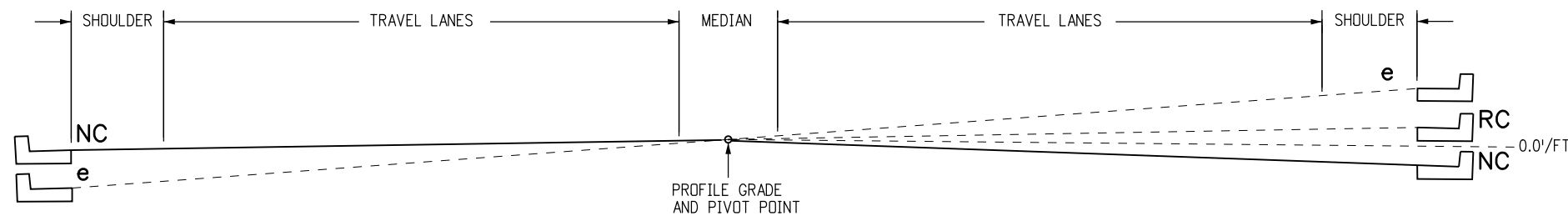
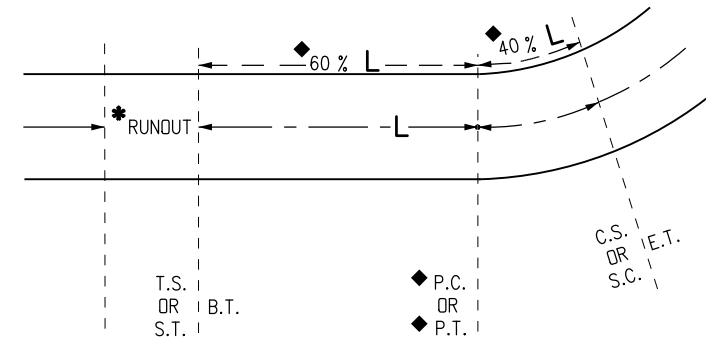


VC - TO OBTAIN SMOOTH PROFILES ON PAVEMENT EDGES, VERTICAL CURVES MAY BE INSERTED AT THE ANGULAR BREAK POINTS. UNLESS RESTRAINING CONDITIONS EXIST, THE LENGTH OF VERTICAL CURVE SELECTED, IN FEET, SHOULD BE AT LEAST NUMERICALLY EQUAL TO THE DESIGN SPEED, AND NO MORE THAN  $.04L/e$ .



### SUPERELEVATION DIAGRAMS

$e_{max} = 4\%$

IF THE CALCULATED RADIUS FALLS BETWEEN TWO RADII, GO TO THE NEXT LOWEST RADIUS VALUE.

e (%)	V <sub>d</sub> = 15 mph			V <sub>d</sub> = 20 mph			V <sub>d</sub> = 25 mph			V <sub>d</sub> = 30 mph			V <sub>d</sub> = 35 mph			V <sub>d</sub> = 40 mph			V <sub>d</sub> = 45 mph			V <sub>d</sub> = 50 mph			V <sub>d</sub> = 55 mph			V <sub>d</sub> = 60 mph			e (%)
	R (FT.)	1 LN	2 LNS	R (FT.)	1 LN	2 LNS	R (FT.)	1 LN	2 LNS	R (FT.)	1 LN	2 LNS	R (FT.)	1 LN	2 LNS	R (FT.)	1 LN	2 LNS	R (FT.)	1 LN	2 LNS	R (FT.)	1 LN	2 LNS	R (FT.)	1 LN	2 LNS	R (FT.)	1 LN	2 LNS	
2.0	506-796	31	46	902-1410	32	49	1340-2050	34	51	1880-2830	36	55	2490-3730	39	58	3220-4770	41	62	4040-5930	44	67	4940-7220	48	72	5950-8650	51	77	7080-10300	53	80	2.0
2.2	399-506	34	51	723-902	36	54	1110-1340	38	57	1580-1880	40	60	2120-2490	43	64	2760-3220	46	68	3480-4040	49	73	4280-4940	53	79	5180-5950	56	84	6190-7080	59	88	2.2
2.4	271-399	37	55	513-723	39	58	838-1110	41	62	1270-1580	44	65	1760-2120	46	70	2340-2760	50	74	2980-3480	53	80	3690-4280	58	86	4500-5180	61	92	5410-6190	64	96	2.4
2.6	201-271	40	60	388-513	42	63	650-838	45	67	1000-1270	47	71	1420-1760	50	75	1930-2340	54	81	2490-2980	58	87	3130-3690	62	94	3870-4500	66	100	4700-5410	69	104	2.6
2.8	157-201	43	65	308-388	45	68	524-650	48	72	817-1000	51	76	1170-1420	54	81	1620-1930	58	87	2100-2490	62	93	2660-3130	67	101	3310-3870	71	107	4060-4700	75	112	2.8
3.0	127-157	46	69	251-308	49	73	433-524	51	77	681-817	55	82	982-1170	58	87	1370-1620	62	93	1800-2100	67	100	2290-2660	72	108	2860-3310	77	115	3530-4060	80	120	3.0
3.2	105-127	49	74	209-251	52	78	363-433	55	82	576-681	58	87	835-982	62	93	1180-1370	66	99	1550-1800	71	107	1980-2290	77	115	2490-2860	82	123	3090-3530	85	128	3.2
3.4	88-105	52	78	175-209	55	83	307-363	58	87	490-576	62	93	714-835	66	99	1010-1180	70	106	1340-1550	76	113	1720-1980	82	122	2170-2490	87	130	2700-3090	91	136	3.4
3.6	73-88	55	83	147-175	58	88	259-307	62	93	416-490	65	98	610-714	70	105	865-1010	74	112	1150-1340	80	120	1480-1720	86	130	1880-2170	92	138	2350-2700	96	144	3.6
3.8	61-73	58	88	122-147	62	92	215-259	65	98	348-416	69	104	512-610	74	110	730-865	79	118	970-1150	84	127	1260-1480	91	137	1600-1880	97	146	2010-2350	101	152	3.8
4.0	42-61	62	92	86-122	65	97	154-215	69	103	250-348	73	109	371-512	77	116	533-730	83	124	711-970	89	133	926-1260	96	144	1190-1600	102	153	1500-2010	107	160	4.0

- o = PIVOT
- ◆ = WHEN CURVE IS NOT SPIRALLED.
- e = MAXIMUM RATE OF SUPERELEVATION IN FEET (PER FOOT OF WIDTH) FOR THE GIVEN RADIUS OF CURVE AND DESIGN SPEED.
- \* RUNOUT LENGTH SHOULD USUALLY BE  $.02L/e$  WHEN CONDITIONS ARE SUCH THAT THIS LENGTH IS NOT SUITABLE, THE DESIGNER SHALL CHOOSE ANOTHER LENGTH TO SUIT CONDITIONS.

- R - RADIUS OF CURVE
- V<sub>d</sub> - ASSUMED DESIGN SPEED
- L - LENGTH OF SUPERELEVATION RUNOFF OR SPIRAL LENGTH
- NC - NORMAL CROWN SECTION
- RC - REMOVE ADVERSE CROWN, SUPERELEVATE AT NORMAL CROWN SLOPE
- LN - TRAVEL LANE
- VC - VERTICAL CURVE
- BT - BEGINNING OF TRANSITION
- ET - ENDING OF TRANSITION
- TS - TANGENT TO SPIRAL
- ST - SPIRAL TO TANGENT
- PC - POINT OF CURVATURE
- PI - POINT OF INTERSECTION
- PT - POINT OF TANGENT
- CS - CURVE TO SPIRAL
- SC - SPIRAL TO CURVE

### SUPERELEVATION NOTES

1. THIS STANDARD PLAN SHOWS THE REQUIRED RATES OF SUPERELEVATION FOR THE VARIOUS RADIUS LENGTHS AT DIFFERENT DESIGN SPEEDS FOR THE MAXIMUM SUPERELEVATION RATE OF 4%. ALTERNATIVE MAXIMUM RATE OF SUPERELEVATION SHALL BE USED FOR STREETS WHEN SPECIFIED ON THE PLANS.
2. USE OF  $e_{max} = 4\%$  SHOULD BE LIMITED TO URBAN CONDITIONS.
3. VALUES ARE FOR DESIGN ELEMENTS RELATED TO DESIGN SPEED AND HORIZONTAL CURVATURE FOR TWO LANE AND FOUR LANE STREETS.
4. WHERE SIDE STREETS OR ROADS INTERSECT, THE RATE OF SUPERELEVATION MAY BE REDUCED TO FACILITATE A SMOOTH INTERSECTION OF THE PROFILE GRADES.
5. NUMBER OF LANES ROTATED:
  - A. ONE LANE ROTATED IS TYPICAL FOR A TWO-LANE HIGHWAY.
  - B. TWO LANES ROTATED ARE TYPICAL FOR A FOUR-LANE HIGHWAY.
6. SPIRALS ARE RECOMMENDED BELOW THE HEAVY LINE IN THE TABLES. SPIRALS ARE PERMISSIBLE BUT NOT RECOMMENDED ABOVE THE HEAVY LINES. SPIRAL LENGTHS MAY BE ROUNDED TO MULTIPLES OF 50 FEET FOR CALCULATION CONVENIENCE.

Computer File Information	
Creation Date: 07/04/12	Initials: DD
Last Modification Date: 07/04/12	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 2030120102.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

Sheet Revisions	
Date:	Comments
(R-X)	
(R-X)	
(R-X)	
(R-X)	

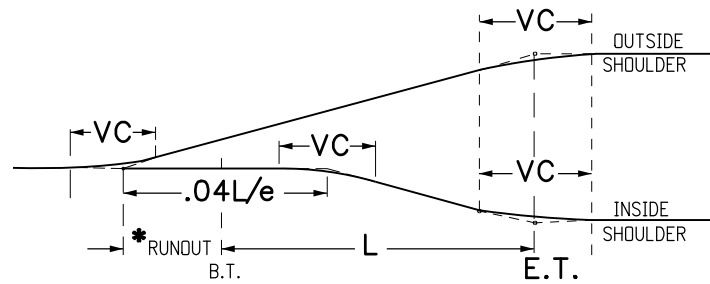
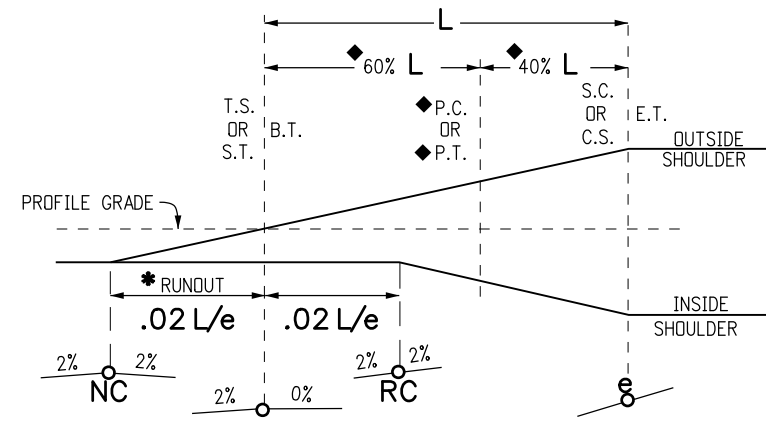
Colorado Department of Transportation  
 4201 East Arkansas Avenue  
 Denver, Colorado 80222  
 Phone: (303) 757-9083  
 Fax: (303) 757-9820

**Project Development Branch DD/LTA**

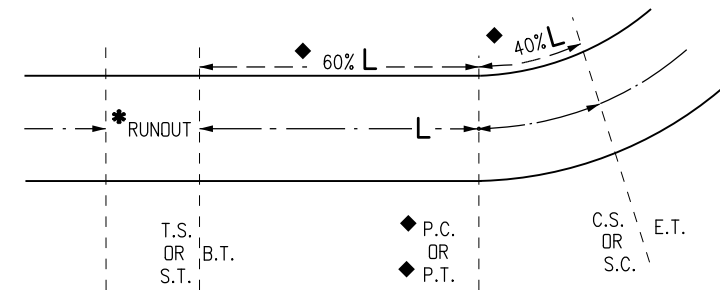
## SUPERELEVATION STREETS

Issued By: Project Development Branch July 4, 2012

STANDARD PLAN NO.  
**M-203-12**  
 Sheet No. 1 of 2

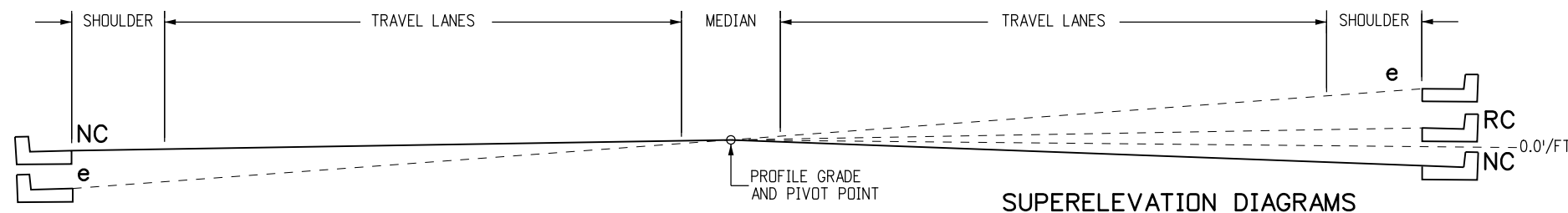


VC - TO OBTAIN SMOOTH PROFILES ON PAVEMENT EDGES, VERTICAL CURVES MAY BE INSERTED AT THE ANGULAR BREAK POINTS. UNLESS RESTRAINING CONDITIONS EXIST, THE LENGTH OF VERTICAL CURVE SELECTED, IN FEET, SHOULD BE NO LESS THAN NUMERICALLY EQUAL TO THE DESIGN SPEED, AND NO MORE THAN  $.04L/e$ .



- R - RADIUS OF CURVE
- V<sub>d</sub> - ASSUMED DESIGN SPEED
- L - LENGTH OF SUPERELEVATION RUNOFF OR SPIRAL LENGTH
- NC - NORMAL CROWN SECTION
- RC - REMOVE ADVERSE CROWN, SUPERELEVATE AT NORMAL CROWN SLOPE
- LN - TRAVEL LANE
- VC - VERTICAL CURVE
- BT - BEGINNING OF TRANSITION
- ET - ENDING OF TRANSITION
- TS - TANGENT TO SPIRAL
- ST - SPIRAL TO TANGENT
- PC - POINT OF CURVATURE
- PI - POINT OF INTERSECTION
- PT - POINT OF TANGENT
- CS - CURVE TO SPIRAL
- SC - SPIRAL TO CURVE

- o = PIVOT
- ◆ = WHEN CURVE IS NOT SPIRALLED.
- e = MAXIMUM RATE OF SUPERELEVATION IN FEET (PER FOOT OF WIDTH) FOR THE GIVEN RADIUS OF CURVE AND DESIGN SPEED.
- \* RUNOUT LENGTH SHOULD USUALLY BE  $.02L/e$  WHEN CONDITIONS ARE SUCH THAT THIS LENGTH IS NOT SUITABLE, THE DESIGNER SHALL CHOOSE ANOTHER LENGTH TO SUIT CONDITIONS.



**SUPERELEVATION DIAGRAMS**

$e_{max} = 6\%$

e (%)	V <sub>d</sub> = 15 mph		V <sub>d</sub> = 20 mph		V <sub>d</sub> = 25 mph		V <sub>d</sub> = 30 mph		V <sub>d</sub> = 35 mph		V <sub>d</sub> = 40 mph		V <sub>d</sub> = 45 mph		V <sub>d</sub> = 50 mph		V <sub>d</sub> = 55 mph		V <sub>d</sub> = 60 mph		e (%)
	R (FT.)	L (FT.)	R (FT.)	L (FT.)	R (FT.)	L (FT.)	R (FT.)	L (FT.)	R (FT.)	L (FT.)	R (FT.)	L (FT.)	R (FT.)	L (FT.)	R (FT.)	L (FT.)	R (FT.)	L (FT.)	R (FT.)	L (FT.)	
2.0	614-868	31 46	1120-1580	32 49	1630-2290	34 51	2240-3130	36 55	2950-4100	39 58	3770-5230	41 62	4680-6480	44 67	5700-7870	48 72	6820-9410	51 77	8060-11100	53 80	2.0
2.2	543-614	34 51	991-1120	36 54	1450-1630	38 57	2000-2240	40 60	2630-2950	43 64	3370-3770	46 68	4190-4680	49 73	5100-5700	53 79	6110-6820	56 84	7230-8060	59 88	2.2
2.4	482-543	37 55	884-991	39 58	1300-1450	41 62	1790-2000	44 65	2360-2630	46 70	3030-3370	50 74	3770-4190	53 80	4600-5100	58 86	5520-6110	61 92	6540-7230	64 96	2.4
2.6	430-482	40 60	791-884	42 63	1170-1300	45 67	1610-1790	47 71	2130-2360	50 75	2740-3030	54 81	3420-3770	58 87	4170-4600	62 94	5020-5520	66 100	5950-6540	69 104	2.6
2.8	384-430	43 65	709-791	45 68	1050-1170	48 72	1460-1610	51 76	1930-2130	54 81	2490-2740	58 87	3110-3420	62 93	3800-4170	67 101	4580-5020	71 107	5440-5950	75 112	2.8
3.0	341-384	46 69	635-709	49 73	944-1050	51 77	1320-1460	55 82	1760-1930	58 87	2270-2490	62 93	2840-3110	67 100	3480-3800	72 108	4200-4580	77 115	4990-5440	80 120	3.0
3.2	300-341	49 74	566-635	52 78	850-944	55 82	1200-1320	58 87	1600-1760	62 93	2080-2270	66 99	2600-2840	71 107	3200-3480	77 115	3860-4200	82 123	4600-4990	85 128	3.2
3.4	256-300	52 78	498-566	55 83	761-850	58 87	1080-1200	62 93	1460-1600	66 99	1900-2080	70 106	2390-2600	76 113	2940-3200	82 122	3560-3860	87 130	4250-4600	91 136	3.4
3.6	209-256	55 83	422-498	58 88	673-761	62 93	972-1080	65 98	1320-1460	70 105	1740-1900	74 112	2190-2390	80 120	2710-2940	86 130	3290-3560	92 138	3940-4250	96 144	3.6
3.8	176-209	58 88	358-422	62 92	583-673	65 98	864-972	69 104	1190-1320	74 110	1590-1740	79 118	2010-2190	84 127	2490-2710	91 137	3040-3290	97 146	3650-3940	101 152	3.8
4.0	151-176	62 92	309-358	65 97	511-583	69 103	766-864	73 109	1070-1190	77 116	1440-1590	83 124	1840-2010	89 133	2300-2490	96 144	2810-3040	102 153	3390-3650	107 160	4.0
4.2	131-151	65 97	270-309	68 102	452-511	72 108	684-766	76 115	960-1070	81 122	1310-1440	87 130	1680-1840	93 140	2110-2300	101 151	2590-2810	107 161	3140-3390	112 168	4.2
4.4	116-131	68 102	238-270	71 107	402-452	75 113	615-684	80 120	868-960	85 128	1190-1310	91 137	1540-1680	98 147	1940-2110	106 158	2400-2590	112 169	2920-3140	117 176	4.4
4.6	102-116	71 106	212-238	75 112	360-402	79 118	555-615	84 125	788-868	89 134	1090-1190	95 143	1410-1540	102 153	1780-1940	110 166	2210-2400	117 176	2710-2920	123 184	4.6
4.8	91-102	74 111	189-212	78 117	324-360	82 123	502-555	87 131	718-788	93 139	995-1090	99 149	1300-1410	107 160	1640-1780	115 173	2050-2210	123 184	2510-2710	128 192	4.8
5.0	82-91	77 115	169-189	81 122	292-324	86 129	456-502	91 136	654-718	97 145	911-995	103 155	1190-1300	111 167	1510-1640	120 180	1890-2050	128 191	2330-2510	133 200	5.0
5.2	73-82	80 120	152-169	84 126	264-292	89 134	413-456	95 142	595-654	101 151	833-911	108 161	1090-1190	116 173	1390-1510	125 187	1750-1890	133 199	2160-2330	139 208	5.2
5.4	65-73	83 125	136-152	88 131	237-264	93 139	373-413	98 147	540-595	105 157	759-833	112 168	995-1090	120 180	1280-1390	130 194	1610-1750	138 207	1990-2160	144 216	5.4
5.6	58-65	86 129	121-136	91 136	212-237	96 144	335-373	102 153	487-540	108 163	687-759	116 174	903-995	124 187	1160-1280	134 202	1470-1610	143 214	1830-1990	149 224	5.6
5.8	51-58	89 134	106-121	94 141	186-212	99 149	296-335	105 158	431-487	112 168	611-687	120 180	806-903	129 193	1040-1160	139 209	1320-1470	148 222	1650-1830	155 232	5.8
6.0	39-51	92 138	81-106	97 146	144-186	103 154	231-296	109 164	340-431	116 174	485-611	124 186	643-806	133 200	833-1040	144 216	1060-1320	153 230	1330-1650	160 240	6.0

**SUPERELEVATION NOTES**

1. THIS STANDARD PLAN SHOWS THE REQUIRED RATES OF SUPERELEVATION FOR THE VARIOUS RADIUS LENGTHS AT DIFFERENT DESIGN SPEEDS FOR THE MAXIMUM SUPERELEVATION RATE OF 6%. MAXIMUM RATE OF SUPERELEVATION SHALL BE USED FOR STREETS WHEN SPECIFIED ON THE PLANS.
2. VALUES ARE FOR DESIGN ELEMENTS RELATED TO DESIGN SPEED AND HORIZONTAL CURVATURE FOR TWO LANE AND FOUR LANE STREETS.
3. WHERE SIDE STREETS OR ROADS INTERSECT, THE RATE OF SUPERELEVATION MAY BE REDUCED TO FACILITATE A SMOOTH INTERSECTION OF THE PROFILE GRADES.
4. NUMBER OF LANES ROTATED:
  - A. ONE LANE ROTATED IS TYPICAL FOR A TWO-LANE HIGHWAY.
  - B. TWO LANES ROTATED ARE TYPICAL FOR A FOUR-LANE HIGHWAY.
5. SPIRALS ARE RECOMMENDED BELOW THE HEAVY LINE IN THE TABLES. SPIRALS ARE PERMISSIBLE BUT NOT RECOMMENDED ABOVE THE HEAVY LINES. SPIRAL LENGTHS MAY BE ROUNDED TO MULTIPLES OF 50 FEET FOR CALCULATION CONVENIENCE.

Computer File Information	
Creation Date: 07/04/12	Initials: DD
Last Modification Date: 07/04/12	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 2030120202.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

Sheet Revisions	
Date:	Comments:
(R-X)	
(R-X)	
(R-X)	
(R-X)	

Colorado Department of Transportation  
 4201 East Arkansas Avenue  
 Denver, Colorado 80222  
 Phone: (303) 757-9083  
 Fax: (303) 757-9820

**Project Development Branch DD/LTA**

**SUPERELEVATION STREETS**

Issued By: Project Development Branch July 4, 2012

**STANDARD PLAN NO.**

M-203-12

Sheet No. 2 of 2