WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

A DETAILED PROJECT REPORT ON IMPROVEMENT SUCH AS WIDENING AND STRENGTHENING OF OLD CUTTACK-SAMBALPUR ROAD

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ABSTRACT:

In past a decade the state Odisha has been doing great and reached to its peak roadway networks. Improvement such as Strengthening and widening in highway paths will mandatorily hike in social and economical face of the state. The highway cellular network serves some sort help to the pedestrian, traders and all other industrial as well as commercial sector. This Journal is all about the Detailed discussion about a stretch part of Old Cuttack-Sambalpur Road from Ch.0000 to Ch 32/310.

The old Cuttack Sambalpur road (ODR) from 0/000 km to 32/310 km for a length of 32.310 km covers the jurisdiction from Nuapatna on newly constructed Madhusudan Setu to Shankarpur in Athagarh town. The project road (MDR) takes off from Nuapatna at Chainage 0/000 KM (From approach of Madhusudan Setu) and terminal at Chandabali Junction, Shankarpurat 32/310km. The road passes through mostly plain terrain, at presently mostly intermediate road (5.5mtrs) and some portion is double lane (7.0 mtrs)

Key Words:ODR, DPR, Terrain, alignment, profiles, crust, lane, junction

INTRODUCTION:

A pavement constitutes a layered structure of processed materials atop the natural soil sub-grade, designed primarily to distribute vehicular pressure to the sub-grade. The promotion of sub-urban roads comes with vast social and economical values for sub-urban areas. Enhanced rural road networks lead to increased mobility, productivity, cost savings in transportation, and positively impact the lifestyle of residents by facilitating the flow of commodities. Rural road connectivity is instrumental in rural development, enabling access to essential services, bolstering agricultural income, creating employment opportunities, and ultimately reducing. Many initiatives for the upgradation of roads have been started in our country but still we lack in the the developmental progress.

The proposed strech is under state plan and commence from Nuapatna located near newly built man made highway bridge “Madhusudan Setu” of Cuttack district to the Athagarh town of Cuttack District.

The total distance of the the proposed stretch is about 32.310 kms.

Some brief description what were the problems faced by the users before the new alignment.

Reduced Capacity: Narrow lanes restrict the space available for vehicles to maneuver, reducing the overall capacity of the road. This limitation can lead to congestion, especially during peak traffic hours, as vehicles have less room to move.

Lower Speeds: Narrow lanes often necessitate slower speeds, as vehicles may need to navigate more carefully to avoid collisions with other vehicles or obstacles such as parked cars or pedestrians. This decrease in speed can contribute to traffic delays and backups.

Difficulty in Passing: In narrow lanes, it becomes challenging for larger vehicles to pass each other safely. This can result in delays as vehicles may need to wait for an opportunity to pass, leading to slower overall traffic flow.

Increased Congestion: Narrow lanes can exacerbate congestion, particularly at intersections or areas with high volumes of turning traffic. Vehicles may have difficulty merging or changing lanes smoothly, causing traffic to back up and creating bottlenecks.

Risk of Accidents: Narrow lanes can increase the risk of accidents, especially in situations where vehicles are forced to navigate tight spaces or make abrupt maneuvers to avoid obstacles. Accidents or breakdowns in narrow lanes can further disrupt traffic flow and lead to additional delays.

Overall, narrow lanes can have a detrimental impact on traffic flow by reducing capacity, slowing speeds, impeding passing maneuvers, increasing congestion, and raising the risk of accidents. Improving lane width and roadway design can help alleviate these issues and promote smoother traffic flow.

Reconnaissance Survey

A reconnaissance survey for the old Cuttack-Sambalpur road aims to provide an initial assessment of the existing conditions and identify potential issues and opportunities for improvement. Here are the key steps involved in conducting such a survey

ROUTE IDENTIFICATION :

It has been proposed to strengthen the link between city of Cuttack and sub-divisional town of Athagarh. Three of the possible alignments have been studied based on distance, benefits and feasibility of each of them. Each of them is detailed out and best of all has been regarded for future scope of strengthening and widening activities.

In an observation, Cuttack has got a number of exit points which have been listed.

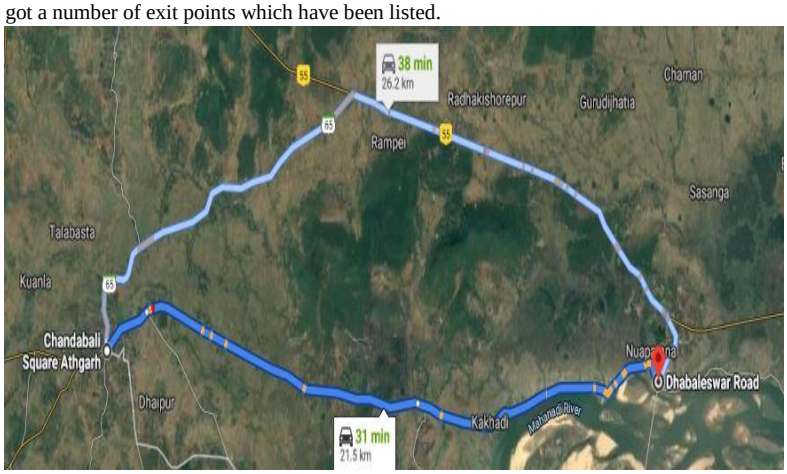


Fig.1 Analysis of the proposed strech

The possible links with Athagarh can be strengthened with exit points at.

1. Trisulia (Netaji Subhash Bose Setu) near High court
2. Naraj Barrage
3. Nuapatna(Madhusudan Setu)
4. Mahanadi Bridge (NH 16, Sikharpur)
5. Kathajodi Bridge (NH 16, Gopalpur)
6. Jobra Anicut

Meanwhile, Athagarh is linked to all its neighbouring towns through Chandbali Chowk. Combining all possible routes, three of them have been sorted out and approached in detail.

Possible alignments:

Alignment A: Cuttack High court → Netaji Subhash Bose Setu → Mundali → Athagarh

Alignment B: Cuttack → Nuapatna→ Nidhipur→ Athagarh

Alignment C: Cuttack → Jobra Anicut →Choudwar → Khuntuni → Athagarh

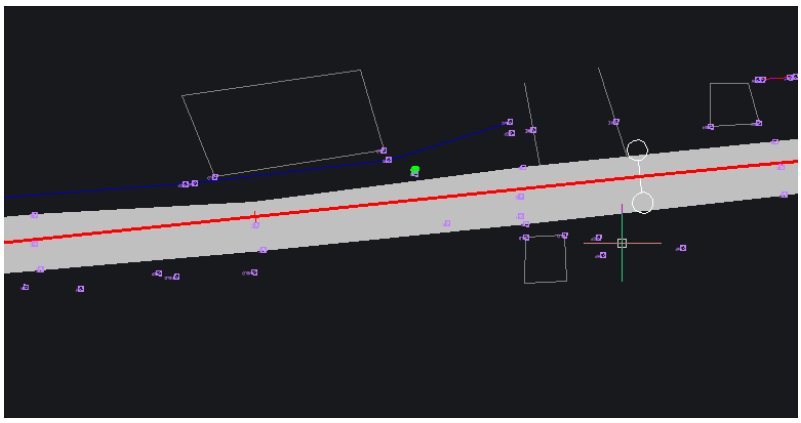


Fig.2 existing stretch surveyed in TS

WORK METHODOLOGY :

width of carriageway : Initially this route carried out by 5.5m Intermediate lane (IL), now proposed to double lane carriageway width i.e. 7m with additional 1.5m of paved shoulder and 1 m of earthern shoulder on either side results in 12 m of formation width which gives a smooth flow of Traffic.

Typical cross section :

The proposed pavement surface consists of 200mm GSB of Gr-VI, 250mm WMM , 50mm DBM and 30mm BC under the widening portion.As per IIT PAVE Design of Flexible Pavement using IRC 37 :2018.

Traffic survey : A traffic survey for the old Cuttack-Sambalpur road involves collecting data on various aspects of traffic flow and vehicle composition. Here's a breakdown of the steps:

Traffic Volume Counts: Measure the number of vehicles passing through at different times and days.

Vehicle Classification: Categorize vehicles to understand traffic composition.

Speed Measurements: Gauge vehicle speeds to identify trends and safety concerns.

Traffic Flow Analysis: Study traffic patterns and congestion points.

Intersection Performance: Assess how intersections function and their capacity.

Pedestrian and Bicycle Traffic: Track pedestrian and cyclist activity for safety assessments.

Parking Surveys: Evaluate parking demand and usage.

Behavioral Surveys: Gather insights from road users about their travel habits and perceptions.

Data Analysis: Analyze collected data to identify patterns and issues.

Reporting: Present survey findings in a comprehensive report to aid decision-making.

Date & Time																						
From	To	Direction	Cycle	Cycle Rickshaw	Sc/Mc	3-Wheeler	Tempo/LCV	4 Tyre	6 Tyre	Car/Jeep/Van/Taxi	Ambulance, Funeral Vans	Mini Bus	Std. Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	Multi Axle Truck	Tractor with Trailor	Tractor without Trailor	Animal Drawn	Others	Grand Total
12-02-2024	13-02-2024	Up	172	0	262	96	62	166	0	150	22	23	34	154	91	35	8	119	14			
8:00 AM	8:00 AM	Down	154	0	300	100	74	180	0	156	26	21	36	158	103	35	11	143	17			
13-02-2024	14-02-2024	Up	172	0	266	80	64	156	0	142	30	19	34	124	100	28	11	119	13			
8:00 AM	8:00 AM	Down	154	0	272	90	72	174	0	150	26	19	34	136	116	23	8	143	17			
14-02-2024	15-02-2024	Up	170	0	258	82	70	180	0	150	22	23	34	132	80	23	8	123	14			
8:00 AM	8:00 AM	Down	154	0	266	90	72	166	0	156	26	23	36	143	116	28	11	145	15			
15-02-2024	16-02-2024	Up	172	0	256	82	68	172	0	150	26	19	34	136	100	23	8	119	13			
8:00 AM	8:00 AM	Down	150	0	274	88	70	182	0	156	22	17	36	136	116	28	11	145	17			
16-02-2024	17-02-2024	Up	170	0	264	118	66	158	0	156	26	21	34	191	83	23	8	119	14			
8:00 AM	8:00 AM	Down	154	0	284	120	70	170	0	166	22	21	36	198	107	23	11	143	17			
17-02-2024	18-02-2024	Up	170	0	266	90	72	172	0	146	26	23	34	136	91	174	8	119	13			
8:00 AM	8:00 AM	Down	154	0	282	92	72	190	0	154	22	21	34	145	119	23	11	143	15			
18-02-2024	19-02-2024	Up	170	0	264	76	70	170	0	142	26	17	34	121	83	23	8	117	13			
8:00 AM	8:00 AM	Down	150	0	274	88	76	174	0	150	22	21	40	151	80	17	8	164	18			
Total no. of Vehicle for 7 days=			2266	0	3788	1292	978	2410	0	2124	344	288	490	2061	1385	506	130	1861	210	0	0	20133
Total no. of Vehicle Per days=			323		541	184	139	344	0	303	49	41	70	294	197	72	18	265	30	0	0	2870
dopted Passenger car units (PCU) value			0.5	2	0.5	1.0	1.5	1.5	1.5	1.5	1.5	1.5	3	3	3	4.5	4.5	4.5	1.5	8		
assenger car units (PCU) value per day			161	0	270	184	208	516	0	454	73	61	210	882	591	324	81	1192	45	0	0	5252
Total no. of commercial vehicle Per day=			957													Design Traffic Volume/ Projected PCU =			12037.68			
Commercial vehicle per day (CVD)=			957																			

Table-1. Daily Traffic Counts

geotechnical investigation :

A soil and material survey for the old Cuttack-Sambalpur road involves the assessment of soil properties and the materials used in road construction. Here's an outline of the survey process:

Soil Sampling: Soil samples are collected at various locations along the road alignment, considering different soil types and conditions.

Laboratory Testing: Soil samples are subjected to laboratory tests to determine their properties, including grain size distribution, moisture content, density, plasticity, and strength.

Subgrade Evaluation: The suitability of the subgrade soil for road construction is assessed, considering factors such as stability, bearing capacity, and potential for settlement.

Material Identification: The types of materials used in the existing road pavement layers, including base course, sub-base, and surface course, are identified.

Material Sampling: Samples of pavement materials are collected from the road surface and pavement layers for testing and analysis.

Material Testing: Laboratory tests are performed on the pavement material samples to evaluate their properties, such as gradation, strength, durability, and resistance to deformation and moisture.

Quality Control: Ensuring that the materials used in road construction meet the specified standards and requirements for strength, durability, and performance is ensured.

Material Specifications: The appropriate specifications for soil stabilization, pavement design parameters, and construction materials are determined based on the survey findings and engineering standards.

Recommendations: Recommendations for soil stabilization techniques, pavement design parameters, and material specifications are provided to optimize the performance and longevity of the road.

Documentation The survey findings, test results, and recommendations are documented in a comprehensive report for use by engineers, contractors, and stakeholders involved in road construction and maintenance.

Through conducting a thorough soil and material survey, valuable insights into the characteristics of the soil and materials along the old Cuttack-Sambalpur road can be gained, enabling the design and construction of a durable and resilient roadway that meets the needs of users and withstands the challenges of the local environment.

Serial no.	Tests	Results
1	Grain size distribution	Well graded
2	Plastic limit	24.9%
3	Liquid limit	18%
4	CBR Test	8%
5	OMC	9%
6	Dry density	2.1kg/m^3
7	Specific gravity	2.5

Table-2. Soil Test

Serial No.	Tests	Results
1	Grading of aggregates	Confirmed as per specification
2	Impact test	24.07%
3	Crushing strength test	24.36%
4	Abrasion test	0.8%
5	Flakiness test	14.36%
6	Elongation test	11.22%
7	Grading of fine aggregates	Zone 3

Table-3. Aggregate Test

Serial No.	Tests	Results
1	Penetration test	100mm
2	Ductility test	80mm
3	Softening point test	49°c

Table-4. Bitumen Test Result

Specifications:

Specifications for the old Cuttack-Sambalpur road include detailed requirements for various aspects of road construction and materials. Here's an outline of the specifications:

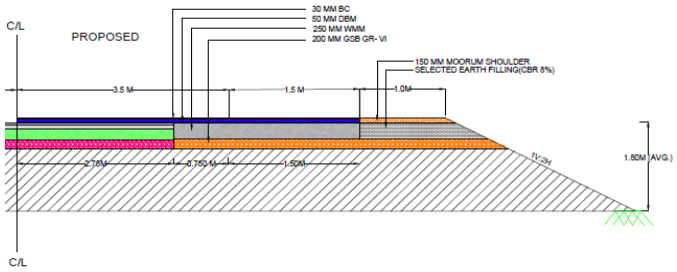
Subgrade: The subgrade soil should have a minimum bearing capacity of 12T and a maximum allowable moisture content of 1%. It should be compacted to achieve a minimum dry density of 1.75g/cm^3 as per MoRTH.

Base Course: The base course material shall consist of wet mixed macadam (WMM) with a minimum California Bearing Ratio (CBR) of 5%. It should be compacted to achieve a minimum dry density of 2.2 g/cm^3 as per MoRTH.

Sub-base Course: The sub-base course material shall consist of Granular Sub-base (GSB) with a maximum particle size of 45-50mm

Surface Course: The surface course material shall consist of DBM and BC with a minimum thickness of 50mm and 30mm respectively. It should meet the requirements for skid resistance, texture depth, and rutting resistance.

Pavement Thickness:



Drainage: Adequate drainage facilities, including surface drains, culverts, and cross-drainage structures, shall be provided to prevent waterlogging and maintain road stability.

Environmental Considerations: Construction activities shall comply with environmental regulations and minimize negative impacts on the surrounding ecosystem, including soil erosion, air and water pollution, and disturbance to wildlife habitats.

Safety: Safety measures, including signage, markings, barriers, and traffic control devices, shall be implemented to ensure the safety of road users and construction workers throughout the project.

Fig- Road Sign

DETAILED ESTIMATE COST :

Name of the work:- Construction of Old Cuttack Sambalpur Road from Ch.0/000km to 9/120 km in the District of Cuttack for the year 2023-24 Under State Plan.

GENERAL ABSTRACT

A) ROAD PROPER

	I			
Road Proper		9120.00 m	Rs	14,51,39,359.11
		m	Rs	
				14,51,39,359.11

B) CD WORKS

	I	
Box Widenning 1x2x2 m		
	1.00 Nos	
	Rs	8,61,645.23
	II	
HP Culvert 1x1.2m		
	2.00 Nos	
	Rs	7,91,363.91
	III	
Box Culvert 1x2x2 m		
	3.00 Nos	
	Rs	43,45,289.67
	IV	
Box Culvert 1x4x4m		
	1.00 Nos	
	Rs	32,59,681.97
	Total 7 Nos	
	Rs	**92,57,980.78**
C) DRAIN & PROTECTION WORK.		
-		
	I	
Toe wall(2.0 m height above GL)		
	1585.00 M	
	Rs	2,83,81,125.91
	II	
RCC Drain		
	5400.00 M	
	Rs	5,77,58,694.59
	III	
Retaing Wall		
	220.00 M	
	Rs	1,31,57,406.46

		Rs	**9,92,97,226.96**
D) ROAD SAFETY PROVISION			
		Rs	**59,88,989.92**
SUB TOTAL.			
		Rs	**25,96,83,556.77**
	E		
SGST			
	9%		
		Rs	**2,33,71,520.11**
	F		
CGST			
	9%		
		Rs	**2,33,71,520.11**
			30,64,26,596.99
	G		
ADD 1% FOR CONTINGENCIES (OVER ITEM (A+B+C+D))			
		Rs	25,96,835.57
	H		
ADD 1% FOR QUALITY CONTROL(OVER ITEM (A+B+C+D))			
		Rs	25,96,835.57
	I		
ADD FOR UTILITY SHIFTING,FELLING TREES & PLANTATION(LS)			
		Rs	2,50,00,000.00
TOTAL.			
		Rs	**33,66,20,268.13**
			GRAND TOTAL
			33,66,20,000.00

SAY Rs

33,66,20,000.00

Name of work:- Widening and strengthening to Old Cuttack-Sambalpur Road from 11/183 km to 32/310 km(Except ROB & Bridge with approaches of 2.06 km) in the district of Cuttack under state plan.

GENERAL ABSTRACT

A)	**ROAD PROPER**				
I	Widening & Strengthening of Flexible pavement			Rs	31,37,00,696.87
				Rs	**31,37,00,696.87**
B)	**ROAD SAFETY PROVISION**			**Rs**	**73,80,394.05**
C)	**CD WORKS**				
I	HP Culvert 1X1.2 M DIA	4		Rs	13,52,885.32
[	Box Culvert 1x2x1.5	5		Rs	63,68,109.45
III	Box Culvert 1x2x2	13		Rs	1,76,14,349.25
IV	Box Culvert 1x2x3	5		Rs	1,00,81,030.51
V	Box Culvert 1x3x4	3		Rs	1,09,96,397.26
		30	Nos	**Rs**	**4,64,12,771.79**
D)	**DRAIN & PROTECTION WORK.**				
I	RCC Drain	5356	M	Rs	4,79,70,343.57
II	Toe Wall 1.5 M	3719.00	M	Rs	2,96,34,419.59
III	Toe Wall 2.0 M	2258.00	M	Rs	2,87,88,882.19
IV	Retaining Wall 3.0 M	415.00	M	Rs	2,28,11,355.33
				Rs	**12,92,05,000.68**
	SUB TOTAL.			**Rs**	**49,66,98,863.39**
E	**SGST**	**6%**		Rs	**2,98,01,931.80**
F	**CGST**	**6%**		Rs	**2,98,01,931.80**
					55,63,02,727.00
G	ADD 1% FOR CONTINGENCIES (OVER ITEM (A+B+C+D))			Rs	49,66,988.63
H	ADD 1% FOR QUALITY CONTROL(OVER ITEM (A+B+C+D))			Rs	49,66,988.63
I	ADD FOR UTILITY SHIFTING,FELLING TREES & PLANTATION(LS)			Rs	1,25,00,000.00
	TOTAL.			Rs	**57,87,36,704.26**
	GRAND TOTAL				**57,87,37,000.00**
				SAY Rs	**57,87,37,000.00**

CONCLUSION:

During execution of work, standard MORTH specification for construction of Road & Bridge Works(5th Revision) will be strictly followed. Necessary Quality Assurance will be maintained during the execution of work.

This paper presents the principles of roadway geometric design and its applications. The four fundamental highway elements—horizontal alignments, vertical alignments, cross sections, and intersections—are designed in part by these factors, which also include highway type, sight distance, design controls, and simple highway curves. Up-to-date details are provided on the design of intricate highway curves, three-dimensional alignment design, truck sight distance requirements, design considerations for RRR projects, and economic assessment.

The article describes emerging design concepts such as human perception, safety audits, design flexibility, consistency, and

smart design. Road users benefit from improved efficiency, comfort, and safety by using geometric design rules. Strict adherence to these recommendations won't, however, ensure a high-quality design. The essential components listed below are also necessary.

Regularity: In order to promote safety and efficiency, geometric design should give drivers clear instructions and refrain from making sudden changes to the rules. It is imperative that highway designs meet the expectations of drivers.

Aesthetics: Coordinating horizontal and vertical alignments as well as landscape improvements can help create a visually pleasing environment. Using physical models and computer viewpoints can substantially facilitate the process.

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