

**Calculation of MSA for Project Roads for Design Of Overlay On Flexible Pavement**

Design Life in Years (Year 2006-2026) 20  
 Design Life considered for each growth factor 5 years  
 Design Life in Years -overlays 10

SR.NO.	Road No.	Description of Road	No. of proposed Lanes	Commercial Traffic (Both Direction)	Commercial Traffic (each direction)		Traffic Growth Rate		Vehicle Damage Factor	Lane Distribution Factor	MSA
							2006-2011	2011-2016			
1	4		4	4	2	2	0.04	0.03	3.5	0.75	0
2	10	Mutha Chowk to Govardhanghat (with a bridge on Godavari) to Latur Road (thru Kautha)	6	27	13.5	15	0.04	0.03	3.5	0.6	0
3	23	Vazirabad Road to Banda Ghat	2	18	18	19	0.04	0.03	3.5	0.75	0
4	30	Latur Road to Milk Dairy	2	890	890	963	0.04	0.03	4.5	0.75	13
5	34	Pawdewadi Naka to Rest House	2	33	33	36	0.04	0.03	3.5	0.75	0
6	35	Shivajinagar ROB to Nasratpur	2	14	14	15	0.04	0.03	3.5	0.75	0
7	39	Anand Nagar Road	6	659	329.5	356	0.04	0.03	3.5	0.6	3
8	40	Bhagyanagar to Yashwant College to Railway Station	6	218	109	118	0.04	0.03	3.5	0.6	1
9	41	Gakul Dairy to Degloor Road Junction	4	2087	1043.5	1129	0.04	0.03	4.5	0.75	15
10	42	Degloor Road Junction to Old Godawari river bridge	4	4705	2352.5	2544	0.04	0.03	4.5	0.75	34

Calculation of MSA for Project Roads for Design Of Rigid Pavement

Design Life in Years (Year 2006-2026)

20

Design Life considered for each growth factor

5

SR.NO.	Road No.	Description of Road	No. of proposed Lanes	Commerical Traffic (Both Direction )	Traffic Growth Rate				Vehicle Damage Factor	Lane Distributi on Factor	MSA
					2006-2011	2011-2016	2016-2021	2021-2026			
1	1	Railway Station To Wazirabad Police Station	4	345	0.04	0.03	0.03	0.02	3.5	0.25	2.34
2	2	Wazirabad Pollce Station To Gurudwara Gate No. 1	4	82	0.04	0.03	0.03	0.02	3.5	0.25	0.56
3	3	Keli Market To Berki Chowk	4	232	0.04	0.03	0.03	0.02	3.5	0.25	1.57
4	5		4	5	0.04	0.03	0.03	0.02	3.5	0.25	0.03
5	7	S.T Workshop Road To Mutho Chowk	6	267	0.04	0.03	0.03	0.02	3.5	0.25	1.81
6	8	Mutha- Mahavir -Berki Chowk	6	114	0.04	0.03	0.03	0.02	3.5	0.25	0.77
7	16	Gurudwara Gate No. 4 (Parikrama) to Gurudwara Road (Lohar Galli C.C. Road)	2	Missing Link							
8	17	Gurudwara Gate No. 1 to Dena Bank to Nagina Ghat (Partially pedestrian road)	2	259	0.04	0.03	0.03	0.02	3.5	0.25	1.76
9	18	Gandhi Statue to Mahaveer Chowk	6	105	0.04	0.03	0.03	0.02	3.5	0.25	0.71
10	19	Hingoli Gate (RUB) to Forest Office to Banda Ghat	6	172	0.04	0.03	0.03	0.02	3.5	0.25	1.17
11	28	Bafna Petrol Pump to Old Mondha to New Bridge on Godawari	6	1079	0.04	0.03	0.03	0.02	3.5	0.25	7.32
12	32	Airport (Forest Naka) to Chhatrapati Nagar	4	760	0.04	0.03	0.03	0.02	3.5	0.25	5.16

**Annexure 3**  
**Flexible Pavement Design**

<b>DESIGN OF FLEXIBLE PAVEMENT</b>			
<b>(Sample Calculation for Road No.9 - Proposed 4 Lane)</b>			
<b>Data Input:</b>			
1) Traffic			
No. of Commercial Vehicles per Day on Road 42 -Both Direction			4705
2) Vehicle Damage Factor F			4.5
3) Design life in Years- n			20
4) Lane Distribution Factor D			0.75
5) Annual growth rate (%) r			
Upto Year 2016			4
Upto Year 2016			3
Upto Year 2021			3
Upto Year 2026			2
6) No. of years between last count and the year of completion of construction			2
7) CBR of Subgrade Soil			5%
<b>Pavement Design :</b>			
MSA =	$365 \times VDF \times A \frac{((1+r)^n - 1)}{r}$		
	$= \frac{(365 \times 4.5 \times 4705/2 \times ((1+0.04)^5 - 1)/0.04) + (365 \times 4.5 \times 4705/2 \times ((1+0.03)^5 - 1)/0.03) + (365 \times 4.5 \times 4705/2 \times ((1+0.03)^5 - 1)/0.03)}{+ (365 \times 4.5 \times 4705/2 \times ((1+0.02)^5 - 1)/0.02)}$		
	<b>= 67msa</b>		
Pavement thickness from Design Curves/tables(IRC 37-2001) for 67 msa			<b>850 mm</b>
<b>Proposed Pavement Composition</b>	BC	50	mm
	DBM	150	mm
	WMM	250	mm
	GSBI	200	mm
	GSBII	200	mm
	Total	<b>850</b>	mm
Construtability point of view thickness of DBM of 140 mm and WMM of 225 mm has been proposed.			

**Annexure 3**  
**Flexible Pavement Design**

<b>DESIGN OF FLEXIBLE PAVEMENT</b>			
<b>(Sample Calculation for Road No.27 - Proposed 2 Lane)</b>			
<b>Data Input:</b>			
1) Traffic			
No. of Commercial Vehicles per Day on Road 27			549
2) Vehicle Damage Factor F			3.5
3) Design life in Years- n			20
4) Lane Distribution Factor D			0.75
5) Annual growth rate (%) r			
Upto Year 2016			4
Upto Year 2016			3
Upto Year 2021			3
Upto Year 2026			2
6) No. of years between last count and the year of completion of construction			2
7) CBR of Subgrade Soil			3%
<b>Pavement Design :</b>			
MSA =	$365 \times VDF \times A \frac{((1+r)^n - 1)}{r}$		
	$= (365 \times 3.5 \times 549 \times \frac{((1+0.04)^5 - 1)}{0.04}) + (365 \times 3.5 \times 549 / 2 \times \frac{((1+0.03)^5 - 1)}{0.03}) + (365 \times 3.5 \times 549 \times \frac{((1+0.03)^5 - 1)}{0.03})$		
	$+ (365 \times 3.5 \times 549 \times \frac{((1+0.02)^5 - 1)}{0.02})$		
	<b>= 12msa</b>		
Pavement thickness from Design Curves/tables(IRC 37-2001) for 20 msa			<b>810 mm</b>
<b>Proposed Pavement Composition</b>	BC	40	mm
	DBM	120	mm
	WMM	250	mm
	GSBI	200	mm
	GSBII	200	mm
	Total	<b>810</b>	mm
Construtability point of view thickness of DBM of 110 mm and WMM of 275 mm has been proposed.			

## Calculation of MSA for Project Roads for Design Of Flexible Pavement

Design Life in Years (Year 2006-2026) 20  
 Design Life considered for each growth factor 5 years  
 Design Life in Years -overlays 10

SR.NO.	Road No.	Description of Road	No. of proposed Lanes	Commercial Traffic (Both Direction)	Commercial Traffic (each direction)		Traffic Growth Rate				Vehicle Damage Factor	Lane Distribution Factor	MSA
							2006-2011	2011-2016	2016-2021	2021-2026			
1	4		4	4	2	2	0.04	0.03	0.03	0.02	3.5	0.75	0
2	6		2	2	2	2	0.04	0.03	0.03	0.02	3.5	0.75	0
3	9	Deglur Naka to Hingoli Road	6	2489	1244.5	1346	0.04	0.03	0.03	0.02	4.5	0.6	28
4	10	Mutha Chowk to Govardhanghat (with a bridge on Godavari) to Latur Road (thru Kautha)	6	27	13.5	15	0.04	0.03	0.03	0.02	3.5	0.6	0
5	11	Gurudwara Parikrama-II	2	Missing Link									
6	12	Baryam Singh Wine shop Gurudwara Gate No. 2 to Yatri Niwas	2	58	58	63	0.04	0.03	0.03	0.02	3.5	0.75	1
7	13	Chikhalwadi Road to Bhagat Singh Road	2	307	307	332	0.04	0.03	0.03	0.02	3.5	0.75	7
8	14	Chikalwadi Road to Bhagat Singh Road to Crusher Road	2	350	350	379	0.04	0.03	0.03	0.02	3.5	0.75	8
9	15	Gurudwara Gate No. 3/4 to Bhagat Singh Road	2	Missing Link									
10	22	Nagina Ghat to Banda Ghat	2	155	155	168	0.04	0.03	0.03	0.02	3.5	0.75	3

SR.NO.	Road No.	Description of Road	No. of proposed Lanes	Commercial Traffic (Both Direction)	Commercial Traffic (each direction)		Traffic Growth Rate				Vehicle Damage Factor	Lane Distribution Factor	MSA
							2006-2011	2011-2016	2016-2021	2021-2026			
11	23	Vazirabad Road to Banda Ghat	2	18	18	19	0.04	0.03	0.03	0.02	3.5	0.75	0
12	24	Degloor Road through C.R.C. to Gyanamata School (with an RUB or ROB Crossing Railway)	4	5472	2736	2959	0.04	0.03	0.03	0.02	4.5	0.75	77
13	26	Mahadeo Dalmill to Gorakshan Chikalwadi Road	2		0	0	0.04	0.03	0.03	0.02			
14	27	Dr Savrikar Building to Navghat	2	549	549	594	0.04	0.03	0.03	0.02	3.5	0.75	12
15	28a	Khalsa RUB Approaches	4	1079	539.5	584	0.04	0.03	0.03	0.02	3.5	0.75	12
16	29	Crusher Road (from Degloor Road) to Keli Market (Ambedkar Chowk)	2	44	44	48	0.04	0.03	0.03	0.02	3.5	0.75	1
17	30	Latur Road to Milk Dairy	2	890	890	963	0.04	0.03	0.03	0.02	4.5	0.75	25
18	31	Navghat Bridge to Milk Dairy (Latur Road)	2	26	26	28	0.04	0.03	0.03	0.02	4.5	0.75	1
19	34	Pawdewadi Naka to Rest House	2	33	33	36	0.04	0.03	0.03	0.02	3.5	0.75	1
20	35	Shivajinagar ROB to Nasratpur	2	14	14	15	0.04	0.03	0.03	0.02	3.5	0.75	0
21	37	Shivaji Statue (Thru Z.P. Girls School) to Degloor Road	4	1045	522.5	565	0.04	0.03	0.03	0.02	3.5	0.4	6
22	38a	Part of Western bypass (Southern Part inclu. Bridge)			0	0	0.04	0.03	0.03	0.02			
23	39	Anand Nagar Road	6	659	329.5	356	0.04	0.03	0.03	0.02	3.5	0.6	6

SR.NO.	Road No.	Description of Road	No. of proposed Lanes	Commercial Traffic (Both Direction)	Commercial Traffic (each direction)		Traffic Growth Rate				Vehicle Damage Factor	Lane Distribution Factor	MSA
							2006-2011	2011-2016	2016-2021	2021-2026			
24	40	Bhagyanagar to Yashwant College to Railway Station	6	218	109	118	0.04	0.03	0.03	0.02	3.5	0.6	2
25	41	Gakul Dairy to Degloor Road Junction	4	2087	1043.5	1129	0.04	0.03	0.03	0.02	4.5	0.75	30
26	42	Degloor Road Junction to Old Godawari river bridge	4	4705	2352.5	2544	0.04	0.03	0.03	0.02	4.5	0.75	67

**Annexure 3  
Flexible Pavement Design**

<b>DESIGN OF FLEXIBLE PAVEMENT</b>			
<b>(Sample Calculation for Road No.9 - Proposed 6 Lane)</b>			
<b>Data Input:</b>			
1) Traffic			
No. of Commercial Vehicles per Day on Road 9 (Expected Traffic in year 2006)-Both Direction			2489
2) Vehicle Damage Factor F			4.5
3) Design life in Years- n			20
4) Lane Distribution Factor D			0.6
5) Annual growth rate (%) r			
Upto Year 2016			4
Upto Year 2016			3
Upto Year 2021			3
Upto Year 2026			2
6) No. of years between last count and the year of completion of construction			2
7) CBR of Subgrade Soil			3%
<b>Pavement Design :</b>			
MSA =	$365 \times VDF \times A \left( \frac{(1+r)^n - 1}{r} \right)$		
	$= \frac{(365 \times 4.5 \times 2489/2 \times ((1+0.04)^5 - 1)/0.04) + (365 \times 4.5 \times 2489/2 \times ((1+0.03)^5 - 1)/0.03) + (365 \times 4.5 \times 2489/2 \times ((1+0.03)^5 - 1)/0.03)}{+ (365 \times 4.5 \times 2489/2 \times ((1+0.02)^5 - 1)/0.02)}$		
	<b>= 28msa</b>		
Pavement thickness from Design Curves/tables(IRC 37-2001) for 30 msa			<b>830 mm</b>
<b>Proposed Pavement Composition</b>	BC	40	mm
	DBM	140	mm
	WMM	250	mm
	GSBI	200	mm
	GSBII	200	mm
	Total	<b>830</b>	mm

**Pavment Compoition for Different MSA**

**CBR                    3%**

<b>Traffic</b>	<b>BC (mm)</b>	<b>DBM (mm)</b>	<b>WMM (mm)</b>	<b>GSBI (mm)</b>	<b>GSBII (mm)</b>	<b>Total (mm)</b>
1-5	40	60	250	175	175	700
5-10	40	90	250	200	200	780
10-20	40	120	250	200	200	810
20-30	40	140	250	200	200	830
30-50	40	160	250	200	200	850
50-70	50	180	250	200	200	880

**Pavment Compoition for Different MSA**

**CBR                    4%**

<b>Traffic</b>	<b>BC (mm)</b>	<b>DBM (mm)</b>	<b>WMM (mm)</b>	<b>GSBI (mm)</b>	<b>GSBII (mm)</b>	<b>Total (mm)</b>
1-5	40	60	250	150	150	650
5-10	40	80	250	175	175	720
10-20	40	110	250	175	175	750
20-30	40	130	250	175	175	770
30-50	40	160	250	175	175	800
50-70	50	170	250	175	175	820

**Pavment Compoition for Different MSA**

**CBR                    5%**

<b>Traffic</b>	<b>BC (mm)</b>	<b>DBM (mm)</b>	<b>WMM (mm)</b>	<b>GSBI (mm)</b>	<b>GSBII (mm)</b>	<b>Total (mm)</b>
1-5	40	60	250	150	150	650
5-10	40	70	250	150	150	660
10-20	40	100	250	150	150	690
20-30	40	120	250	150	150	710
30-50	40	140	250	150	150	730
50-70	50	150	250	150	150	750