments to be incorporated into the final draft before it is approved by the Chief Road Design Engineer. The approved PDFS report is distributed to the appropriate staff and Divisions.

The Roadside Safety Audit report is prepared by Safety/Traffic Division and forwarded to the Project Coordinator. The Project Coordinator prepares a list of recommendations and comments and forwards this to the Chief Road Design Engineer for approval.

Preliminary design submittal. Once the scope is approved and the preliminary design work is sufficiently done to indentify impacts to right of way and utilities, the plans are submitted to the various divisions such as Hydraulics, Structural Design, Geotech, Construction, Traffic, and District for review. Once the divisions have reviewed and submitted comments, Roadway Design, Hydraulics, and Structural Design begin making refinements to prepare the plans for Intermediate design.

Geometric approval and design exceptions. The Principal Road Design Engineer prepares a memorandum outlining the geometric design for the project. Additionally, any design exceptions are prepared in a memorandum at this time.

See Section 4 concerning geometric approval and design exceptions.

Change in control of access. The Principal Road Design Engineer prepares a memorandum for any change in control of access. Instructions for preparing a change in control of access can be found on SharePoint.

Traffic management plan. A traffic management plan is only applicable for projects with a large impact to traffic. The Designer is responsible for developing an appropriate traffic management plan for the project in cooperation with the Construction Division, District Engineer and Safety/Traffic Division. The Construction Division is responsible for reviewing the traffic control plans and making recommendations to the Project Coordinator regarding implementation of the traffic control plan. The District Engineer is responsible for reviewing the traffic control plans and making recommendations to the project coordinator regarding the constructability of the traffic control plan. The Safety/Traffic Section is responsible for reviewing the traffic control plans and making recommendations to the project coordinator regarding compliance of the traffic control plan with relevant criterion and standard practice.

For more information on developing a Traffic Management Plan can be found in the 2008 Work Zone Safety & Mobility Implementation Guide.

Cost update. The Project Coordinator updates the scope budget form once an approved scope is finalized and project costs are updated. The budget and scope change form and Instructions are located on SharePoint.

Engineers Estimate. An Engineer's Estimate should be entered into the IFS/CMS after the scope of the project has been approved. Instructions for developing an Engineers Estimate can be found on SharePoint.

AGREEMENTS

General. The need for an agreement is established by the Project Coordinator; details of the agreement are identified, put in writing, reviewed, and agreed upon by all parties. The agreement is reviewed by Agreement Services, Legal, and other divisions as needed. Once the edits and corrections have been made the agreement is signed by all applicable parties. Request for proposals for consultant services are written and executed if applicable.

Example agreements entered between the Department and outside entities are:

Inter-local. These are used when the department is "obtaining service" from or "providing service" to another state or local government agency.

Cooperative. These are used when a joint exercise of powers, privilege and authority by the department and another agency is contemplated, such as with state agencies, other states, local governments, Native American tribes and federal agencies.

Independent Contractor. These are used to procure private providers of services such as janitorial, landscaping, etc.

Consultant. These are used to procure private providers of engineering services such as for design, construction management, etc.

Private-party Agreements. These are used when the department is entering into an agreement with non-governmental parties, such as property developers, in order to coordinate and share in the cost of improvements to the transportation system; normally to the mutual benefit of both parties. It is important that third party agreements are properly entered into the IFS system with a separate breakout.

Generic agreement shells and instructions are found at SharePoint.

ENVIRONMENTAL PROCESS (NEPA)

General. The NEPA process usually begins at the scoping phase and extends up to the point were the preferred alternative is selected. During the preliminary design phase, NEPA is still ongoing and all feasible alternatives are studied equally. This is a dynamic process and requires close coordination between Roadway Design and Environmental Services during the development of alternatives to setting the right of way. Any changes to the final scope or right of way setting that produces additional impacts to the project footprint, changes to capacity, access points, and utilities, could be cause for a re-evaluation of any NEPA approvals.

Before NEPA approvals are done, the final footprint of the project has been established and agreed to by the FHWA, NDOT Divisions, and any Public Entities involved. The footprint for staging areas and detours for construction of the project have been indentified. Utility relocations have been established and agreed to by the utility companies. Public meetings have taken place and written comments have been included in the Environmental documentation.

Environmental Services initiates a formal notification for the project. The general public, public agencies and regulatory agencies are notified and entered into the project records. All of the approved alternatives are presented through the use of displays, photos and plans to the public at an informational meeting. The questions and issues, which are gathered from the public, public agencies, and regulatory agencies are answered by the appropriate Division and documented for inclusion in the environmental documents.

Environmental Services schedules the public meeting and is usually held at a public facility (i.e. school, city hall, etc.) Design provides displays for the various alternatives and provides technical support about the project.

See Public Meetings under Section 4 regarding the type of information that is normally provided at public meetings.

Environmental Services has indentified the permits that will be required to construct the project and begin the process to acquire the necessary permits before the Doc date.

INTERMEDIATE DESIGN

General. Roadway Design along with the other divisions incorporates the recommendations from the alignment development meeting and final scoping reports. At this stage the various divisions complete their design to a level where Right of Way can be set and any utilities can be identified for conflict.

Roadway Design details the locations for barrier rail, guardrail, sound walls and retaining walls. All pedestrian facilities and bike plan facilities have been incorporated into the design. Roadway design along with Hydraulics and Structural design compile a list of locations for potholing utilities in conflict. Property boundaries, existing right of way, proposed right of way, and control of access have been sufficiently detailed.

The Project Coordinator coordinates among the Traffic Engineering Section and the Utilities Section to identify electrical service points for signs, lighting and signals, and Landscaping.

The Project Coordinator holds the traffic control review meeting to determine the limitation of operations and accommodation of public traffic criteria as they relate to the construction staging and the Traffic Control Plan (TCP.) The traffic representative is responsible for determining if the TCP conforms to the MUTCD and making recommendations to address any unconformities. The construction representative is responsible for determining if the TCP provides a reasonable approach for the contractor to control traffic during the construction and making recommendations to address any potential construction problems with the TCP. The Project Coordinator is responsible for getting the approval of the Chief Maintenance Engineer for the TO plan and the TTL plan.

SECTION 6 WORK FLOW

The Construction Division along with Roadway Design and the Safety/Traffic Division develop a traffic control plan. A constructability meeting takes place and agreement has been reached and documented on how the project will be constructed. Limitations of operations are developed and a draft traffic control matrix is based on traffic control scenarios during each phase of construction. Preliminary time frames and construction sequencing is developed in the regard for the length of time temporary easements will be needed.

Any special structures such as retaining walls and sound walls have been forwarded to Structural Design. Adequate bridge design and estimates have been completed and provided to Roadway Design.

Hydraulics has finalized the footprint for on-site and off-site drainage facilities. Special drainage structures that affect right of way are forwarded to Structural Design to establish footings that may encroach beyond right of way. Refer to the Drainage Manual for Hydraulic coordination and deliverables.

Geotechnical exploration and analysis are conducted and the draft geotechnical report has been forward to Structures, Hydraulics and Design for design completion.

Request for water, power and telephone sources for NDOT facilities have been forwarded to utility companies by R/W or District, and preliminary approvals have been returned. In addition, the utility companies have provided plans showing proposed utility relocations.

Landscape and aesthetics plans have identified the location where water, power and telephone lines will be located.

When restricted lanes, as listed in section 4, DIVSIONS, Over dimensional permits, are planned at the detail design and final design phases for either permanent infrastructure, temporary construction, or temporary traffic control, and at least seven days in advance (and sooner if possible) of implementation of any of these items during the construction phase, advise the Over Dimensional Vehicles Permits Office in writing at: OverDimensionalPermitsOffice@dot.state.nv.us

Intermediate submittal. The following is the procedure for processing intermediate submittals for 3R projects. A similar sequence of activity should be followed for capacity projects using appropriate adjustments to the time frame based on the project's particular requirements. The Project Coordinator decides when a given project is within five days of meeting intermediate design submittal requirements at which point Road Design will hand carry to Specifications:

- A written request for Specifications to set an intermediate design review meeting to be held not less than 20 or more than 25 working days from the date of the request.
- A copy of the engineer's estimate (CM14 report) and notes related to Limitations of Operations, Traffic Control, or other Special Provision items that may have been agreed to at the PDFS or otherwise provided by Construction, the lab, district, or others.
- The Project Coordinator will discuss the bid items in detail with the specifications engineer at the time of the initial submittal to ensure that the estimate is complete and the units of work are appropriate for the intended work. It will also be determined if additional notes to specifications are required.
- Within five working days after the above request, one set of the intermediate design plans and any additional notes to specifications will be hand delivered to Specifications for their use in developing the Special Provisions.

Specifications will:

- Select a date, time, and reserve a meeting place for the intermediate design review, ensuring that it does not conflict with other Specification reviews. In setting up the meeting, Specifications will make every attempt to contact the appropriate assistant construction engineer and assistant district engineer.
- Develop preliminary special provisions and furnish the appropriate number of sets (as established by the senior specifications writer in the intermediate design review list) to design within five working days of receipt of intermediate design plans and estimate.
- Provide design with a copy of the distribution list.
- Conduct the specifications portion of the review meeting.
- Coordinate specification related comments and make revisions as necessary.

Road Design will:

- Make any additional arrangements and contact the participants for the intermediate design review.
- Arrange for reproduction of the appropriate number (as established by the senior specifications writer in the intermediate design review list) of intermediate design plans and estimates.
- Distribute plans, specifications and estimates for review. The transmittal letter will reiterate policy that no scope changes will be allowed after this review.
- Conduct the plan review portion of the meeting.
- Document plan and estimate review comments.
- Make plan and estimate revisions as necessary.

Review Period. The total time for this process is 6 to 7 weeks once the project is submitted to the review meeting is held. Allow 3 weeks once the plans, specs, and estimate are sent on review; large or complex projects should allow for 4 weeks.

Right of way setting. All right of way needs along with any utility adjustments and/or relocations have been identified and approved by the project team. The Right-of-Way Setting memo outlines the various acquisitions involved and sent to the Assistant Director, Engineering for approval. Once the right of way memo has been signed, the various divisions are authorized to proceed with the necessary steps to complete the required right of way acquisitions and environmental clearances to complete this project.

Generic right-of-way memos can be found on SharePoint under standard project memo templates.

See Section 4 for additional guidance concerning right of way settings.

Update engineers estimate. The Designer updates the engineers estimate with approved unit prices from the Principal Design Engineer. See the Project Estimate Guidelines for entering and updating estimates.

Program final design. Financial Management programs the project funds for final design and right-of-way acquisition once the Project Coordinator submits the program request form. Final design utilizing Federal Aid Funds cannot proceed until the NEPA process is complete.

FINAL DESIGN

General. After the Intermediate review meeting is held, the individual divisions such as bridge, traffic, and hydraulics finalize their plans and quantities and submit their plans to roadway design to be combined into the plan set. Roadway updates the Engineers estimate into the IFS. Refer to the Project Estimate Guidelines for instructions. All details of the project are finished and compiled into the plans and ready for the discipline review.

Discipline submittals. This step applies to large or complex projects; 3R projects are normally exempt from this step. Discipline submittals are specific to the division in charge and do not require that multiple sets be submitted to other divisions. Structures reviews the drafted structural details for the bridge design, retaining walls, sound wall, special drainage structures, special structures, sign bridges, signal bridges, etc. and revises them before they are finalized for quantities & quality assurance review. Hydraulics reviews the drafted drainage details, permanent erosion control detail, temporary erosion control details and special drainage structure details, etc. and revises them before they are finalized for quantities & quality assurance review. Right of Way Engineering reviews and revises all of the proposed parcel maps prior to going to the appraisal stage.

Discipline submittals are usually done on complex projects to assist the other divisions to ensure accuracy. The discipline reviews need to be done and incorporate changes before preceding the QA/QC. 3R projects do not require discipline submittals and proceed to quality assurance/quality control review.

In-squad checking. Before submitting the project workbook and plans, the Designer ensures quantity calculations have been cross checked and the workbook is neatly organized and updated. It is preferable that another design squad checks the plans along with the engineer's estimate.

Quality Assurance / Quality Control. A memo along with 4 sets of plans, the project workbook, notes to specifications, and 2 estimates (CM14) are submitted to Specifications. Generic QA/QC memos are found on SharePoint.

Specifications perform the QA on the plans and starts writing the specifications for the project. QA/QC takes approximately 2 weeks to complete this work.

Once Specifications has completed a quality assurance review, all remarks and requests are returned to the Designer for revision. The Designer forward revisions to the responsible Divisions and receives updated plans and estimates for inclusion into the review set.

Plan, Specs, and Estimate (PS&E) review. Once the QA/QC is complete, Specifications develops the special provisions and schedules the specs review meeting along with the number of sets of plans needed for review. The specs writer informs the Designer of the number of plans sets needed for review and prepares the memorandum that indicates the time and location of the meeting. Design provides the requested number of plan sets and specifications distributes the plans and special provisions.

All plans, specifications, and estimates have been reviewed by all Divisions and any errors, revisions or recommendations have been forwarded to appropriate Division for corrections.

Allow 3 weeks once the plans, specs, and estimate are sent on review; large or complex projects should allow for 4 weeks.

Specifications review meeting. A formal meeting is held to review and discus issues brought up during the review period. The meeting is to determine which corrections and additional information needs to go into the final project documents.

Processing memo. The Chief Road Design Engineer prepares the processing memo around the time of the specs review meeting for signature by the Assistant Director of Engineering. The memo sets the advertising date, the advertising period, the date of reproduction for small sets, the date for approval of the traffic control by the Chief Safety/Traffic Engineer and the date for submittal of the preliminary agreement estimate to Financial Management. The contract number is issued by Administrative Services; the Project Coordinator obtains this information and is passed to the Designer to put onto the title sheet. The Title sheet is signed by the Director once the title sheet is finalized. Designs Administrative Assistant will notify the Project Coordinator by email and will request information such as final construction cost, project scope, and location.

Price check. The Principal Design Engineer checks the unit prices used by the Designer and forwards any changes to the design squad to update the estimate in the IFS/CMS. The Principal Design Engineer sets the final prices for the preliminary agreement estimate and locks the estimate.

Submittals. After incorporation and verification of the specification review meeting changes, the design squad submits the preliminary agreement estimate to Financial Management and the electronic plan files to the specifications writer along with the OPI2. All contact regarding plan reproduction must be directly with Administrative Services concerning changes, schedule modifications, supplemental notices, plan sheet additions, etc. On the date set forth to go to reproduction, the Designer will assemble all pertinent files in a single directory named with the contract number. The directory location will be forwarded to Specifications. After the award of the contract, the specifications writer will retrieve a final copy of the special provisions, supplements, and plans and create three CD copies: one for Design, one for Central Records and one for Specifications. Refer to instructions for archiving electronic files.

Prior to advertising the project another participating agency will be given an opportunity to review the proposed contract plans for the facilities in which it is participating. At the time of advertising, the agency should be notified and given a copy of small sets, special provisions and an estimate showing the amount of its participation.

Refer to instructions for electronically submitting plans.

Proof set. The Administrative Services Division prints proof sets for review. The Designer reviews the plans and the Specifications Section reviews the specification proof set before advertisement sets are printed. This review is for legibility, to make sure no pages are missing (index of sheets), PE stamps (if applicable), and the Director's signature.

The Project Coordinator authorizes the Administrative Services Division to print the construction plans once the Designer and specifications writer approve the proof sets.

If the proof sets are not approved, the Designer and/or specifications writer make the necessary changes and the plans and specifications are resubmitted to Administrative Services. Final plan set are submitted by Administration to reproduction for advertising.

Right of way certification. The Chief Right-of-way Agent is responsible for certifying that the project is in compliance with applicable right-of-way and utility criteria.

Federal aid projects, including full oversight projects but not including local public agency projects, will be processed as follows: once a final processing memo is received by the Right of way Division, a certification letter will be sent to the Administrative Services Division. Paper copies will be sent to the Project Manager and the Financial Management Division and a digital copy will be emailed to the FHWA Division Administrator to the attention of the Right of Way Program Manager.

Federal aid local public agency projects will be processed as follows: Once a processing memo is received by the Right of Way Division, a certification letter will be sent to the Principal Intergovernmental Programs Engineer in the Road Design Division. A paper copy will be sent to the Financial Management Division and a digital copy will be emailed to the FHWA Division Administrator to the attention of the Right of Way Program Manager.

State funded projects, not including local public agency projects, will be processed as follows: once a processing memo is received by the Right of Way Division, a certification memo will be sent to the Administrative Services Division. Paper copies will be sent to the Project Manager and the Financial Management Division.

State funded local public agency projects will be processed as follows: once a processing memo is received by the Right of Way Division, a certification memo will be sent to the Principal Intergovernmental Programs Engineer in the Road Design Division. A paper copy will be sent to the Financial Management Division.

Doc date. The processing memo has been sent to all Divisions. The plans, quantities and estimates for all Divisions have been updated, corrected and submitted to Design and combined into a final Plans & Estimate package and delivered to Specifications. All Specifications have been updated, corrected and combined with the Plans and Estimate and are ready to be sent to Administrative Services.

SECTION 6 WORK FLOW

Projects that are within urban areas will require the review and approval of the Chief Traffic Engineer. For the purposes of this requirement urban areas shall be the counties of Clark, Carson, Douglas, Lyon, Storey and Washoe. Projects outside of these counties can be advertised without an approval letter signed by the Chief Traffic Engineer. The processing memo shall indicate which projects require a formal review by the Chief Traffic Engineer.

On full oversight projects, one more additional week is needed to allow time for the FHWA to review the plans, special provisions and estimates (PSE). The FHWA must be informed of all changes, other than clarifications, to plans and specs that occur after the final spec review. In addition, the FHWA will physically sign the plans and special provisions.

Advertise contract. The contract cannot advertise until all of the project certifications are complete. Contracts with FHWA for Federal oversight projects will usually require additional time to certify. Most contracts are advertised for a period of 3-4 weeks. Administrative Services will forward two copies of the final plans and specifications to the Project Coordinator and Designer so they will have current information to answer the Contractor's questions during the advertising, pre-bid, pre-con, and construction phases of the contract.

Request for information (RFI's). During the advertising period, the Project Coordinator is required to answer contractor's questions in accordance with sub-section 102.05 of the Standard Specifications for Road and Bridge Construction. An email is sent to the assigned Project Coordinator informing that a question has been posted to NDOT's web site. The Project Coordinator responds in writing to the questions as they arise. RFI's are found at NDOT'S intranet homepage>engineering>RFI

Supplemental notices. Based on questions that may arise from the pre-bid conference or other issues, the Project Coordinator or other divisions may issue a supplemental notice to correct or clarify the project plans prior to bids being received. There are three main factors to consider in deciding to "supplement" or not:

- Is the information provided to bidders accurate so that contracts can be executed and performed without unnecessary difficulty?
- Do contractors have adequate time to prepare their responses to bids after receiving the information?
- Will the contracts get out and bids be awarded in time for the construction season?

When a supplemental is needed, the matter must be dealt with promptly. The issuance of a supplemental cause a number of people to take action before the bid opening date and each person must handle their part with a sense of urgency. The following steps should be used to implement a supplemental:

- Review the matter with the Chief Road Design Engineer. If the consensus is that a supplemental is needed:
- The division head checks with other division personnel to find out if more items have been identified within that division.
- Submit a request for a supplemental to the specification writer on the contract.
- The specification writer will pool requests, check with other divisions to see if more items needing correction have been identified, and have the revisions reviewed by the principal specification engineer.
- The Chief or Assistant Chief Road Design Engineer will approve the supp as written, sign off, and deliver it to Contract Services. If the request occurs during the week of the bid opening, front office approval must be obtained for maintaining the bid date or postponing the opening.
- Contract Services will prepare the supplemental for vendor distribution and release it.

Close coordination with Administrative Services is vital to ensure that proper timeframes and procedures are met. The Supplemental Notice needs to be processed one week before the bid opening date, or the bid date will need to be adjusted to allow sufficient time for review by contractors.

Bid opening. Administrative Services receives bids from the contractors and the bids are opened at the bid-opening meeting and the apparent low bidder is announced.

Award contract. Within two working days of a bid opening, Administrative Services provides the bid tabulation, including percentage variances from the engineer's estimate for each bid item to the chairman of the Bid Review Analysis Team (BRAT). They also notify the BRAT chairman of any defects or challenges that would or may render any of the bids non-responsive or otherwise affect the award of the contract. If requested by the BRAT the road Designer reviews the quantities and prices of certain items to determine if there is an error in the contract that is prompting bidding discrepancies.

The BRAT reports to the director listing the effects of re-advertising on construction scheduling and the likelihood of receiving better bids with one of the following recommendations:

- Award to the apparent low bidder
- Award to the apparent second low bidder (or next responsive bid that is not materially unbalanced)
- Reject all bids, re-advertise and notify any agencies that are under agreement to provide funding.

Third party involvement. Any agreement with a local government (or private party) that is participating in the costs should review the bid and give concurrence to award the contract. Any such stipulation must be honored in accordance with the agreement.

Notice to proceed. Contracts in the Las Vegas area usually have a 45 working day notice to proceed; most northern Nevada projects have a 30 work day notice to proceed. The Construction Division sets the notice to proceed date.

CONSTRUCTION SUPPORT

General. Once a contract has been awarded it becomes the responsibility of the resident engineer to coordinate the activities. The design team provides the construction team with support throughout the remaining life of the contract.

Change orders. Change orders requested by Roadway Design go through the Chief Road Design Engineer to the Chief Construction Engineer. Examples of change orders can be found on SharePoint under standard project memo templates.

ARCHIVING

Electronic files. Roadway Design archives all pertinent project computer files on CDROM around the time the contract is awarded. All archives include the project design files and the special provisions.

The Designer will assemble all pertinent files (to include design files, finished drafted files, etc.) in a single directory named with the contract number. The location and path to this directory will be forwarded to Specifications, who will retrieve the files for temporary storage. The Designer should coordinate with the Safety/Traffic Division and Hydraulics when archiving projects to ensure that all pertinent engineering documents are included.

After the award of the Contract, the Specifications writer will retrieve a final copy of the Special Provisions, Supplements, and any other correspondence pertinent to the contract. Specifications will copy all of the assembled files to three CD ROM disks; one to be forwarded to Central Records, one to be stored in the workbook in Design, and one to be kept in Specifications.

Workbook. The project files are to be retained by the Designer until the contract is completed so that any construction problems can be worked out.

The material sent to Central Storage is to be reviewed by the Designer. All voided and non-current documents are to be disposed of prior to storage. FHWA requires that contract documents shall be retained until 3 years past the final pay or the final settlement of any litigation (whichever is the latest) This means that three years time is allowed for Federal Auditing after the final payment of the contract.

Therefore, all documents to be stored are plainly labeled so that information can be readily located and retrieved.

Project records that are retained beyond the final payment + 3 years are such documents as follows:

- Original Traverses
- Hydraulic Calculations of Drainage Areas
- Field Books Containing Alignments, Check Levels, Monument
- Workbooks

SECTION 6 WORK FLOW

Existing files. Previous contracts are available either in original 11”X17” printed format or on microfiche. Once a contract is available on microfiche the printed version is no longer maintained in the division’s files. The microfiche system provides easy printing of any pages from archived documents through the Xerox copier located next to the microfiche viewer. Any printed contracts must be maintained in good condition and repaired if necessary prior to returning to the file. Cards are provided that must be filled out and inserted in place of the retrieved contract.

Older contracts produced using original versions of Microstation and Inroads are available from the Standards and Manuals section. These contain contract files that were converted from the Unix format to the Windows format and are not fully compatible with current versions of the programs or CADD standards. These may be useful for creating initial plan sets or for reproducing certain details such as typical cross sections or special construction details.

A listing of contracts by county, route and project type is maintained in the division’s front office. This resource provides a convenient method to find contracts when you have only general information on the location.