e max = 8% TABLE CONTINUES ON SHEET 2.

	V_d =15 mph			V_d =20 mph			V_d =25 mph			V_d =30 mph			V_d =35 mph			V_d =40 mph			V_d =45 mph			V_d =50 mph			
		L (FT.)			L (FT.)			L (FT.)			L (FT.)			L (FT.)			L (FT.)			L (FT.)			L (FT.)	
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	e (%)
2.0	676–<932	31	46	1190–<1640	32	49	1720–<2370	34	51	2370–<3240	36	55	3120–<4260	39	58	3970–<5410	41	62	4930–<6710	44	67	5990–<8150	48	72	2.0
2.2	605–<676	34	51	1070–<1190	36	54	1550–<1720	38	57	2130–<2370	40	60	2800–<3120	43	64	3570–<3970	46	68	4440–<4930	49	73	5400–<5990	53	79	2.2
2.4	546–<605	37	55	959–<1070	39	58	1400–<1550	41	62	1930–<2130	44	65	2540–<2800	46	70	3240–<3570	50	74	4030–<4440	53	80	4910–<5400	58	86	2.4
2.6	496–<546	40	60	872–<959	42	63	1280–<1400	45	67	1760–<1930	47	71	2320–<2540	50	75	2960–<3240	54	81	3690–<4030	58	87	4490–<4910	62	94	2.6
2.8	453–<496	43	65	796–<872	45	68	1170–<1280	48	72	1610–<1760	51	76	2130–<2320	54	81	2720–<2960	58	87	3390–<3690	62	93	4130–<4490	67	101	2.8
3.0	415–<453	46	69	730–<796	49	73	1070–<1170	51	77	1480–<1610	55	82	1960–<2130	58	87	2510–<2720	62	93	3130–<3390	67	100	3820–<4130	72	108	3.0
3.2	382–<415	49	74	672–<730	52	78	985–<1070	55	82	1370–<1480	58	87	1820–<1960	62	93	2330–<2510	66	99	2900–<3130	71	107	3550–<3820	77	115	3.2
3.4	352–<382	52	78	620–<672	55	83	911–<985	58	87	1270–<1370	62	93	1690–<1820	66	99	2170–<2330	70	106	2700–<2900	76	113	3300–<3550	82	122	3.4
3.6	324–<352	55	83	572–<620	58	88	845–<911	62	93	1180–<1270	65	98	1570–<1690	70	105	2020–<2170	74	112	2520–<2700	80	120	3090–<3300	86	130	3.6
3.8	300–<324	58	88	530–<572	62	92	784–<845	65	98	1100–<1180	69	104	1470–<1570	74	110	1890–<2020	79	118	2360–<2520	84	127	2890–<3090	91	137	3.8
4.0	277–<300	62	92	490–<530	65	97	729–<784	69	103	1030–<1100	73	109	1370–<1470	77	116	1770–<1890	83	124	2220–<2360	89	133	2720–<2890	96	144	4.0
4.2	255–<277	65	97	453–<490	68	102	678–<729	72	108	955–<1030	76	115	1280–<1370	81	122	1660–<1770	87	130	2080–<2220	93	140	2560–<2720	101	151	4.2
4.4	235–<255	68	102	418–<453	71	107	630–<678	75	113	893–<955	80	120	1200–<1280	85	128	1560–<1660	91	137	1960–<2080	98	147	2410–<2560	106	158	4.4
4.6	215–<235	71	106	384–<418	75	112	585–<630	79	118	834–<893	84	125	1130–<1200	89	134	1470–<1560	95	143	1850–<1960	102	153	2280–<2410	110	166	4.6
4.8	193–<215	74	111	349–<384	78	117	542–<585	82	123	779–<834	87	131	1060–<1130	93	139	1390–<1470	99	149	1750–<1850	107	160	2160–<2280	115	173	4.8
5.0	172–<193	77	115	314–<349	81	122	499–<542	86	129	727–<779	91	136	991–<1060	97	145	1310–<1390	103	155	1650–<1750	111	167	2040–<2160	120	180	5.0
5.2	154–<172	80	120	284–<314	84	126	457–<499	89	134	676–<727	95	142	929–<991	101	151	1230–<1310	108	161	1560–<1650	116	173	1930–<2040	125	187	5.2
5.4	139–<154	83	125	258–<284	88	131	420–<457	93	139	627–<676	98	147	870–<929	105	157	1160–<1230	112	168	1480–<1560	120	180	1830–<1930	130	194	5.4
5.6	126–<139	86	129	236–<258	91	136	387–<420	96	144	582–<627	102	153	813–<870	108	163	1090–<1160	116	174	1390–<1480	124	187	1740–<1830	134	202	5.6
5.8	115–<126	89	134	216–<236	94	141	358–<387	99	149	542–<582	105	158	761–<813	112	168	1030–<1090	120	180	1320–<1390	129	193	1650–<1740	139	209	5.8
6.0	105–<115	92	138	199–<216	97	146	332–<358	103	154	506–<542	109	164	713–<761	116	174	965–<1030	124	186	1250–<1320	133	200	1560–<1650	144	216	6.0
6.2	97–<105	95	143	184–<199	101	151	308–<332	106	159	472–<506	113	169	669–<713	120	180	909–<965	128	192	1180–<1250	138	207	1480–<1560	149	223	6.2
6.4	89–<97	98	148	170–<184	104	156	287–<308	110	165	442–<472	116	175	628–<669	124	186	857–<909	132	199	1110–<1180	142	213	1400–<1480	154	230	6.4
6.6	82–<89	102	152	157–<170	107	161	267–<287	113	170	413–<442	120	180	590–<628	128	192	808–<857	137	205	1050–<1110	147	220	1330–<1400	158	238	6.6
6.8	76–<82	105	157	146–<157	110	165	248–<267	117	175	386–<413	124	185	553–<590	132	197	761–<808	141	211	990–<1050	151	227	1260–<1330	163	245	6.8
7.0	70–<76	108	162	135–<146	114	170	231–<248	120	180	360–<386	127	191	518–<553	135	203	716–<761	145	217	933–<990	156	233	1190–<1260	168	252	7.0
7.2	64–<70	111	166	125–<135	117	175	214–<231	123	185	336–<360	131	196	485–<518	139	209	672–<716	149	223	878–<933	160	240	1120–<1190	173	259	7.2
7.4	59–<64	114	171	115–<125	120	180	198–<214	127	190	312–<336	135	202	451–<485	143	215	628–<672	153	230	822–<878	164	247	1060–<1120	178	266	7.4
7.6	54–<59	117	175	105–<115	123	185	182–<198	130	195	287–<312	138	207	417–<451	147	221	583–<628	157	236	765–<822	169	253	980–<1060	182	274	7.6
7.8	48–<54	120	180	94–<105	126	190	164–<182	134	201	261–<287	142	213	380–<417	151	226	533–<583	161	242	701–<765	173	260	901–<980	187	281	7.8
8.0	38–<48	123	185	76–<94	130	195	134–<164	137	206	214–<261	145	218	314–<380	155	232	444–<533	166	248	587–<701	178	267	758–<901	192	288	8.0

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 8%. ALTERNATIVE MAXIMUM RATE OF SUPERELEVATION SHALL BE USED FOR CROWNED HIGHWAYS WHEN SPECIFIED ON THE PLANS.
2. VALUES ARE FOR DESIGN ELEMENTS RELATED TO DESIGN SPEED AND HORIZONTAL CURVATURE FOR 2-LANE AND 4-LANE HIGHWAYS.
3. 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.
4. SPIRALS ARE RECOMMENDED BELOW THE HEAVY LINE IN THE TABLES. SPIRALS ARE PERMISSIBLE BUT NOT RECOMMENDED ABOVE THE HEAVY LINE. SPIRAL LENGTHS MAY BE ROUNDED TO MULTIPLES OF 50 FEET FOR CALCULATION CONVENIENCE.

e = SUPERELEVATION RATE

R - RADIUS OF CURVE

Vd - ASSUMED DESIGN SPEED

L - LENGTH OF SUPERELEVATION RUNOFF OR SPIRAL LENGTH

LN - TRAVEL LANE

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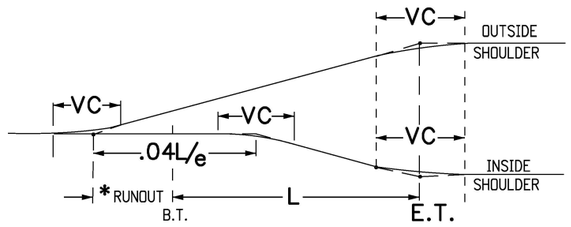
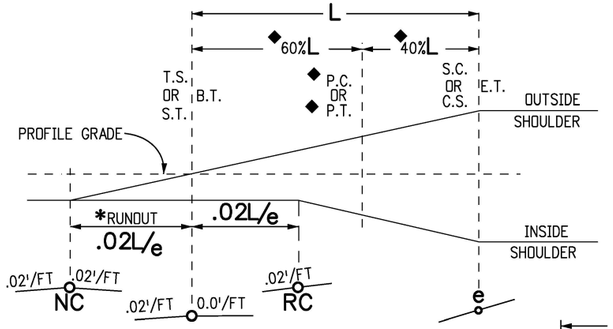
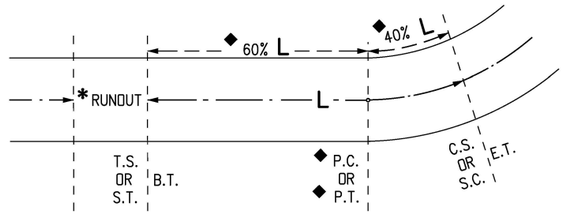
SUPERELEVATION
CROWNED AND DIVIDED
HIGHWAYS

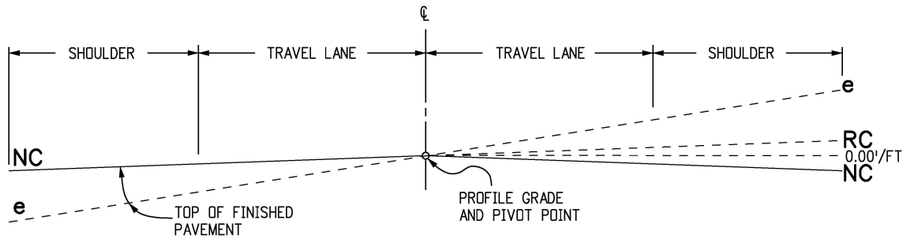
Issued by the Project Development Branch: July 31, 2019

STANDARD PLAN NO.
M-203-11
Standard Sheet No. 1 of 3
Project Sheet Number:









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 $.04L/e$.

* 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.

○ = PIVOT

◆ = WHEN CURVE IS NOT SPIRALED.

e = MAXIMUM RATE OF SUPERELEVATION IN FEET (PER FOOT OF WIDTH) FOR THE GIVEN RADIUS OF CURVE AND DESIGN SPEED.

SUPERELEVATION DIAGRAMS FOR CROWNED HIGHWAYS

$e_{max} = 8\%$ TABLE CONTINUED FROM SHEET 1.

	V_d =50 mph			V_d =55 mph			V_d =60 mph			V_d =65 mph			V_d =70 mph			V_d =75 mph			V_d =80 mph			
		L (FT.)			L (FT.)			L (FT.)			L (FT.)			L (FT.)			L (FT.)			L (FT.)		
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	e (%)
2.0	5990–<8150	48	72	7150–<9720	51	77	8440–<11500	53	80	9510–<12900	56	84	10700–<14500	60	90	12000–<16100	63	95	13300–<17800	69	103	2.0
2.2	5400–<5990	53	79	6450–<7150	56	84	7620–<8440	59	88	8600–<9510	61	92	9660–<10700	66	99	10800–<12000	69	104	12000–<13300	75	113	2.2
2.4	4910–<5400	58	86	5870–<6450	61	92	6930–<7620	64	96	7830–<8600	67	100	8810–<9660	72	108	9850–<10800	76	114	11000–<12000	82	123	2.4
2.6	4490–<4910	62	94	5370–<5870	66	100	6350–<6930	69	104	7180–<7830	73	109	8090–<8810	78	117	9050–<9850	82	123	10100–<11000	89	134	2.6
2.8	4130–<4490	67	101	4950–<5370	71	107	5850–<6350	75	112	6630–<7180	78	117	7470–<8090	84	126	8370–<9050	88	133	9340–<10100	96	144	2.8
3.0	3820–<4130	72	108	4580–<4950	77	115	5420–<5850	80	120	6140–<6630	84	126	6930–<7470	90	135	7780–<8370	95	142	8700–<9340	103	154	3.0
3.2	3550–<3820	77	115	4250–<4580	82	123	5040–<5420	85	128	5720–<6140	89	134	6460–<6930	96	144	7260–<7780	101	152	8130–<8700	110	165	3.2
3.4	3300–<3550	82	122	3970–<4250	87	130	4700–<5040	91	136	5350–<5720	95	142	6050–<6460	102	153	6800–<7260	107	161	7620–<8130	117	175	3.4
3.6	3090–<3300	86	130	3710–<3970	92	138	4400–<4700	96	144	5010–<5350	100	151	5680–<6050	108	162	6400–<6800	114	171	7180–<7620	123	185	3.6
3.8	2890–<3090	91	137	3480–<3710	97	146	4140–<4400	101	152	4710–<5010	106	159	5350–<5680	114	171	6030–<6400	120	180	6780–<7180	130	195	3.8
4.0	2720–<2890	96	144	3270–<3480	102	153	3890–<4140	107	160	4450–<4710	112	167	5050–<5350	120	180	5710–<6030	126	189	6420–<6780	137	206	4.0
4.2	2560–<2720	101	151	3080–<3270	107	161	3670–<3890	112	168	4200–<4450	117	176	4780–<5050	126	189	5410–<5710	133	199	6090–<6420	144	216	4.2
4.4	2410–<2560	106	158	2910–<3080	112	169	3470–<3670	117	176	3980–<4200	123	184	4540–<4780	132	198	5140–<5410	139	208	5800–<6090	151	226	4.4
4.6	2280–<2410	110	166	2750–<2910	117	176	3290–<3470	123	184	3770–<3980	128	193	4310–<4540	138	207	4890–<5140	145	218	5530–<5800	158	237	4.6
4.8	2160–<2280	115	173	2610–<2750	123	184	3120–<3290	128	192	3590–<3770	134	201	4100–<4310	144	216	4670–<4890	152	227	5280–<5530	165	247	4.8
5.0	2040–<2160	120	180	2470–<2610	128	191	2960–<3120	133	200	3410–<3590	140	209	3910–<4100	150	225	4460–<4670	158	237	5050–<5280	171	257	5.0
5.2	1930–<2040	125	187	2350–<2470	133	199	2820–<2960	139	208	3250–<3410	145	218	3740–<3910	156	234	4260–<4460	164	246	4840–<5050	178	267	5.2
5.4	1830–<1930	130	194	2230–<2350	138	207	2680–<2820	144	216	3110–<3250	151	226	3570–<3740	162	243	4090–<4260	171	256	4640–<4840	185	278	5.4
5.6	1740–<1830	134	202	2120–<2230	143	214	2550–<2680	149	224	2970–<3110	156	234	3420–<3570	168	252	3920–<4090	177	265	4460–<4640	192	288	5.6
5.8	1650–<1740	139	209	2010–<2120	148	222	2430–<2550	155	232	2840–<2970	162	243	3280–<3420	174	261	3760–<3920	183	275	4290–<4460	199	298	5.8
6.0	1560–<1650	144	216	1920–<2010	153	230	2320–<2430	160	240	2710–<2840	167	251	3150–<3280	180	270	3620–<3760	189	284	4140–<4290	206	309	6.0
6.2	1480–<1560	149	223	1820–<1920	158	237	2210–<2320	165	248	2600–<2710	173	260	3020–<3150	186	279	3480–<3620	196	294	3990–<4140	213	319	6.2
6.4	1400–<1480	154	230	1730–<1820	163	245	2110–<2210	171	256	2490–<2600	179	268	2910–<3020	192	288	3360–<3480	202	303	3850–<3990	219	329	6.4
6.6	1330–<1400	158	238	1650–<1730	169	253	2010–<2110	176	264	2380–<2490	184	276	2790–<2910	198	297	3240–<3360	208	313	3720–<3850	226	339	6.6
6.8	1260–<1330	163	245	1560–<1650	174	260	1910–<2010	181	272	2280–<2380	190	285	2690–<2790	204	306	3120–<3240	215	322	3600–<3720	233	350	6.8
7.0	1190–<1260	168	252	1480–<1560	179	268	1820–<1910	187	280	2180–<2280	195	293	2580–<2690	210	315	3010–<3120	221	332	3480–<3600	240	360	7.0
7.2	1120–<1190	173	259	1400–<1480	184	276	1720–<1820	192	288	2070–<2180	201	301	2470–<2580	216	324	2900–<3010	227	341	3370–<3480	247	370	7.2
7.4	1060–<1120	178	266	1320–<1400	189	283	1630–<1720	197	296	1970–<2070	207	310	2350–<2470	222	333	2780–<2900	234	351	3250–<3370	254	381	7.4
7.6	980–<1060	182	274	1230–<1320	194	291	1530–<1630	203	304	1850–<1970	212	318	2230–<2350	228	342	2650–<2780	240	360	3120–<3250	261	391	7.6
7.8	901–<980	187	281	1140–<1230	199	299	1410–<1530	208	312	1720–<1850	218	327	2090–<2230	234	351	2500–<2650	246	369	2970–<3120	267	401	7.8
8.0	758–<901	192	288	960–<1140	204	306	1200–<1410	213	320	1480–<1720	223	335	1810–<2090	240	360	2210–<2500	253	379	2670–<2970	274	411	8.0

R - RADIUS OF CURVE
Vd - ASSUMED DESIGN SPEED
L - LENGTH OF SUPERELEVATION RUNOFF OR SPIRAL LENGTH
NC - NORMAL CROWN SECTION
RC - REMOVE ADVERSE CROWN, SUPERELEVATE AT NORMAL CROWN SLOPE
VC - VERTICAL CURVE
LN - TRAVEL LANE

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 8%. ALTERNATIVE MAXIMUM RATE OF SUPERELEVATION SHALL BE USED FOR CROWNED HIGHWAYS WHEN SPECIFIED ON THE PLANS.
2. VALUES ARE FOR DESIGN ELEMENTS RELATED TO DESIGN SPEED AND HORIZONTAL CURVATURE FOR 2-LANE AND 4-LANE HIGHWAYS.
3. 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.
4. SPIRALS ARE RECOMMENDED BELOW THE HEAVY LINE IN THE TABLES. SPIRALS ARE PERMISSIBLE BUT NOT RECOMMENDED ABOVE THE HEAVY LINE. SPIRAL LENGTHS MAY BE ROUNDED TO MULTIPLES OF 50 FEET FOR CALCULATION CONVENIENCE.

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SUPERELEVATION CROWNED AND DIVIDED HIGHWAYS

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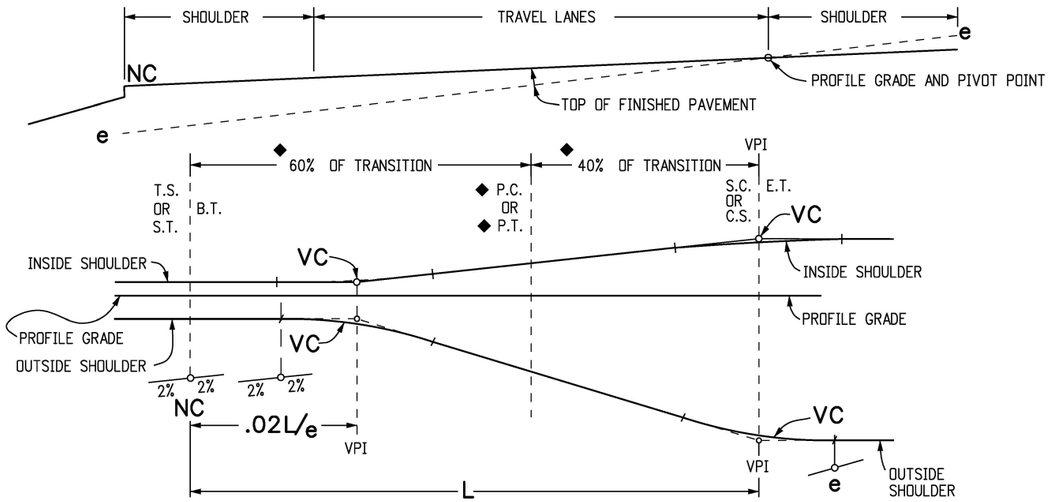
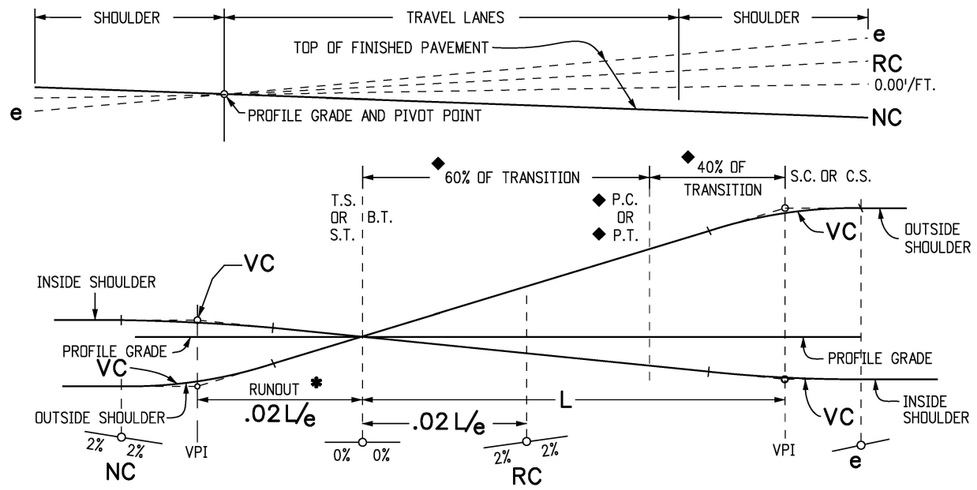
STANDARD PLAN NO. M-203-11

Standard Sheet No. 2 of 3

Project Sheet Number:



DIAGRAMMATIC PROFILE FOR SUPERELEVATION OF INSIDE LANES



DIAGRAMMATIC PROFILE FOR SUPERELEVATION OF OUTSIDE LANES

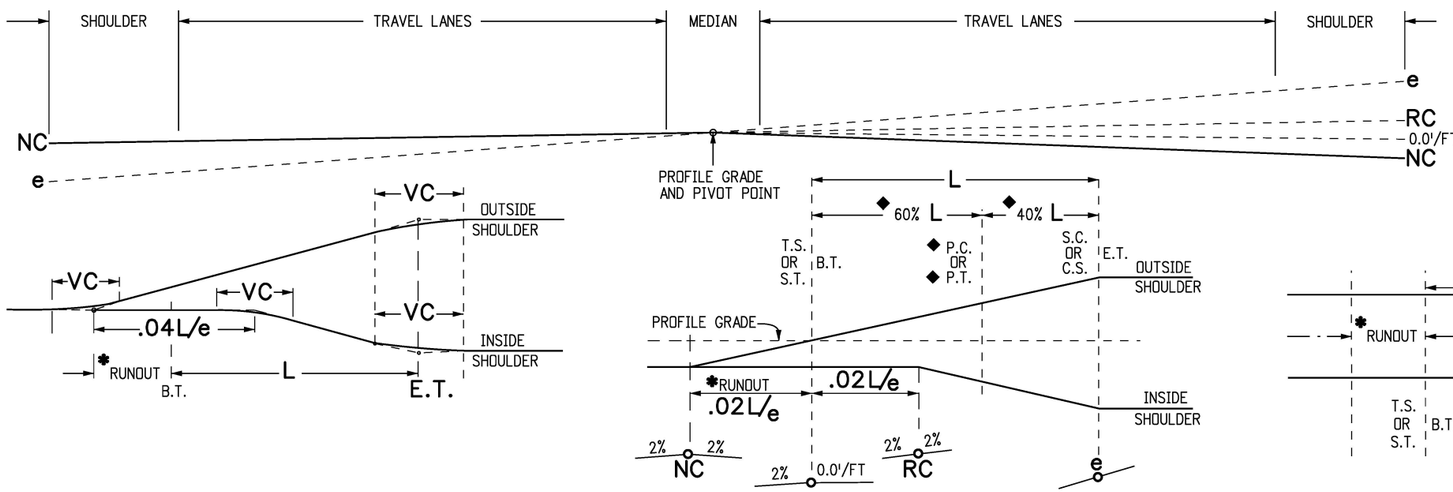
SUPERELEVATION DIAGRAMS FOR DIVIDED HIGHWAYS SHOULDER PIVOT

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 $.04L/e$.

R - RADIUS OF CURVE
Vd - ASSUMED DESIGN SPEED
L - LENGTH OF SUPERELEVATION RUNOFF OR SPIRAL LENGTH
NC - NORMAL CROWN SECTION
RC - REMOVE ADVERSE CROWN, SUPERELEVATE AT NORMAL CROWN SLOPE

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
LN - TRAVEL LANE



o = PIVOT
◆ = WHEN CURVE IS NOT SPIRALED.
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 $.02\ L/e$. WHEN CONDITIONS ARE SUCH THAT THIS LENGTH IS NOT SUITABLE, THE DESIGNER SHALL CHOOSE ANOTHER LENGTH TO SUIT CONDITIONS.

SUPERELEVATION DIAGRAMS FOR DIVIDED HIGHWAY CENTER PIVOT

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SUPERELEVATION CROWNED AND DIVIDED HIGHWAYS

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