APPENDIX L

Design Criteria

Design Criteria - US 550 (Southern Curves)

DESIGN PARAMETERS	EXISTING CONDITIONS (EIS LIMITS)	US 550 EA		EIS (2006)		SFEIS (2012)		AASHTO PGDHS (2004) (MINIMUM SOUTHERN CURVES)		AASHTO PGDHS (2004) (DESIRABLE SOUTHERN CURVES)		AASHTO PGDHS (2004) (SOUTH OF CR 220)		CDOT DESIGN GUIDE (2005) (MINIMUM SOUTHERN CURVES)		CDOT DESIGN GUIDE (2005) (DESIRABLE SOUTHERN CURVES)		CDOT DESIGN GUIDE (2005) (SOUTH OF CR 220)		PROJECT RECOMMENDATION
CLASSIFICATION	PRINCIPAL ARTERIAL [3]	RURAL HIGHWAY	1-6			FREEWAY	2-31	RURAL PRINCIPAL ARTERIAL	8	RURAL PRINCIPAL ARTERIAL	8	RURAL PRINCIPAL ARTERIAL	8	PRINCIPAL ARTERIAL [3]		PRINCIPAL ARTERIAL [3]		PRINCIPAL ARTERIAL [3]		RURAL PRINCIPAL ARTERIAL
TERRAIN	MOUNTAINOUS [3]			ROLLING	1-11	ROLLING	2-31	ROLLING		ROLLING		ROLLING		MOUNTAINOUS [3]		MOUNTAINOUS [3]		MOUNTAINOUS [3]		ROLLING
DESIGN VEHICLE								WB-67		WB-67		WB-67								WB-67
AVERAGE DAILY TRAFFIC (2013)		5800 (2003)	1-6											6800 [3]		6800 [3]		6800 [3]		7,900
AVERAGE DAILY TRAFFIC (2035)		12600 (2025)	1-6																	21,600
DESIGN SPEED (MPH)		70 (60 AT BONDAD HILL)	2-9	60	1-11, 2-19	70	2-22, 2-26, 2-31, 5 46	55	68, 444	60	68, 444	70	68, 444	55	3-33	60	3-33	70	3-33	55
POSTED SPEED (MPH)	60 S. of CR 220							50		55		65		50		55		65		50
HORIZONTAL CURVES																				
MINIMUM RADIUS								960	170	1,200	170	1,810	170	960 [4]	10,11	1200 [4]	10,11	1810 [4]	10,11	960
MAXIMUM SUPERELEVATION								8%	446	8%	446	8%	446	8% [4]	10,11	8% [4]	10,11	8% [4]	10,11	8%
VERTICAL CURVES																				
CREST (K)								114	272	151	272	247	272	114	3-2	151	3-2	247	3-2	114
SAG (K) (for Headlight Sight Distance)								115	277	136	277	181	277	115	3-2	136	3-2	181	3-2	115
MAX. GRADE DIFFERENCE REQUIRING NO CURVE														0.2%	3-35	0.2%	3-35	0.2%	3-35	0.2%
STOPPING SIGHT DISTANCE (FT)								495	112	570	112	730	112	553	3-2	638	3-2	825	3-2	495
PASSING SIGHT DISTANCE (FT)								1985	124, 445	2135	124, 445	2480	124, 445	1985	3-2	2135	3-2	2480	3-2	1985
GRADE																				
MINIMUM								0.50%	236	0.50%	236	0.50%	236	0.50%	3-33, 7-2	0.50%	3-33, 7-2	0.50%	3-33, 7-2	0.50%
MAXIMUM		5%	2-9	4%	1-11, 2-19	4% - 5%	2-31	5%	446	4%	446	4%	446	6%	3-32	6%	3-32	5%	3-32	5%
PAVEMENT CROSS SLOPE								1.5% - 2%	446	1.5% - 2%	446	1.5% - 2%	446	2%		2%		2%		2%
CROSS SECTIONAL ELEMENTS																				
NUMBER OF THRU LANES	2	4	Fig 2.3-3, 2-6	4	2-34			2-4	446	2-4	446	2-4	446	4	4-6, 4-7	4	4-6, 4-7	4	4-6, 4-7	4
LANE WIDTH (FT)	12	12	Fig 2.3-3, 2-6					12	448, 455	12	448, 455	12	448, 455	12	3-39, 4-6, 4-7	12	3-39, 4-6, 4-7	12	3-39, 4-6, 4-7	12
SHOULDER WIDTH (FT)	0-2	10	Fig 2.3-3, 2-6	8' - 10'	1-10			> 8	448	> 8	448	> 8	448	10	4-7	10	4-7	10	4-7	10
MEDIAN WIDTH (FT)	0	46 (14 at Bondad Hill)	Fig 2.3-3, 2-6	46'	2-19			> 4	451	> 4	451	>4	451	32 MIN	4-7, 4-33, 7-6	32 MIN	4-7, 4-33, 7-6	30-60	4-7, 4-33, 7-6	46' S of CR 220
CLEAR ZONE WIDTH (FT) [2]				21' - 46'	1-10			24	3-3	30	3-3	30	3-3	24	3-3	30	3-3	30	3-3	30
SIDE SLOPE DISTANCE "Z" (FT) (Where Applicable)														12	4-7, 4-16	12	4-7, 4-16	12	4-7, 4-16	12
SIDESLOPE (MAXIMUM)																				
CUT								4:1	324	4:1	324	4:1	324	4:1 DES. / 3:1 MAX	4-15	4:1 DES. / 3:1 MAX	4-15	4:1 DES. / 3:1 MAX	4-15	3:1 MAX
FILL								4:1	324	4:1	324	4:1	324	4:1 DES. / 3:1 MAX	4-15	4:1 DES. / 3:1 MAX	4-15	4:1 DES. / 3:1 MAX	4-15	4:1 DES. / 3:1 MAX
REDIRECT TAPERS *														50:1	57	55:1	57	65:1	57	55:1

1 Items denoted with a * are per the State of Colorado*State Highway Access Code.*
2 Per AASHTO *Roadside Design Guide (2011)*
3 Per CDOT Straight Line Diagram 7-23-13
4 Per CDOT M&S Standards (July, 2012)

Design Criteria - US 550 (Northern Curves)

DESIGN PARAMETERS	EXISTING CONDITIONS (EIS LIMITS)	US 550 EA		EIS (2006)		SFEIS (2012)		AASHTO PGDHS (2004) (MINIMUM NORTHERN CURVES)		AASHTO PGDHS (2004) (DESIRABLE NORTHERN CURVES)		CDOT DESIGN GUIDE (2005) (MINIMUM NORTHERN CURVES)		CDOT DESIGN GUIDE (2005) (DESIRABLE NORTHERN CURVES)		PROJECT RECOMMENDATION
CLASSIFICATION	PRINCIPLAL ARTERIAL [3]	RURAL HIGHWAY	1-6			FREEWAY	2-31	RURAL PRINCIPAL ARTERIAL	8	RURAL PRINCIPAL ARTERIAL	8	PRINCIPAL ARTERIAL [3]		PRINCIPAL ARTERIAL [3]		RURAL PRINCIPAL ARTERIAL
TERRAIN	MOUNTAINOUS [3]			ROLLING	1-11	ROLLING	2-31	ROLLING		ROLLING		MOUNTAINOUS [3]		MOUNTAINOUS [3]		ROLLING
DESIGN VEHICLE								WB-67		WB-67						WB-67
AVERAGE DAILY TRAFFIC (2013)		5800 (2003)	1-6									6800 [3]		6800 [3]		7,900
AVERAGE DAILY TRAFFIC (2035)		12600 (2025)	1-6													21,600
DESIGN SPEED (MPH)		70 (60 AT BONDAD HILL)	2-9	60	1-11, 2-19	70	2-22, 2-26, 2-31, 5-46	40	68, 444	50	68, 444	40	3-33	50	3-33	40
POSTED SPEED (MPH)	35 N. of CR 220							35		45		35		45		35
HORIZONTAL CURVES																
MINIMUM RADIUS								444	170	758	170	444 [4]	10,11	758 [4]	10,11	444
MAXIMUM SUPERELEVATION								8%	446	8%	446	8% [4]	10,11	8% [4]	10,11	8%
VERTICAL CURVES																
CREST (K)								44	272	84	272	44	3-2	84	3-2	44
SAG (K) (for Headlight Sight Distance)								64	277	96	277	64	3-2	96	3-2	64
MAX. GRADE DIFFERENCE REQUIRING NO CURVE												0.2%	3-35	0.2%	3-35	0.2%
STOPPING SIGHT DISTANCE (FT)								305	112	425	112	333	3-2	474	3-2	305
PASSING SIGHT DISTANCE (FT)								1470	124, 445	1835	124, 445	1470	3-2	1835	3-2	1470
GRADE																
MINIMUM								0.50%	236	0.50%	236	0.50%	3-33, 7-2	0.50%	3-33, 7-2	0.50%
MAXIMUM		5%	2-9	4%	1-11, 2-19	4% - 5%	2-31	6%	446	5%	446	8%	3-32	7%	3-32	5%
PAVEMENT CROSS SLOPE								1.5% - 2%	446	1.5% - 2%	446	2%		2%		2%
CROSS SECTIONAL ELEMENTS																
NUMBER OF THRU LANES	2	4	Fig 2.3-3, 2-6	4	2-34			2-4	446	2-4	446	4	4-6, 4-7	4	4-6, 4-7	4
LANE WIDTH (FT)	12	12	Fig 2.3-3, 2-6					12	448, 455	12	448, 455	12	3-39, 4-6, 4-7	12	3-39, 4-6, 4-7	12
SHOULDER WIDTH (FT)	0-2	10	Fig 2.3-3, 2-6	8' - 10'	1-10			> 8	448	> 8	448	10	4-7	10	4-7	10
MEDIAN WIDTH (FT)	0	6 (14 at Bondad Hil	Fig 2.3-3, 2-6	46'	2-19			> 4	451	> 4	451	32 MIN	4-7, 4-33, 7-6	32 MIN	4-7, 4-33, 7-6	18' N of CR 220
CLEAR ZONE WIDTH (FT) [2]				21' - 46'	1-10			16	3-3	22	3-3	16	3-3	22	3-3	30
SIDE SLOPE DISTANCE "Z" (FT) (Where Applicable)												12	4-7, 4-16	12	4-7, 4-16	12
SIDESLOPE (MAXIMUM)																
CUT								4:1	324	4:1	324	4:1 DES. / 3:1 MAX	4-15	4:1 DES. / 3:1 MAX	4-15	3:1 MAX
FILL								4:1	324	4:1	324	4:1 DES. / 3:1 MAX	4-15	4:1 DES. / 3:1 MAX	4-15	4:1 DES. / 3:1 MAX
REDIRECT TAPERS *												20:1	57	45:1	57	30:1

1 Items denoted with a * are per the State of Colorado *State Highway Access Code.*

2 Per AASHTO *Roadside Design Guide (2011)*

3 Per CDOT Straight Line Diagram 7-23-13

4 Per CDOT M&S Standards (July, 2012)

Design Criteria - Ramps

DESIGN PARAMETERS	EIS (2006)[5]	AASHTO PGDHS (2004)	AASHTO PGDHS (2004) PAGE REFERENCE	CDOT DESIGN GUIDE (2005)	CDOT DESIGN GUIDE (2005) PAGE REFERENCE	PROJECT RECOMMENDATION
DESIGN VEHICLE		WB-67				WB-67
ENTRANCE - EXIT RAMP SPACING		1600 FT	EX. 10-68	1600 FT	FIG 10-10	1600 FT
SIGNAL SPACING			EX 10-2			EX 10-2
ACCEL LANE LENGTH (ENTERING US 160)			EX. 10-70, 10-71	PARLLEL TYPE PREFERRED	SEC 10.7.6.4 & TABLE 10-4, 10-5	CDOT TABLE 10-4, 10-5
ACCEL LANE TAPER		300'	846	300'	SEC 10.7.7.2	300'
DECEL LANE LENGTH (ENTERING US 160)			EX. 10-73, 10-71	PARLLEL TYPE PREFERRED	SEC 10.7.6.4 & TABLE 10-3, 10-5	CDOT TABLE 10-3, 10-5
DECEL LANE TAPER		15:1 TO 25:1	852	15:1 TO 25:1	SEC 10.7.8.2	15:1 TO 25:1
HORIZONTAL CURVES						
MAXIMUM SUPERELEVATION		8%	446	8% [4]	10,11	8%
VERTICAL CURVES						
CREST (K)			272		3-2	CDOT TABLE 3-1
SAG (K) (for Headlight Sight Distance)			277		3-2	CDOT TABLE 3-1
MAX. GRADE DIFFERENCE REQUIRING NO CURVE				0.2%	3-35	0.2%
STOPPING SIGHT DISTANCE (FT)			112		3-2	CDOT TABLE 3-1
GRADE						
MINIMUM		0.50%	236	0.50%	3-33, 7-2	0.50%
MAXIMUM		7%	829	7%	SEC 10.6.4	6.5%
PAVEMENT CROSS SLOPE		1.5% - 2%	446	2%	FIG 4-3	2%
CROSS SECTIONAL ELEMENTS						
NUMBER OF LANES		1-2	446	1-2	FIG 4-3	1-2
LANE WIDTH (FT)		14' MIN. LANE. 20' MIN PVMT	EX. 10-67	15' MIN LANE, 20' MIN PVMT	FIG 4-3 & TABLE 9-1	15' MIN LANE, 20' MIN PVMT
INSIDE SHOULDER WIDTH (FT)		2-4	838, EX 10-67	4' MIN FOR 1 LANE	FIG 4-3, TABLE 9-2	4' MIN
OUTSIDE SHOULDER WIDTH (FT)		8-10	838, EX 10-67	6' MIN FOR 1 LANE	FIG 4-3, TABLE 9-2	6' MIN FOR 1 LANE 8' MIN FOR 2 LANES
CLEAR ZONE WIDTH (FT) [2]			3-3		3-3	30
SIDE SLOPE DISTANCE "Z" (FT) (Where Applicable)				12	FIG 4-3	12
SIDESLOPE (MAXIMUM)						
CUT		1:06	324	4:1 DES. / 3:1 MAX	4-15	3:1 MAX
FILL			324	4:1 DES. / 3:1 MAX	4-15	4:1 DES. / 3:1 MAX

1 Items denoted with a * are per the State of Colorado*State Highway Access Code.*

2 Per AASHTO *Roadside Design Guide (2011)*

3 Per CDOT Straight Line Diagram 7-23-13

4 Per CDOT M&S Standards (July, 2012)

5 Specific criteria for interchanges was not found in the EIS

Design Criteria - CR220

DESIGN PARAMETERS	AASHTO PGDHS (2004)		CDOT DESIGN GUIDE (2005)		LAPLATA COUNTY		PROJECT RECOMMENDATION
CLASSIFICATION	RURAL COLLECTOR	9	RURAL COLLECTOR		COLLECTOR		RURAL COLLECTOR
TERRAIN	ROLLING		ROLLING		ROLLING		ROLLING
DESIGN VEHICLE	WB-67						
AVERAGE DAILY TRAFFIC (2013)							1,400
AVERAGE DAILY TRAFFIC (2035)							9,200
DESIGN SPEED (MPH)	45	68, 444	45	3-33	30-**45**	Sec. 74-91	45
POSTED SPEED (MPH)	35		35				35
HORIZONTAL CURVES							
MINIMUM RADIUS	587	454	587 [4]	10,11	630 [5]	185	1039
MAXIMUM SUPERELEVATION	8%	170	8% [4]	10,11	8%	Sec. 74-91	NORMAL CROWN
VERTICAL CURVES							
CREST (K)	61	272	61	3-2	120 [5]	307	61
SAG (K) (for Headlight Sight Distance)	79	277	79	3-2	90 [5]	316	79
MAX. GRADE DIFFERENCE REQUIRING NO CURVE			0.2%	3-35	2.5%	Sec. 74-91	0.2%
STOPPING SIGHT DISTANCE (FT)	360	112	360	3-2	400 [5]	307	360
PASSING SIGHT DISTANCE (FT)	1625	124, 445	1625	3-2	1650 [5]	311	1625
GRADE							
MINIMUM	0.50%	236	0.50%	3-33, 7-2			0.50%
MAXIMUM	6%	446	8%	3-32	8%	Sec. 74-91	8%
MAXIMUM AT INTERSECITON	6%	582	6%	9-3	5% w/in 100'	Sec. 74-91	5% w/in 100'
PAVEMENT CROSS SLOPE	1.5% - 2%	446	2%				2%
CROSS SECTIONAL ELEMENTS							
NUMBER OF THRU LANES	2	446	2	4-6, 4-11	2	Sec. 74-91	2
LANE WIDTH (FT)	12	448, 455	12	3-39, 4-6, 4-11	12	Sec. 74-91	12
SHOULDER WIDTH (FT)	6-8	314	8	4-11	4	Sec. 74-91	4
MEDIAN WIDTH (FT)			0	4-11			0
CLEAR ZONE WIDTH (FT) [2]	16[2]						16
SIDE SLOPE DISTANCE "Z" (FT) (Where Applicable)			8	4-11			
SIDESLOPE (MAXIMUM)							
CUT	3:1	326	4:1 DES. / 3:1 MAX	4-15			4:1 DES. / 3:1 MAX
FILL	3:1	327	4:1 DES. / 3:1 MAX	4-15			4:1 DES. / 3:1 MAX
REDIRECT TAPERS *			12:1	57			12:1

1 Items denoted with a * are per the State of Colorado *State Highway Access Code*

2 Per AASHTO *Roadside Design Guide (2011)*

3 Per CDOT Straight Line Diagram 7-23-13

4 Per CDOT M&S Standards (July, 2012)

5 Per AASHTO *A Policy on Geometric Design of Highways and Streets (1984)*