

Design and Fabrication of Multilevel Vehicle Parking

¹R.vani, ²N.Harika
¹Asst Professor, ²Asst Professor
 St Martins Engineering College

Abstract - Now a days in most of the city's parking is a major problem because most of them they are having four wheeler in city. For parking of this four-wheeler required more space. For avoiding this problem we can use multi-level parking system. A multi-storey car-park is a building designed for car parking and where there are a number of floors or levels on which parking takes place. It is essentially a stacked car park. First multi-level car parking is started in West Washington U.S. In this project we are designing and fabricating multi-level car parking system. In this project we are designing hydraulic lifting system for lifting car for different levels. And multi-level store building model design is done by using Pro.E software. Analysis also conducted by using software ANSYS

keywords - structural modal, ANSYS, Pro-E, vehicle parking, 3D model

I. INTRODUCTION

Parking is the demonstration of halting and withdrawing a vehicle and leaving it abandoned. Parking on one or the two sides of a street is frequently allowed, however now and then with limitations. Parking offices are developed in mix with certain structures, to encourage the traveling every which way of the structures' clients.

Parking offices incorporate indoor and open air private property having a place with a house, the roadside where metered or spread out for such use, parking (North American English) or vehicle leave (British English), indoor and outside staggered structures, shared underground parking offices, and offices for specific methods of vehicle, for example, devoted structures for cycle parking. In the U.S., after the main open parking carport for engine vehicles was opened in Boston, May 24, 1898, uniform stables in urban focuses started to be changed over into carports. In urban areas of the Eastern US, numerous previous attire stables, with lifts for carriages, keep on working as carports today. The accompanying terms give territorial varieties. All aside from garage allude to outside staggered parking offices. In some territorial tongues, a portion of these expressions allude additionally to indoor or single-level offices concerned. In any case, contrasts exist the degree that the glow move wonder is concerned.

For most mechanized vehicles, there are three fundamental methods of parking, in view of the course of action of vehicles - equal parking, opposite parking, and point parking. These are self-leave designs where the vehicle driver can get to the parking freely.

On street parking

On street parking means the vehicles are parked on the sides of the street itself. This will be usually controlled by government agencies itself. Common types of on-street parking are as listed below. As per IRC the standard dimensions of a car is taken as 5× 2.5 m and that for a truck is 3.75× 7.5 m.



Fig 1: On street Parking



Fig 2: Off Street Parking

Off street parking

Off street parking means vehicles are parked off the street itself. This will be usually controlled by commercial agencies itself.

Other Parking Methods

Other than these essential methods of engine vehicle parking, there are occurrences where an all the more specially appointed way to deal with organizing engine vehicles is proper. For instance, in parts of some huge urban communities, for example, Chicago, where land is costly and in this way parking space is including some hidden costs, there are parking parcels for engine vehicles where the driver leaves the keys to the vehicle with a specialist who organizes vehicles in order to expand the quantity of vehicles that can be left in the part. Vehicles might be gotten together to five vehicles somewhere down in mixes of opposite

as well as equal parking with restricted flow passageways for the parking orderly. Such courses of action are known as orderly parking. At the point when the parcel or office is given to serve the clients of a business, it is viewed as valet parking.

Multi-level Car Parking Systems

The term multi-level vehicle leave is utilized in the United Kingdom, Hong Kong and numerous Commonwealth of nations. In the western United States, the term parking structure is utilized particularly when it is important to recognize such a structure from the "carport" in a house. In certain spots in North America, "parking carport" alludes just to an indoor, frequently underground, structure – open air multi-level parking offices are alluded to by various provincial terms: It is a structure (or part there concerning this) which is planned explicitly to be for Automobile Parking and where there are various floors or levels on which parking happens.



Fig 3: Multi-level Car parking

II. LITERATURE REVIEW

The unending quest with the expectation of complimentary spaces in a vehicle leave is a weight for any driver these days since vehicles are a prevalent method of transportation. With rising number of vehicles and diminishing parking spaces, vehicles left along the street and even on walkways have become genuinely normal wonders. In customary parking frameworks, vehicles are left in opposite or equal design. With no wellbeing against the security against climatic conditions, it's anything but a space proficient framework either. Multistoried parking frameworks are favored since they multiply parking limit of a given territory [1]. Different floors are available for parking the vehicles with slopes and staircases given to moving between floors. There are different kinds of existing frameworks that are applied in numerous nations to improve parking offices for swarmed territories [1-6]. This audit distinguishes a couple of them. In any case, Lot-explicit frameworks use signs to give parking data that regularly contain basic bearings to parking offices and encourage for drivers to locate the accessible space utilizing signs that ordinarily have both detached and dynamic parts [2]. The inactive part gives basic bearings to parking offices, for example, with a bolt. The dynamic segment supplements the inactive part to instruct the explorer with respect to the accessibility of spaces at the office. Diverse hued LED lights help the drivers to separate between spaces (held, involved, empty or incapacitated). It additionally maintain a strategic distance from inappropriate parking. This framework causes the parking the executives to deal with the parking stock, permits them to acquire exact expert information and helps keep the vehicle leave open to its actual limit [3]. This framework has certain focal points and this incorporates diminished vehicle develop at passages, ways out and walkways, a shorter empty space search times bringing about less vehicle outflows. It additionally stays away from clog and undesirable traffic with the assistance of successful signage inside the vehicle leaves. This is one of most recent patterns in parking the executives framework, this office empowers the driver to save a parking place in any multi-story leave through the site or cell phone application, and pay online so as to save that place, consequently they will get a message containing data about the spot of parking in that vehicle leave. This system is exceptionally helpful for lessening the time it assumes to discover a position. This methodology is actualized in numerous nations, for example, the U.S. In 2004, Mobile Parking LLC and Spot Scout TM are two organizations that offer customers or drivers the opportunity to check for accessible spaces in around 400 parking region in 50 urban communities over the U.S., utilizing their radio, cell phone, or PC, it was utilized to save a spot in a parking region, not just multi-story park [7].

The advantages of this framework are that decreased time is spent for parking spaces and diminished dissatisfaction of guests and simpler access to parking place. There is additionally decreased exertion for setting administrators so as to fulfill the client, since they will be liable for picking the spot not the scene administrator. Parking administrators will likewise profit by expanded inhabitation and related increment in income as clients will pay for timely bookings other than the expense of parking [8]. Notwithstanding, there are barely any downsides of this framework as it is costly to actualize all over the place, the design of the framework may require a great deal of gear, which thusly requires a colossal spending plan. It additionally requires gigantic measure of time, cost and exertion to execute lastly it needs advanced and present day innovation. From the survey [9], programmed multi-level vehicle leaves give lower building cost per parking space, as they ordinarily require less structure volume and less ground zone than an ordinary office with a similar limit. A multi-level vehicle leave offers the best conceivable adaptability for the acknowledgment of ideal parking arrangement. Anyway to date hoisting type parking component not found from the writing. Henceforth this examination centers around growing such a framework which will likewise build the parking space[9].

III. EXPERIMENTAL PROCEDURE

The model is planned using Pro-E (See Fig 1) and the detail evaluation is a method for tackling, normally about, positive difficulties in building and time. It is utilized for the most part for inconveniences for which no novel arrangement, expressible in some scientific shape, is accessible. In that capacity, it's miles a numerical rather than an explanatory strategy. Strategies for this sort are wished because of reality systematic methods can't manage the genuine, complex difficulties which might be met inward

building. ANSYS Mechanical is a limited component assessment gadget for auxiliary assessment, which incorporates straight, nonlinear and dynamic investigations (See Fig 2).

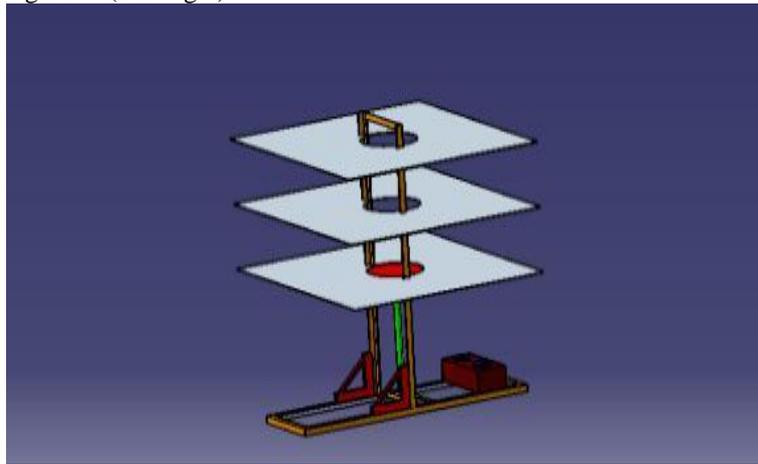


Fig 1: Multi-level car parking Pro-E Model



Fig 2: Meshed Model for Analysis

IV. RESULTS

The deformations and stress analysis results are drawn from the analysis tool Ansys and their results are shown in the Fig 3 & 4. The values of results are tabulated in the Table 1 & 2.

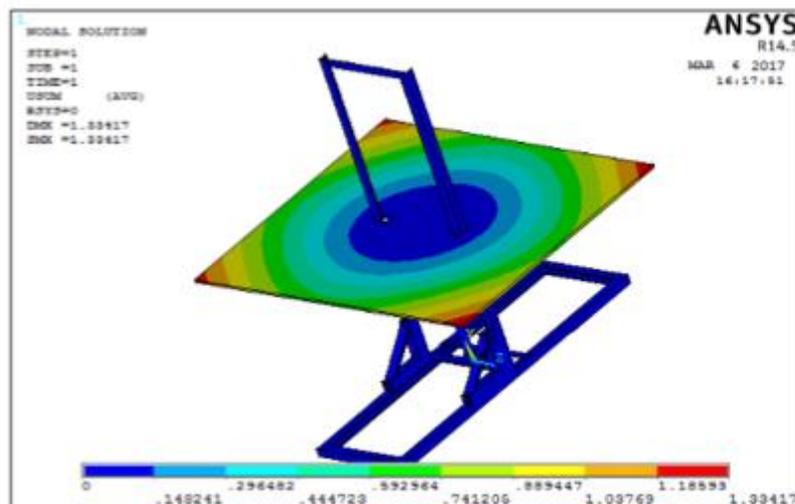


Fig 3: Deformation in the Model Designed

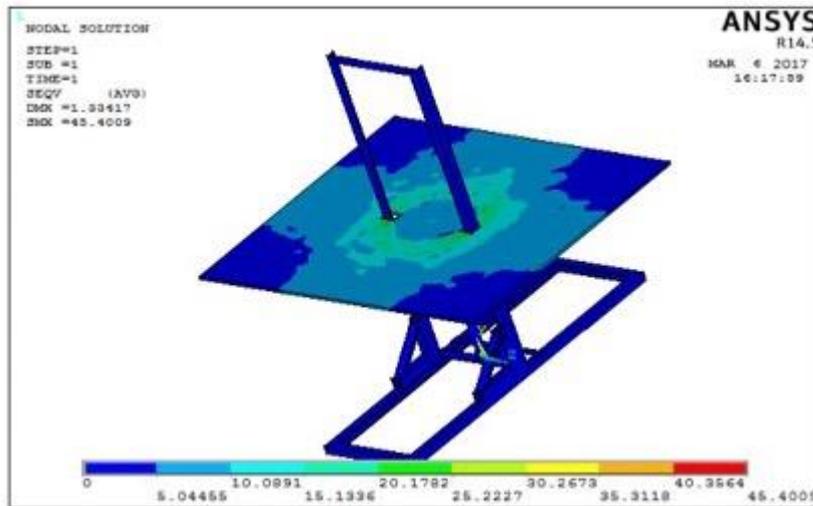


Fig 4: Stress locations in the model

Table 1: Static analysis

| material | Speed km/hr | Deformation(mm) | Stress(MPa) | strain |
|---------------------|-------------|-----------------|-------------|------------|
| aluminum 6061-T8 | 400 | 0.034562 | 83.399 | 0.0012383 |
| | 600 | 0.045865 | 110.68 | 0.0016433 |
| | 800 | 0.081535 | 196.75 | 0.0029214 |
| s2 glass | 400 | 0.027463 | 83.545 | 0.00098035 |
| | 600 | 0.036445 | 110.87 | 0.001301 |
| | 800 | 0.064789 | 197.09 | 0.0023128 |
| carbon epoxy | 400 | 1.9943e-5 | 48.896 | 0.00071355 |
| | 600 | 0.026808 | 65.726 | 0.00095914 |
| | 800 | 0.04706 | 116.85 | 0.0017052 |

Table 2: Fatigue analysis

| material | Speed km/hr | life | damage | Safety factor |
|---------------------|-------------|------|--------|---------------|
| aluminum 6061-T8 | 400 | 1×e6 | 1×e32 | 0.010336 |
| | 600 | 1×e6 | 1×e32 | 0.0077885 |
| | 800 | 1×e6 | 1×e32 | 0.0043812 |
| s2 glass | 400 | 1×e6 | 1×e32 | 0.010318 |
| | 600 | 1×e6 | 1×e32 | 0.007775 |
| | 800 | 1×e6 | 1×e32 | 0.0043736 |
| carbon epoxy | 400 | 1×e6 | 1×e32 | 0.017629 |
| | 600 | 1×e6 | 1×e32 | 0.013115 |
| | 800 | 1×e6 | 1×e32 | 0.0073769 |

V. CONCLUSION

The developing populace of India has made numerous issues one of the difficult ones being vehicle parking which we defy consistently. Other than the issue of room for autos proceeding onward the street, more prominent is the issue of room for a left vehicle thinking about that private vehicles stay left for the vast majority of their time. While private ventures despite everything escape with assigned parking, the genuine issue lie with business spaces numerous a period which is overwhelmed by taking additional open spaces to stop. Right now are planning and creating a multi-level vehicle parking framework. Right now are structuring water powered lifting framework for lifting vehicle for various levels. What's more, multi-level store building model structure is finished by utilizing Pro-E programming. Examination is done on the multi-level parking framework to approve the quality of the parking framework. By watching the outcomes, we can reason that our planned model withstands the weight applied.

Future Scope

Analysis can be done on car parking frame by changing the fiber orientation of composite material. It can be obtained by doing the analysis with metal matrix composite chassis.

VI. ACKNOWLEDGMENT

The authors here by thank the authors of the below mentioned references for their valuable contribution which enabled us make this comparison.

REFERENCES

- [1] Design and Structural Analysis of the Ribs and Spars of Swept Back Wing Mohamed Hamdan A1 , Nithiyakalyani S2
- [2] Design and Analysis of Wing of an Ultralight Aircraft Yuvaraj S R 1 , Subramanyam P 2

- [3] Optimization of aircraft wing with composite material shabeer kp1 , murtaza m a2
- [4] Design and Finite Element Analysis of Aircraft Wing Using Ribs and Spars Guguloth Kavya
- [5] Static & dynamic analysis of a typical aircraft wing structure using msc nastran t.s.vinoth kumar1 , a.waseem basha2 , m.pavithra3 , v.srilekha4
- [6] Graeme J. Kennedy and Joaquim R. R. A. Martinsy, “A Comparison of Metallic and Composite Aircraft Wings Using Aero structural Design Optimization”, University of Toronto Institute for Aerospace Studies, Toronto, ON, Canada.
- [7] Peter J Rohl, Dimitri N Mavris and Daniel P Schrage, “Combined aero dynamic and Structural Optimization of a high speed civil transport Wing”, School of Aerospace Engineering, Georgia Institute of Technology Atlanta
- [8] Boyan Liu, “Two level optimization procedure for wing design subject to strength and buckling constraints”,University of Florida
- [9] Kong, h. park, y. Kim and k. Kang “Structural design on wing of a small scale wig vehicle with carbon/epoxy and foam sandwich composite structure”, 16th international conference on composite materials

