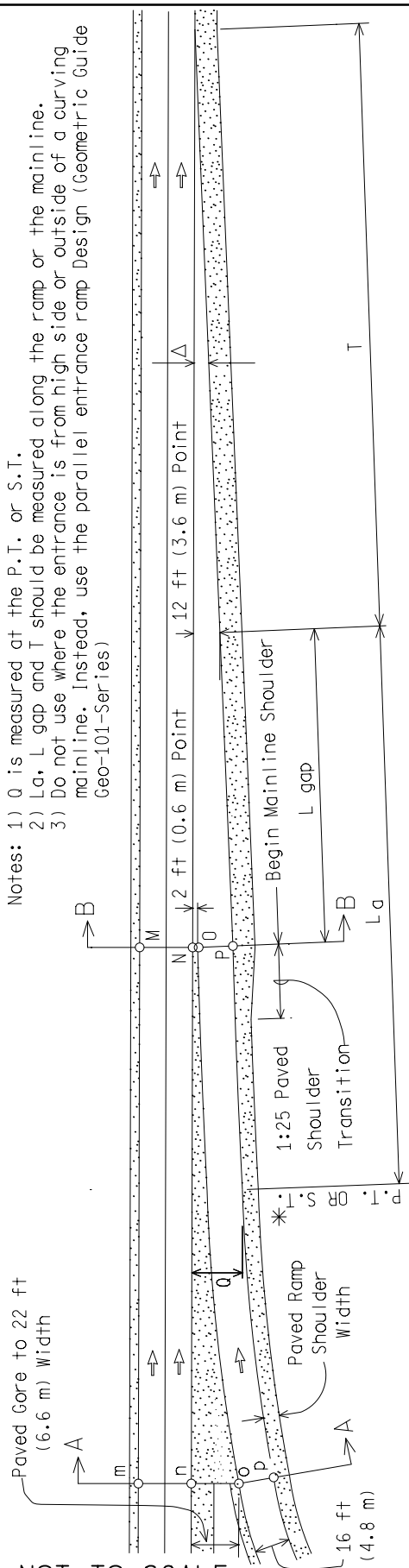Notes: 1) Q is measured at the P.T. or S.T.
       2) La, L gap and T should be measured along the ramp or the mainline.
       3) Do not use where the entrance is from high side or outside of a curving mainline. Instead, use the parallel entrance ramp Design (Geometric Guide Geo-101-Series)

* When a transition spiral is used, reduce the distance between the S.T. and the 2 foot point by half of the transition spiral length. Recalculate "Q".

B
M
N
P
2 ft (0.6 m) Point
12 ft (3.6 m) Point
Begin Mainline Shoulder
L gap
B
La
1:25 Paved Shoulder Transition
T
P.T. OR S.T. *
Paved Gore to 22 ft (6.6 m) Width
A
m
n
o
p
Q
Paved Ramp Shoulder Width
16 ft (4.8 m)
A

NOT TO SCALE

EDGE OF PAVEMENT ELEVATION RELATIONSHIPS

WHEN THE THROUGH LANES ARE NOT SUPERELEVATED	WHEN THE THROUGH LANES ARE SUPERELEVATED AND N IS LOWER THAN M	WHEN THE THROUGH LANES ARE SUPERELEVATED AND N IS HIGHER THAN M	
		RAMP AND THROUGH LANE SUPERELEVATED IN SAME DIRECTION	RAMP AND THROUGH LANE SUPERELEVATED IN OPPOSITE DIRECTION
POINTS n, o & p SHOULD BE PROGRESSIVELY LOWER.	POINTS m, n, o & p SHOULD BE PROGRESSIVELY LOWER.	POINT o SHOULD BE HIGHER THAN POINT n.	POINT o SHOULD BE EQUAL TO OR LOWER THAN POINT n.

SECTION A-A

POINTS N, O & P SHOULD BE IN THE SAME PLANE.	POINTS M, N, O & P SHOULD BE IN THE SAME PLANE.	POINTS M, N, O & P SHOULD BE IN THE SAME PLANE.	POINTS M, N, O & P SHOULD BE IN THE SAME PLANE.

SECTION B-B

Note:
Maximum algebraic difference in pavement cross slope between mainline and ramp auxiliary lane should not exceed 5%.

MINIMUM ENGLISH LENGTHS FOR TAPERED ENTRANCE RAMPS

RAMP DESIGN SPEED (MPH)	PERCENT GRADE OF THROUGH ROADWAY	TAPER=65:1 Δ=0°52′53″ ROADWAY DESIGN SPEED = 75 MPH T = 780 FT Lgap = 390 FT		TAPER=60:1 Δ=0°57′17″ ROADWAY DESIGN SPEED = 70 MPH T = 720 FT Lgap = 360 FT		TAPER=55:1 Δ=1°02′30″ ROADWAY DESIGN SPEED = 60 MPH T = 660 FT Lgap = 330 FT		TAPER=50:1 Δ=1°08′45″ ROADWAY DESIGN SPEED = 55 to 50 MPH T = 600 FT Lgap = 300 FT		TAPER=45:1 Δ=1°16′23″ ROADWAY DESIGN SPEED = 45 or less MPH T = 540 FT Lgap = 270 FT	
		L_a (FT)	Q (FT)	L_a (FT)	Q (FT)	L_a (FT)	Q (FT)	L_a (FT)	Q (FT)	L_a (FT)	Q (FT)
20	−3 TO LESS THAN −5	978	27.1	912	27.2	660	24.0	506	22.2	450	22.0
	BETWEEN −3 AND +3	1630	37.1	1520	37.4	1100	32.0	810	28.2	450	22.0
	+3 TO LESS THAN +5	2528	50.9	2280	50.0	1540	40.0	1094	33.9	608	25.5
25	−3 TO LESS THAN −5	948	26.6	852	26.2	612	23.2	500	22.0	450	22.0
	BETWEEN −3 AND +3	1580	36.4	1420	35.7	1020	30.6	780	27.6	450	22.0
	+3 TO LESS THAN +5	2528	50.9	2201	48.7	1479	38.9	1092	33.9	608	25.5
30	−3 TO LESS THAN −5	906	26.0	810	25.5	555	22.0	500	22.0	450	22.0
	BETWEEN −3 AND +3	1510	35.3	1350	34.5	910	28.6	670	25.4	450	22.0
	+3 TO LESS THAN +5	2492	50.4	2160	48.0	1365	36.9	972	31.5	608	25.5
35	−3 TO LESS THAN −5	852	25.2	738	24.3	550	22.0	500	22.0	450	22.0
	BETWEEN −3 AND +3	1420	33.9	1230	32.5	800	26.6	550	23.0	450	22.0
	+3 TO LESS THAN +5	2450	49.7	2030	45.9	1200	33.9	798	28.0	608	25.5
40	−3 TO LESS THAN −5	696	22.8	600	22.0	550	22.0	500	22.0	450	22.0
	BETWEEN −3 AND +3	1160	29.9	1000	28.7	550	22.0	500	22.0	450	22.0
	+3 TO LESS THAN +5	2088	44.2	1700	40.4	825	27.0	725	26.5	608	25.5
45	−3 TO LESS THAN −5	650	22.0	600	22.0	550	22.0	500	22.0	450	22.0
	BETWEEN −3 AND +3	1040	28.0	820	25.7	550	22.0	500	22.0	450	22.0
	+3 TO LESS THAN +5	1924	41.6	1435	36.0	825	27.0	725	26.5	608	25.5
50	−3 TO LESS THAN −5	650	22.0	600	22.0	550	22.0	500	22.0		
	BETWEEN −3 AND +3	780	24.0	600	22.0	550	22.0	500	22.0		
	+3 TO LESS THAN +5	1482	34.8	1080	30.0	825	27.0	725	26.5		
55	−3 TO LESS THAN −5	650	22.0	600	22.0	550	22.0	500	22.0		
	BETWEEN −3 AND +3	650	22.0	600	22.0	550	22.0	500	22.0		
	+3 TO LESS THAN +5	1268	31.5	1080	30.0	825	27.0	725	26.5		
60	−3 TO LESS THAN −5	650	22.0	600	22.0	550	22.0				
	BETWEEN −3 AND +3	650	22.0	600	22.0	550	22.0				
	+3 TO LESS THAN +5	1268	31.5	1080	30.0	825	27.0				
65	−3 TO LESS THAN −5	650	22.0	600	22.0						
	BETWEEN −3 AND +3	650	22.0	600	22.0						
	+3 TO LESS THAN +5	1268	31.5	1080	30.0						
70	−3 TO LESS THAN −5	650	22.0	600	22.0						
	BETWEEN −3 AND +3	650	22.0	600	22.0						
	+3 TO LESS THAN +5	1268	31.5	1080	30.0						
75	−3 TO LESS THAN −5	650	22.0								
	BETWEEN −3 AND +3	650	22.0								
	+3 TO LESS THAN +5	1268	31.5								

NOT TO SCALE

MINIMUM METRIC LENGTHS FOR TAPERED ENTRANCE RAMPS

RAMP DESIGN SPEED (km/hr)	PERCENT GRADE OF THROUGH ROADWAY	TAPER=65:1 Δ=0°52'53" ROADWAY DESIGN SPEED = 120 Km/Hr T = 238 m Lgap = 119 m		TAPER=60:1 Δ=0°57'17" ROADWAY DESIGN SPEED = 110 Km/Hr T = 219 m Lgap = 110 m		TAPER=55:1 Δ=1°02'30" ROADWAY DESIGN SPEED = 100 Km/Hr T = 201 m Lgap = 101 m		TAPER=50:1 Δ=1°08'45" ROADWAY DESIGN SPEED = 90 to 80 Km/Hr T = 183 m Lgap = 91 m		TAPER=45:1 Δ=1°16'23" ROADWAY DESIGN SPEED = 70 Km/Hr or less T = 165 m Lgap = 82 m	
		L_a (m)	Q (m)	L_a (m)	Q (m)	L_a (m)	Q (m)	L_a (m)	Q (m)	L_a (m)	Q (m)
30	-3 TO LESS THAN -5	309	8.4	234	7.5	183	7.0	152	6.7	137	6.7
	BETWEEN -3 AND +3	515	11.6	390	10.1	305	9.2	225	8.1	137	6.7
	+3 TO LESS THAN +5	736	14.7	555	12.7	428	11.4	315	9.9	178	7.6
40	-3 TO LESS THAN -5	294	8.2	222	7.3	171	6.8	152	6.7	137	6.7
	BETWEEN -3 AND +3	490	11.2	370	9.8	285	8.8	205	7.7	137	6.7
	+3 TO LESS THAN +5	736	15.0	555	12.9	428	11.4	287	9.4	178	7.6
50	-3 TO LESS THAN -5	276	7.9	204	7.0	168	6.7	152	6.7	137	6.7
	BETWEEN -3 AND +3	460	10.7	340	9.3	255	8.3	175	7.1	137	6.7
	+3 TO LESS THAN +5	736	15.0	544	12.7	408	11.1	263	8.9	178	7.6
60	-3 TO LESS THAN -5	246	7.4	183	6.7	168	6.7	152	6.7	137	6.7
	BETWEEN -3 AND +3	410	10.0	290	8.5	205	7.4	152	6.7	137	6.7
	+3 TO LESS THAN +5	697	14.4	493	11.9	349	10.0	243	8.5	178	7.6
70	-3 TO LESS THAN -5	198	6.7	183	6.7	168	6.7	152	6.7	137	6.7
	BETWEEN -3 AND +3	325	8.6	200	7.0	168	6.7	152	6.7	137	6.7
	+3 TO LESS THAN +5	553	12.1	340	9.3	302	9.1	243	8.5	178	7.6
80	-3 TO LESS THAN -5	198	6.7	183	6.7	168	6.7	152	6.7	137	6.7
	BETWEEN -3 AND +3	245	7.4	183	6.7	168	6.7	152	6.7	137	6.7
	+3 TO LESS THAN +5	441	10.4	329	9.1	302	9.1	243	8.5	178	7.6
90	-3 TO LESS THAN -5	198	6.7	183	6.7	168	6.7	152	6.7		
	BETWEEN -3 AND +3	198	6.7	183	6.7	168	6.7	152	6.7		
	+3 TO LESS THAN +5	356	9.1	329	9.1	302	9.1	243	8.5		
100	-3 TO LESS THAN -5	198	6.7	183	6.7	168	6.7				
	BETWEEN -3 AND +3	198	6.7	183	6.7	168	6.7				
	+3 TO LESS THAN +5	356	9.1	329	9.1	302	9.1				
110	-3 TO LESS THAN -5	198	6.7	183	6.7						
	BETWEEN -3 AND +3	198	6.7	183	6.7						
	+3 TO LESS THAN +5	356	9.1	329	9.1						
120	-3 TO LESS THAN -5	198	6.7								
	BETWEEN -3 AND +3	198	6.7								
	+3 TO LESS THAN +5	356	9.1								

NOT TO SCALE

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09/06/2007
PLAN DATE:
GEO-100-F
SHEET 3 OF 4

NOTES:

1. The designer has the flexibility to choose either the taper type ramp or the parallel type ramp. However, the same type of entrance and exit ramp should be used within an interchange and corridor. Uniformity in design is needed to aid driver expectancy. On sharp curves, it may be preferable to use parallel type ramps.

2. Select design speed based on a combination of the superelevation rate and the radius of the curve. See also chapter 3 of the MDOT Road Design Manual.

3. If an additional through lane is provided or the entrance ramp joins the mainline on the high side (outside) of the curve, use GEO-101-Series.

4. If the through pavement is curved, plot offsets for taper and connect with appropriate curve.

5. Prepare detail grades and profiles from Section A-A to section B-B.

6. The value of La or Lgap, whichever produces the greater distance downstream from the 2 ft (0.6 m) point, is suggested for use in the design of the ramp entrance. La is the acceleration distance. Lgap is the minimum distance required to find a gap in traffic and merge onto the mainline.

7. Spirals transitions should be used on new ramp alignments based on the design speed of the curve and the radius as shown in the table of the Road Standard Plan R-107-Series. The table gives the maximum radius in which a spiral should be used.

8. The maximum algebraic difference in pavement cross slope between the mainline and the ramp auxiliary lane should not exceed 5%.

9. The cross slope in the gore area between the 2 ft (0.6 m) point and the 22 ft (6.6 m) point should not exceed 8%, with a 6% maximum algebraic difference in cross slope between the gore and the adjacent paved lane. This algrebraic difference also applies within crowned gores.

10. The design speed of the ramp vertical alignment should meet or exceed the design speed of the ramp horizontal alignment.

11. The mainline shoulder width should extend along the ramp to where the gore is 2 ft (0.6 m) wide. Use a 1:25 taper transition where it joins the ramp shoulder paving.

12. Each ramp should be carefully studied to provide maximum vision at its merge points. See Geometric Design Guide GEO-300-Series.

13. These design concepts are for new construction. Where modification may be needed for retrofitting to existing road features, consult the Geometric Design Unit of Lansing Traffic and Safety.

NOT TO SCALE