Planning and Design of Parking and Bus Bays with Connected Ghat Road to Meet the Tourist Flow at Hills

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Abstract: This study focuses on improving transportation infrastructure at the Lord Narasimha temple, located on Lion Hill near Visakhapatnam. With increasing traffic flow due to the large volume of devotees, especially during the ChandanotsavamFestival Festival, there is a need to plan and design facilities to accommodate this growth. The research aims to design parking, bus bays, and peripheral ghat roads at the hill's entry and exit points. Additionally, the study addresses the construction of retaining structures, drainage disposal systems, and footpath arrangements, considering the uneven hill terrain. The objective is to create a functional and organized infrastructure to enhance visitor access and safety.

Key words: Lord Narasimha temple, Lion Hill, transportation infrastructure, ghat roads, parking design, bus bays, retaining structures, hill terrain, ChandanotsavamFestival

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I. Introduction

Parking has become a significant issue in cities due to the increasing number of vehicles. Cars spend far more time parked than in motion, occupying valuable street space. An average parking space requires 14 m², and out of 8760 hours a year, cars are parked for about 8360 hours. Drivers tend to park as close to their destination as possible, creating a high demand for parking in central business districts (CBDs)[1,2].

This growing demand leads to congestion and illegal parking, negatively impacting land values and traffic flow. While long-term urban planning to accommodate motor vehicles is ideal, immediate solutions are needed. Properly planned car parks, strategically located, can help reduce congestion while accommodating vehicles and ensuring smooth pedestrian movement.

Although car parks may not generate large profits, they are essential for the economic health of city centers[3,4]. Local authorities must prioritize planned parking facilities to support business and property values.

II. Objectives:

The objectives of the study are:

1) To study the parking characteristics in Vella ambalam-Sasthamangalam road and to assess whether the demand is met with.
2) Identification of the problems in traffic and parking in Vella ambalam- Sasthamangalam road.
3) To project the present traffic scenario in Vella ambalam-Sasthamangalam road
4) To improve the parking facilities utilizing the available infrastructure for meeting the parking demand of various categories of vehicles.

5) To smoothen the vehicular traffic flow by conducting relevant traffic studies.

III. Scope of the study and necessity:

The Simhachalam temple, renowned for its annual Chandanotsavam Festival, attracts millions of devotees worldwide, especially during this auspicious event when the deity is covered with sandalwood paste. Despite the influx of pilgrims, there are significant challenges in managing traffic and parking on the hilltop. The narrow Ghat Road faces congestion, unplanned parking, and unsafe conditions for both visitors and the environment.

To address these issues, a study was conducted to explore alternatives for improving parking facilities and traffic flow. The study suggests systematic planning and model-based solutions for hilltop parking. It also examines the demand for parking and proposes parking management techniques that could enhance accessibility, reduce traffic jams, and improve safety. Regular bus services by APSRTC and the temple's own transport system alleviate some of the pressure, but further infrastructure improvements are necessary to accommodate the large number of pilgrims safely.

IV. Methodology

The methodology focuses on improving transportation facilities at the Simhachalam Temple by designing roads, parking lots, and bus bays in the uneven terrain of the uphill area. A detailed topographical survey using Electronic Total Station (ETS) and GPS was conducted to map the existing features, including temple entrances, shops, drainage, and water supply networks. The survey data was used to create a base map in CADD format and overlay Google imagery to plan parking lots, entry and exi points, bus bays, and footpaths[5,6,7].
The project involves analyzing the current terrain, with significant elevation differences, to design functional parking and transportation facilities. A contour grid map was plotted to facilitate planning in the hilly terrain, ensuring proper connectivity to the Ghat Roads. Parking demand and supply were assessed, along with lane markings and traffic flow considerations. Surveys for parking occupancy and duration were conducted to inform parking design standards and signage placement. The final design aims to optimize space while ensuring the comfort and safety of visitors, particularly during peak tourist seasons[8,9,10].

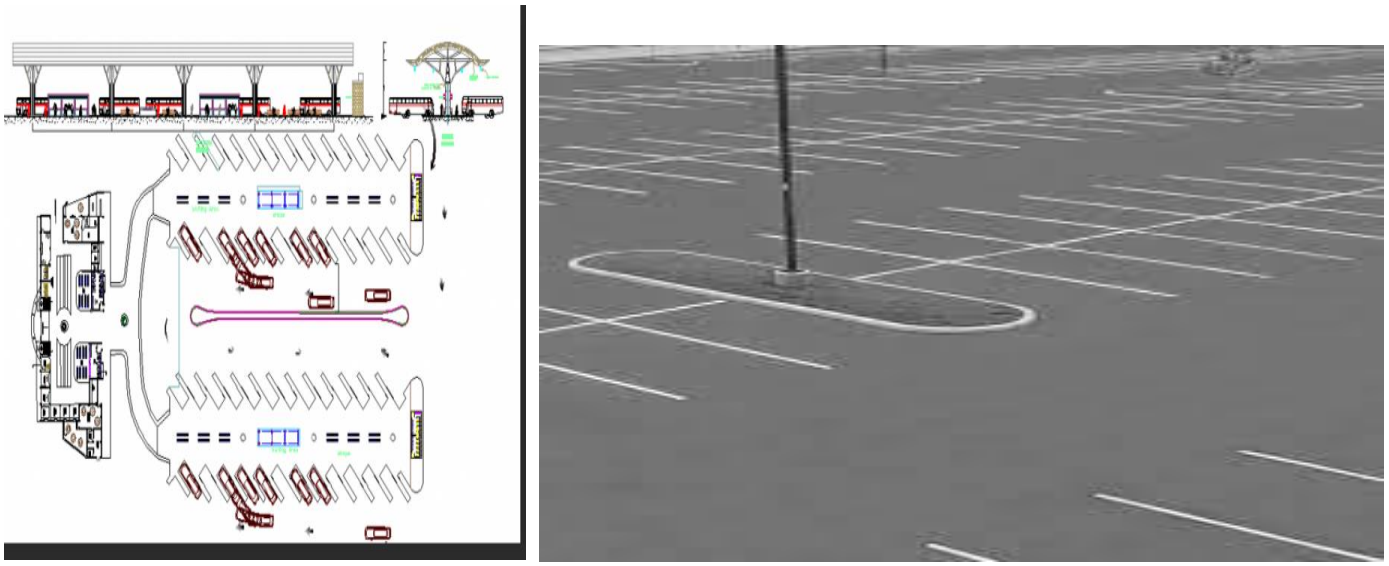

Fig.1 Typical two-way Car Parking Layout with and without Angular Stalls

Table1.Dimensions of different types of Vehicles

Mode	Length	Breadth, m	Project Area,Sqm
Two-Wheeler (2W)	1.65	0.75	1.16
Three-Wheeler or Auto (3W)	2.60	1.15	2.99
Car or Jeep	4.20	1.50	6.30
Bus (B)	9.20	2.50	23.00
Light Commercial Vehicle (LCV)	6.60	2.10	13.86
Lorry (2A)	7.30	2.42	17.67

Fig.2 Drawing showing Contour Grid and Block levels of Study area

V. Data collection & case study corridor

Table.2 Vehicular Data statistics for the year 2023-11 at Devastnam Toll Gate

Month	No. of Two Wheelers Scooters	No. of Cars (Four Wheelers)	No.of Private Buses/Mini Buses (other than APSRTC Buses)
April-2023	11110	10560	300
May-2023	12930	14730	840
JUNE-2023	11788	13302	320

JULY-2023	**10160**	**10060**	**280**
August-2023	**10750**	**10050**	**300**
September-2023	**8920**	**8010**	**300**
october-2023	**10040**	**11800**	**440**
November-2023	**13480**	**10160**	**360**
December-2023	**15700**	**13860**	**430**
January-2024	**13460**	**11670**	**450**
February-2024	**9770**	**9590**	**300**
March-2024	**11250**	**9690**	**360**
TOTAL	**139358**	**133482**	**4680**

The aim of the data collection is to assess key parameters for designing systematic parking lots at Simhachalam Temple, Visakhapatnam. The temple experiences fluctuating vehicle volumes, with peak day traffic being 4 to 5 times the average annual traffic. Data requirements include terrain, soil classification, stormwater disposal, and vehicular statistics from the toll plaza.

Simhachalam Temple is a renowned pilgrimage site, attracting millions of tourists annually. Peak traffic occurs during special festivals like Chandanotsavam. The existing infrastructure, including parking and the ghat road, is inadequate for current tourist volumes. Toll fees are charged based on vehicle type, and revenue is used for road maintenance.

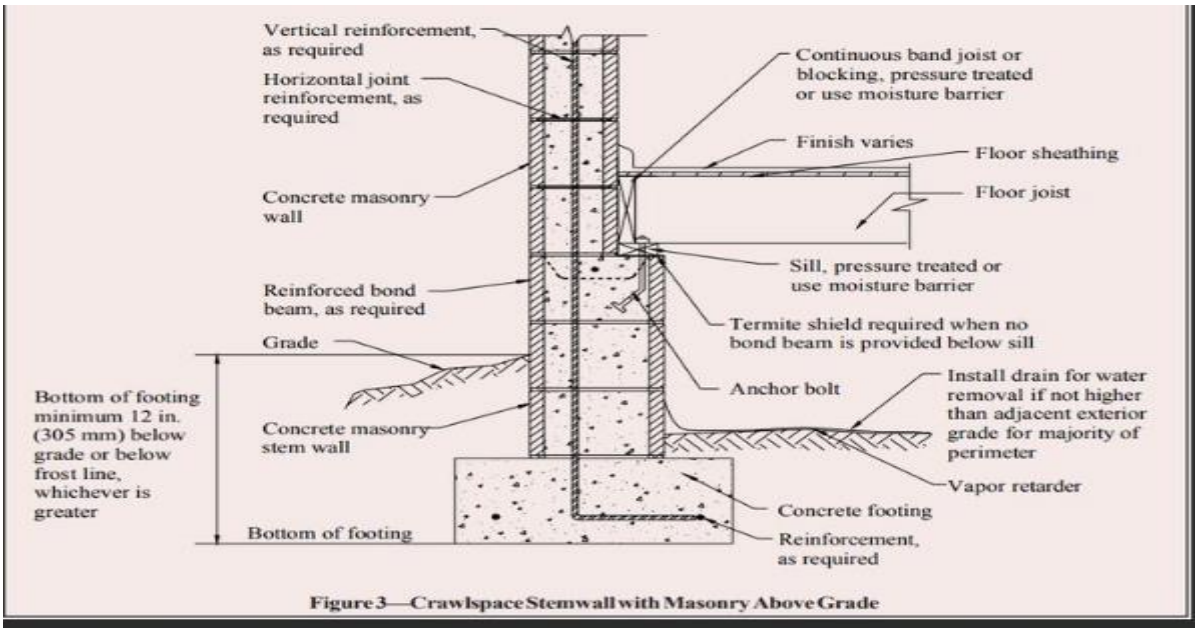

Fig.3 **Design Section showing Retaining wall upto 4mts height.**

VI. Results and Discussion

The study focuses on designing and improving parking and road infrastructure at Sri Varaha Lakshmi Narasimha Swamy Temple, a popular pilgrimage site. It proposes flexible pavement design using CBR and SBC methods for better durability and safety, especially in challenging subgrade conditions [13-18]. The project emphasizes creating designated parking areas for VIPs, general visitors, and buses, integrating pedestrian paths, and implementing efficient parking management systems to reduce congestion, improve safety, and enhance the visitor experience. The design also incorporates sustainable measures to protect the surrounding environment and ensures long-term benefits for traffic flow and revenue generation [18-20].

Table.3 Designed summary of Parking Bays and Stalls

S. No.	Description	4-wheeler Parking's	Bus Parking's	2-Wheeler Parking's	Bus Bay Parking's
1	Parking Bay -1	150	-	50	10
2	Parking Bay -2	110	-	50	-
3	VIP Parking	60	-	-	-
4	Bus Bay	-	20	-	-
		320	20	100	10

Table.4 Designed summary of Parking Bays and Stalls

S. No.	Description	4-wheeler Parkings	Bus Parkings	2-Wheeler Parkings	Bus Bay Parkings
1	Parking Bay -1	150	-	50	10
2	Parking Bay -2	110	-	50	-
3	VIP Parking	60	-	-	-
4	Bus Bay	-	20	-	-
		320	20	100	10

The designed summary of parking bays and stalls illustrates a comprehensive layout to accommodate various types of vehicles at the temple.

- Parking Bay 1 features 150 spaces for four-wheelers, 50 spaces for two-wheelers, and 10 bus bay parking slots.
- Parking Bay 2 includes 110 spaces for four-wheelers and 50 for two-wheelers.
- VIP Parking** is designated for 60 four-wheelers, ensuring convenient access for distinguished visitors.
- Additionally, there is a Bus Bay with 20 designated parking slots for buses.as shown in table.3

The parking facility design includes a total of 320 four-wheeler spaces, 100 two-wheeler spaces, 20 bus parking slots, and 10 bus bays. Specifically, Parking Bay 1 accommodates 150 four-wheelers and 50 two-wheelers, while Parking Bay 2 offers 110 four-wheelers and 50 two-wheelers. VIP Parking provides 60 spaces for four-wheelers, and a dedicated Bus Bay accommodates 20 buses. This structured parking layout significantly enhances vehicle management and accessibility for pilgrims visiting the temple, supporting efficient traffic flow and reducing congestion.as shown in table 4

VI. Conclusion

The study highlights the importance of developing an organized parking system and improving road connectivity to the Sri Varaha Lakshmi Narasimha Swamy Temple to accommodate the increasing volume of pilgrims. The proposed improvements, including additional parking bays, bus bays, and a VIP parking facility, aim to reduce traffic congestion and enhance visitor convenience. The changes, such as flexible pavement, esthetic improvements, and better environmental management, will create a more efficient and pleasant experience for visitors. With an estimated recovery of development costs within 4-5 years, these enhancements will benefit both the pilgrims and the temple's revenue, ensuring smoother traffic flow for the next decade.

VII. Scope of the study

The current study addresses the immediate needs of pilgrims over the next five years but highlights the necessity for further research to enhance traffic management for the temple. Proposed alternatives include a Road Over Bridge connecting VIP Parking to the temple for improved access during peak times. Additionally, developing a direct 11.90 km Ghat Road from Visakhapatnam to the temple is essential for alleviating congestion and enhancing safety. Collaborations between the Visakhapatnam Urban Development Authority and Simhachalam Devasthanam are crucial to expedite this project and accommodate increasing tourist traffic effectively.

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