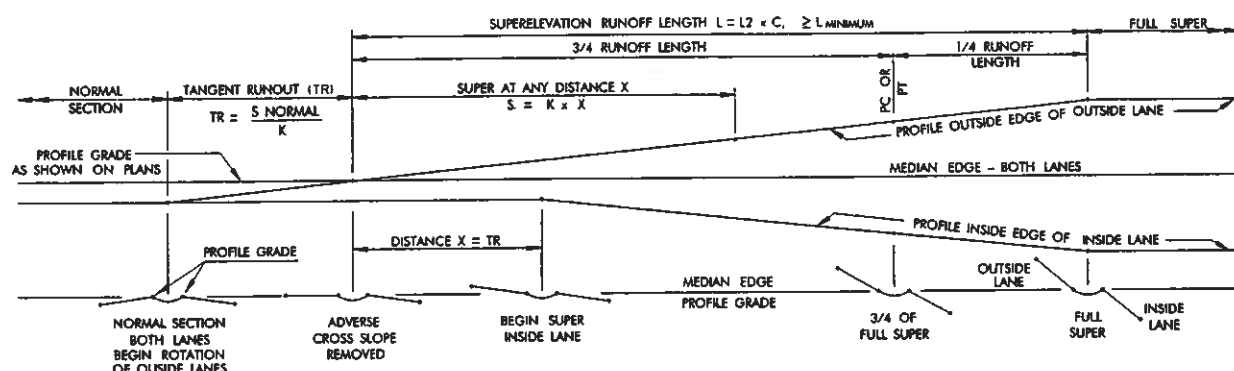
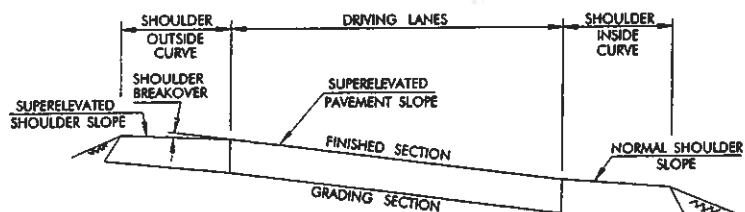


CROWNED PAVEMENT REVOLVED ABOUT CENTERLINE



SUPERELEVATION REVOLVED ABOUT EDGE (4-LANE DIVIDED HIGHWAY)



TYPICAL SECTION

SHOULDER TREATMENT THROUGH SUPERELEVATED CURVE

SHOULDER BREAKOVER SHALL NOT EXCEED 0.07 FEET PER FOOT, CALCULATED AS ALGEBRAIC DIFFERENCE IN CROSS SLOPE OF PAVEMENT AND SHOULDER SURFACES. ROTATE OUTSIDE SHOULDER TO MAINTAIN DESIRABLE BREAKOVER.

INSIDE SHOULDER REMAINS AT NORMAL CROSS SLOPE UNTIL PAVEMENT SUPER EQUALS SHOULDER CROSS SLOPE, THEN IS SUPERELEVATED AT SAME SLOPE AS PAVEMENT. CONTINUOUS OUTSIDE SHOULDER CROSS SLOPE SHOULD BE $\geq 1\%$, TO INSURE PROPER DRAINAGE.

MAXIMUM SUPERELEVATION RATE GUIDELINES
(SEE CHAPTER 6 ODOT ROADWAY DESIGN MANUAL OR "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS", AASHTO 1990)

- $e_{max} = 4.0\%$ LOW SPEED URBAN STREETS WHERE ROADSIDE DEVELOPMENT PRECLUDES A HIGHER SUPERELEVATION RATE; IN RECOGNITION OF SAFETY CONSIDERATIONS, USE ONLY WHEN APPROVED BY THE ENGINEER
- $e_{max} = 6.0\%$ ELEVATED OR INTERMITTENTLY ELEVATED ROADWAYS (I.E. BRIDGES, BOXES), ROADWAYS WITH FREQUENT SLOW-MOVING VEHICLES, URBAN STREETS WHERE ROADSIDE DEVELOPMENT PRECLUDES HIGHER SUPERELEVATION RATE
- $e_{max} = 8.0\%$ DEPRESSED OR GROUND-LEVEL ROADWAYS; ROADWAYS ON STEEP OR LONG DOWNGRADES; ROADWAYS WHERE DRAINAGE CONSIDERATIONS ARE PRIMARY
- $e_{max} = 10.0\%$ LOW VOLUME GRAVEL-SURFACED ROADS

SUPERELEVATION NOMENCLATURE

- S = SUPERELEVATION RATE (CROSS SLOPE) OF ROADWAY, (FT PER FT)
- S_{NORMAL} = SUPERELEVATION RATE (CROSS SLOPE) OF ROADWAY IN A NORMAL CROWN SECTION, (FT PER FT)
- S_{FULL} = FULL SUPERELEVATION RATE ATTAINED IN HORIZONTAL CURVE, (FT PER FT)
- K = TRANSITION RATE, S_{FULL}/L
- X = LINEAR DISTANCE ALONG SUPERELEVATION RUNOFF LENGTH MEASURED FROM S=0 TOWARD S=S_{FULL}, (FT PER FT)
- G = CHANGE IN GRADE, (PERCENT %)
- L_{MINIMUM} = MINIMUM SUPERELEVATION RUNOFF LENGTH REGARDLESS OF THE CALCULATED LENGTH L₂, (FEET)
- L = SUPERELEVATION RUNOFF LENGTH (FEET); THE DISTANCE NEEDED TO ACCOMPLISH THE CHANGE IN CROSS SLOPE FROM A SECTION WITH ADVERSE CROWN (CROSS SLOPE) REMOVED TO A FULLY SUPERELEVATED SECTION, OR VICE VERSA
- L₂ = RUNOFF LENGTH FOR TWO LANE ROADWAY, (FEET)
- C = RATIO OF RUNOFF LENGTH FOR MULTILANE ROADWAY TO RUNOFF LENGTH FOR TWO LANE ROADWAY
- W = PAVEMENT WIDTH, FROM PROFILE GRADE POINT TO FAR EDGE OF PAVEMENT, (FEET)
- RS = RELATIVE SLOPE: SLOPE OF THE OUTSIDE TRAVELWAY PROFILE GRADE LINE, RELATIVE TO THE PROFILE GRADE LINE AS SHOWN ON THE PLANS, ACROSS ONE TRAVEL LANE OF PAVEMENT
- TR = TANGENT RUNOUT (FEET); LENGTH NEEDED TO ACCOMPLISH THE CHANGE IN CROSS SLOPE FROM A NORMAL SECTION WITH ADVERSE CROSS SLOPE REMOVED, OR VICE VERSA

SUPERELEVATION RUNOFF LENGTH FOR MULTILANE ROADWAYS

TOTAL NO. OF LANES BOTH DIRECTIONS	L = L ₂ x C, IF $\geq L_{MINIMUM}$	
	PREFERRED	MINIMUM
2	1.0	1.0
3	1.5	1.2
4	2.0	1.5
5	2.5	1.8
6	3.0	2.0
7	3.5	2.3
8	4.0	2.5

NOTE: FOR DIVIDED HIGHWAY WITH WIDE MEDIAN (≥ 40 FEET), TREAT EACH DIRECTION AS SEPARATE ROADWAY.

SUPERELEVATION RUNOFF LENGTH FOR RAMPS & ROADWAYS WITH WIDE MEDIANS (≥ 40 FEET)

DESIGN SPEED V (MPH)	L = $\frac{S_{FULL} \times W \times 100}{G}$, IF $\geq L_{MINIMUM}$	
	RS (MINIMUM)	MAX GRADE DIFFERENCE G _{MAX} (%) (G _{MAX} = RS x 100)
20	1:133	0.75
25	1:142	0.70
30	1:150	0.67
35	1:163	0.61
40	1:175	0.58
45	1:188	0.53
50	1:200	0.50
55	1:213	0.47
60	1:222	0.45
65	1:244	0.41
70	1:250	0.40

GENERAL NOTES

- ALL CONSTRUCTION METHODS SHALL BE IN ACCORDANCE WITH 1999 ENGLISH STANDARD SPECIFICATIONS.
- THIS STANDARD DRAWING PROVIDES BASIC GUIDELINES FOR SUPERELEVATION DEVELOPMENT FOR OPEN ROADWAY CONDITIONS ONLY. FOR SUPERELEVATION DESIGN CRITERIA, INCLUDING: SUPERELEVATION OF LOW SPEED URBAN STREETS; TURNING ROADWAYS AND INTERSECTION CURVES; SUPERELEVATION RATE TABLES WHERE $e_{max} = 4.0\%$ AND $e_{max} = 10.0\%$; CONSULT THE 1994 AASHTO "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS" AND THE ODOT ROADWAY DESIGN MANUAL.
- FOR CURVES WITH SPIRALS, RUNOFF LENGTH IS EQUAL TO SPIRAL LENGTH, WITH FULL SUPERELEVATION REACHED AT S.C. OR C.S. OF CURVE.
- ALL GRADE BREAKS IN SUPERELEVATION TRANSITION SECTIONS SHALL BE ROUNDED TO OBTAIN SMOOTH EDGE OF PAVEMENT PROFILES SUBJECT TO APPROVAL OF THE ENGINEER. SUGGESTED MINIMUM ROUNDDING DISTANCES:

DESIGN SPEED (mph)	30	35	40	45	50	55	60	65	70
ROUNDING DISTANCE (ft)	30	35	40	45	50	55	60	65	70

CHECK RAMP GRADES AND SUPERELEVATION TRANSITIONS AT RAMP TERMINALS DURING STAKING AND MAKE ADJUSTMENTS AS REQUIRED TO OBTAIN SMOOTH PROFILES FOR BOTH EDGES OF THE RAMP PAVEMENT. CROSSOVER CROWN LINE BREAKOVER SHALL NOT EXCEED 5.0% (CALCULATED AS THE ALGEBRAIC DIFFERENCE IN CROSS SLOPES OF ADJACENT PAVEMENTS), WITHOUT THE APPROVAL OF ODOT ENGINEER.

APPROVED BY ROADWAY ENGINEER *C.M. Sankowski* DATE 9/1/99

OKLAHOMA DEPT. OF TRANSPORTATION
ROADWAY STANDARD (ENGLISH)

SUPERELEVATION

1999 SPECIFICATIONS

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