200 Documentation

200.1 General

This chapter provides design documentation requirements for New Mexico Department of Transportation (NMDOT) projects. Documentation records the evaluations and decisions made as part of the design process; accordingly, providing proper design documentation is a critical aspect to delivering any NMDOT project.

200.2 Purpose

Design documentation records the evaluations and decisions made by the various disciplines that result in design recommendations. Design assumptions and decisions made prior to and during the scoping phase are included. Changes that occur throughout project development are documented. Required justifications and approvals are also included.

200.3 Certification of Documents

All original technical documents must be certified by the responsible professional in direct control of the work. For specialty non-engineering work (e.g., environmental), the responsible professional shall sign the document. For work involving final engineering decisions, the work shall be sealed and signed by the responsible professional engineer.

200.4 Project Decisions Summary

All projects require a Project Decisions Summary. All design decisions need to be documented. It is the intent that the Project

Decisions Summary will document the major design decisions made throughout the life of a project. The Project Decisions Summary is a dynamic document that will be used as a reference when decisions are being made and will be updated as necessary to reflect new decisions. This summary will document decisions made by the project team throughout the life of the project. These decisions may be related to design criteria, design variances, and any design decisions made during the scoping of a project. The information contained in this summary document will be compiled from various project documents, field data collection, meeting notes, and evaluations made as part of the project development process. Design criteria may be revised throughout project development based on continuing evaluations, and it is important to document these changes in the Project Decision Summary.

The appropriate District Engineer and Regional Design Manager must concur with the design decisions made for all projects. A Project Decisions Summary form is provided at the end of this chapter. This form is used to maintain a record of design decisions made throughout the life of a project.

200.5 Design Criteria

Each project shall have design criteria compiled and documented in a report. This is a brief document that is important for the project file because it documents the criteria used for the design. An example of project design criteria documentation is provided at the end of this chapter. Minimum requirements for this document are:

- **Detailed project location** - A detailed description of where the project is located including latitude and longitude, stationing, and/or mileposts.
- **Design guideline documents** - A listing of documents used to establish design guidelines for the project.
- **Drainage criteria** - Drainage criteria values and references. This section should include the design flood used for the project, if applicable, as well as a summary of any design variances that were obtained.

- **Roadway/bridge criteria** - Roadway classification, design speed, average daily traffic (existing and projected), clear zone width, roadway width, horizontal curves and superelevation, vertical curves, roadway grades, roadway cross slope, driveways, guard rail, sidewalks, and bridge design criteria. References for the information/criteria used should be included as well as a summary of any design variances that were obtained.

200.6 Design Documents

The project file must contain the documents generated during the design process. For each project, a summary (list) of the design documents shall be included in the project file. A summary of all design exceptions and design variances is required for all projects.

The following items are design documents that should be contained in the file, as applicable to the project. Some items include a reference to a chapter of this Design Manual that provides additional information on documentation requirements.

- Legislation
- Statewide Transportation Improvement Program (STIP) documentation
- Project Definition, Initial Cost Estimate, and Project Control Number Request Form (Chapter 120)
- SHRP 2, R10 project management documentation from project definition related to identifying project issues, completing a complexity dimension rank and rating, developing a complexity map, completing follow-up questions, identifying critical success factors, determining key team members, and developing a preliminary action plan (Chapter 120)
- Scoping Report or Phase IA and Phase IB studies (Chapter 130)
- SHRP 2, R10 project management documentation for scoping or Location Study Procedures – specifically, the complexity map and the project action plan (Chapter 130)
- Phase IC Environmental Documentation (Chapter 130)

- Special environmental reports such as those for cultural resources and biological resources (Chapter 130)
- SHRP 2, R10 project management documentation for Preliminary Design – specifically, the complexity map and the project action plan (Chapter 140)
- Design review submittals and inspection summaries (Chapter 140)
- Public involvement documentation (Chapter 150)
- Project decisions summary (Section 200.4)
- Design criteria report (Section 200.5)
- Design exceptions/variances (Chapter 210)
- Interchange access change request (Chapter 210)
- Right-of-way documentation (Chapter 500)
- Geotechnical reports (Chapter 610)
- Pavement design (Chapter 620)
- Bridge type selection reports (Chapter 700)
- Drainage reports (Chapter 800)
- Work zone documentation (Chapter 900)
- Signing and delineation documentation (Chapter 910)
- Illumination documentation (Chapter 920)
- Intelligent transportation system (ITS) documentation (Chapter 930)
- Traffic signal documentation (Chapter 1100)
- Railroad crossing documentation (Chapter 1110)
- Traffic studies (see the NMDOT State Highway Access Management Manual [SAMM], current edition, see also Chapter 510)
- Certifications from the Environmental, ITS, Railroad, Utilities, and Right-of-Way Bureaus (Chapter 140)

The design documentation file should ultimately be located in NMDOT's offices and records. NMDOT will determine who will be responsible for maintaining the project file. The Project Development Engineer (PDE) will likely be responsible for

maintaining the project file; however, in cases where consultant support is desired, it will be specified in the consultant contract.

200.7 Alternative Project Delivery Methods

When an alternative project delivery method is used, such as design-build, the documents described in Sections 200.4, 200.5, and 200.6 are still required. The NMDOT will begin design documentation for a design-build project in the project scoping phase, but the documentation through the life of the design-build project will be completed by the design-builder.

Project Decision Summary

Project Name				
Project Development Engineer				

Item #	Description of the Decision	Reason for the Decision	Priority	Decision Date	Decision Made By	District Engineer Concurrence Date	Regional Engineer Concurrence Date	FHWA Concurrence Date*	Comments

NM 159 – Mogollon
CN: ER 14103
Engineering Design Criteria

Project Location

The project is located in Catron County, New Mexico from MP 8 to MP 10 of NM 159. The town of Mogollon is located within this corridor.

- Latitude/Longitude = 33.3915, -108.7899
- The project has been split into 3 sections. Section A (sta 2+85 to sta 44+13.58) includes the western segment from MP 8 to Mogollon, Section B (sta 44+13.58 to sta 74+00) includes the town of Mogollon, and Section C (sta 74+87.61 to sta 113+30.94) extends from Mogollon to MP 10. See Map below.

Design Guideline Documents

- Guidelines for Geometric Design of Very Low-Volume Local Roads, ADT≤400 (**GDLVLR**), AASHTO, 2001
- A Policy on Geometric Design of Highways and Streets (**Green Book**), AASHTO, 6th Edition, 2011
- Roadside Design Guide (**RDG**), AASHTO, 4th Edition, 2011
- Manual on Uniform Traffic Control Devices (**MUTCD**), 2009 Edition
- State Access Management Manual (**SAMM**), 2001
- New Mexico State Highway and Transportation Department Drainage Manual
- Barrier Guide for Low Volume and Low Speed Roads, Publication No. FHWA-CFL/TD-05-009
- Low-Volume Roads Engineering – Best Management Practices Field Guide, USDA Forest Service

Drainage Criteria

See the table below for drainage design criteria items, values, and reference information. The values were taken from Table 2B – Storm Frequencies for Minor Arterials, Collectors, and Local Roads. NM 159 is a Rural Minor Collector with <400 ADT.

Criteria Item	Value	Reference	Remarks	Design Variance Obtained (Y/N)
Bridge Structure	Design Flood: 25-year Check Flood: 50-year	Drainage Design Criteria for NMDOT, 4th Revision, June 2007, Table 2B	See discussion below	Yes 1-12-2016
Roadside Ditches and Inlets	Design Flood: 10-year Check Flood: 25-year	Drainage Design Criteria for NMDOT, 4th Revision, June 2007, Table 2B	See discussion below	Yes 1-12-2016

Roadside Ditches and Channel

Table 1 – Criteria for Drainage Structures from the Drainage Design Criteria NMDOT Projects, dated June 2007, states that the 25-year check flood shall be limited to water depth on one-half of a driving lane. In this project, the 25-year check flood is contained within the channel except for a few locations. In these locations, the check flood is over the entire roadway and therefore does not meet the criteria.

A design variance was prepared for the project. There are two situations occurring within the project limits that cause storm flows to enter the roadway.

1. The proposed channel design meets the NMDOT requirements for the 25-year storm except in a few locations. Due to the constrained mountainous terrain, historic buildings and adjacent archeological sites, there are several locations where water will overflow the channel onto the road during the 25-year design storm. No structures will be affected by the flows.
2. There are three low water crossings of Silver Creek. These locations were evaluated for culverts or bridges but the community wanted low water crossings. The locations have low traffic volumes and all the crossings will be concrete paved. One crossing is in the paved section of roadway and the other two are in the eastern portion of the project where the road is unpaved.

Bridge Structures

The NMDOT criteria for bridge structures is to design for the 25-year storm and use the 50-year storm as the check storm. During the 25-year design storm at least two feet of freeboard must be maintained and during the 50-year check storm the flows need to remain below the low chord of the bridge. All three bridge structures within the project boundaries meet these requirements for both the design storm and the check storm.

Roadway Criteria

The table below lists the design criteria item, the value used during design for that item, and the reference document. The Remarks column contains additional explanations, if necessary. The appendix includes a table showing a comparison between AASHTO requirements and the Forest Service requirements for reference.

Criteria Item	Value	Reference	Remarks	Design Variance Obtained (Y/N)
Roadway Classification	Minor Collector Rural	http://dot.state.nm.us/content/dam/nmdot/planning/Federal_Function_Classification.pdf		N/A
Design Speed	Section A - 30 mph Section B – 20 mph Section C – 20 mph		• Section A - The existing posted speed is 25 mph. A 30 mph design speed was established for this section. • Section B – The existing posted speed is 15 mph. A 20 mph design speed was established for this section. • Section C – No posted speed limit. A 20 mph design speed was established for this section.	N/A
ADT	ADT (2013) = 99 ADT (2036) = 129	Data provided by NMDOT		N/A
Clear Zone	• 6 ft where it can be provided • In constrained areas, clear zones of less than 6', including designs with 0 ft, may be used.	• Ref. GDLVLR pages 48-49.	• Due to the mountainous terrain, clear zones of 6' were not used. • Clear zones of 4'-5' were used where possible.	
Roadway Width	• 18' required by AASHTO • 16'-23' required by USFS	• Ref. GDLVLR Exhibit 1 • Low Volume Roads Engineering - USFS	• Matched existing roadway width of 14'-16'. See design variance for location and justification of lane widths.	Yes 1-12-2016

Criteria Item	Value	Reference	Remarks	Design Variance Obtained (Y/N)
Horizontal Curvature and Superelevation	• Section A - e_{max}=6%, for RC r=2240 • Section B, C - e_{max}=6%, for RC r=1630	• Ref. AASHTO Green Bk. Table 3-9, e_{max}=6% • Section A - 30 mph design speed • Section B, C – 20 mph design speed	• Matched existing roadway curves due to mountainous terrain and environmental concerns. • See design variance for location and justification of horizontal curves	Yes 1-12-2016
Vertical Curvature	• K=13 for 30 mph "higher risk" locations • K=5 for 20 mph "higher risk locations"	• Ref. GDLVLR Exhibit 12.	• All vertical curves within the project meet these requirements	N/A
Roadway Grades	• 14% max for mountainous terrain at 30 mph • 16% max for mountainous terrain at 20 mph	• Ref. AASHTO Green Bk. Table 5-2	• All grades within the project are less than 14%.	N/A
Roadway Cross Slope	Paved 1.5% -2% Unpaved 2%-6%	• Ref. AASHTO Green Bk. Table 4-1	• All cross-slopes in Sections A and B are 2% • Cross-slopes in Section C are 3%.	N/A
Driveways	Spacing – 200 feet between driveways	• Ref. SAMM Table 18.C-1	• Spacing is less than 200' in town due to existing property boundaries	Yes 1-12-2016
	One-Way Access for Car/Pickup – 16 to 24 feet	• Ref. SAMM Table 18.I-1	• Many driveways are narrower due to existing site constraints	Yes 1-12-2016
	Maximum grade should be 10% with 20 level pad (maximum grade 2%)	• Ref. SAMM Section 18.N	• The grades on many driveways are steeper than 10% and do not have a level pad due to site constraints	Yes 1-12-216
			See design variance for location and justification of all driveway requirements	

Criteria Item	Value	Reference	Remarks	Design Variance Obtained (Y/N)
Guardrail	Barrier is less warranted if speed 25 mph or lower, traffic volume below 400 vpd with no history of crashes	• Ref. Barrier Guide Table 2.8	• No barrier exists on NM 159 in any location; adding barrier would be inconsistent with the existing roadway • No barrier allows for a wider shoulder for drivers to pass on the narrow roadway	N/A
Bridge End Rails	Because of their severity, bridge rails should never be considered “not warranted”	• Ref. Barrier Guide Section 2.5.4 Bridge End Rails	• Barrier was provided at the bridge end rails.	N/A
Sidewalks			No sidewalks exist within project limits	

APPENDIX

NM 159 Mogollon, ER14013
AASHTO/USFS CRITERIA SUMMARY

		AASHTO			USFS *
GENERAL		Section A	Section B	Section C	
Existing posted speed		25	15		
Design speed		30	20	20	
DESIGN ELEMENT	ASSUMPTIONS				
Total roadway width (ft)		18	18		16 to 23
Min. radius (ft)	<250 vpd, max. super 8%	250	105	150 (loose gravel)	50
Min. radius (ft) - Constrained		125	70		
Min. sight distance (ft)	0-100 vpd 100-250 vpd, high risk areas	135 165	90 95		
Min. K value for crest VCs	0-100 vpd 100-250 vpd, high risk areas	9 13	4 5		
Sight triangle (ft)		140	90		
Clear zone (ft)		6	6		
Clear zone (ft) - Constrained		<6	<6		
Max. grade	Rolling Mountainous	10% 14%	11% 16%		12%
Cross slope		1.5% to 2%	1.5% to 2%	2% to 6%, 3% desirable	Outslope, 3% to 5% for grades <10% Inslope w/ ditches, 3% to 5% for grades >10%
Max. superelevation	 Snow/ice conditions prevailing	12% 8%	12% 8%	12% 12%	
Max. cut slope					0.75:1
Max. fill slope					1.5:1

* USFS critera are converted from metric units