



A Review on Design & Analysis of Elevated Fuel, Gas & Electric Station

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ABSTRACT

In this study, As we see our World is fully on developing mode and grasp new technologies due to this lots of challenges and trouble we are facing. So the one of the problem is Elevated Fuel, Gas & electric station. As we see most of the countries is move to EV vehicles and CNG vehicles. The Purpose of this topic is to make a combine Platform for all Like Fuel, Gas & Electric and also Connect to the Existing & upcoming proposed bridges.

Study represents the Design of Elevated Fuel, Gas & Electric Station building for the moderation of traffic challenges in Highway & Metropolitan region. Total Area of Station is 40 m x 30 m (1200 m²) also added Additional lane to reach the station which is directly connected to the Highways & Flyovers (existing & proposed). Firstly, plan was made on AUTO-CAD Software with all details of Foundation, Column and Beam design. Further it was placed in STAAD.PRO SOFTWARE to Analysis of the frame Structure for the Vertical and Horizontal Loads. The Design has been Studied according to IS 456:2000, SP -07, IS 10987:1992 & Amendment in building by laws (EVCI),

INTRODUCTION

A flyover is constructed over the road for the purpose of traffic management. It can be constructed over the railway or existing roadway. Nowadays, the use of these flyovers has become a common engineering term in big cities where traffic is hard to manage. Similarly we see fuel station (Fuel, Gas and Electric) in our routine life is always in Ground so here is the problem is when we are travelling or driving on the flyovers at that we never see the fuel station (Fuel, Gas and Electric) which is connected to the flyovers.

Now a days there is more crowd of vehicles in the cities so there is waiting in fuel station (Fuel, Gas and Electric) and also it takes more time to re-fueling/re-charge the vehicles for this we have to wait for that. Especially for those who are travellers or new to

the city. The task of locating the fuel station (fuel, gas and electricity) for that person then waits for an opportunity to refuel/recharge your vehicles. As we see that the government also takes initiative to prevent pollution in various ways just like government promotes ethanol vehicles, lithium-ion battery vehicles, CNG vehicles, electric vehicles etc.

So, if we can make elevated road (flyover), elevated metro station then why can't we go for elevated fuel station?

Elevated Fuel, Gas & Electric Station is an innovative idea where each and every type of vehicles (ethanol vehicles, lithium-ion battery vehicles, CNG vehicles, electric vehicles, etc) can come in a single platform which is connected to the flyovers. Elevated Fuel, Gas & Electric Station can also connect to the existing flyovers

just like overlap the surface of fuel station and pavements similarly we can also add to new proposed flyovers during the time of Designing, & Tendering.

If we talk about the area for this platform so we need only 2000-3000 sq.mt as per road traffics and demands. We design the structure with including additional lane for the vehicles and at the center of the lane makes platform with additional land which cover the area 2000-3000 sq.mt. Below the additional lane we can also make the room as warehouses for farmer, Rest house/Rooms for government employees/inspection team of flyovers, Roads, Highways, etc. And if we go for the Solar Panel at same area so we also generate the electricity for the fuel station so need of any High Voltage line there.

Urbanization and the rise in population have increased the demand for high-rise structures in the cities of India. The population of India is continuously increasing day by day, and towns and cities have grown up around their public transport system. The **Elevated Fuel, Gas & Electric Station** scenario is woefully falling short of the current requirement in the country.

Elevated Fuel, Gas & Electric Station which reduces traffic in the city and also accommodates a large number of vehicles. The study presents the design of elevated fuel stations, i.e., stations connected to the bridge, flyovers, and elevated pavement. The area of the elevated fuel station with an additional lane is approximately 2400 m².

The Elevated Fuel Station is connected to new proposed bridges, existing bridges, flyovers, and elevated roads at the same level of pavement.

India has a total of **1,473,523** bridges across its massive network.

So here is the purpose of the project: to find out who is travelling there in their daily routine, in terms of transportation, and also who is travelling long distances and doesn't know where we can get fuel stations.

Now a days, we promote electric vehicles, lithium-ion batteries, and compressed natural gas (CNG), so for those people who use this feature of a car, we have to build stations for their vehicles every 100 km because the electric vehicle range is about 250–350 KM per charge. If we have to promote and want a pollution-free country, then we need this type of platform.

To provide a single platform for all types of vehicle to find the Fuel, Gas, Electric Charging, Energy Station, etc. where they can find out their respective needs for vehicles. In India in terms of sharing knowledge, experience, information, best practices, innovation in all aspects of transport and learn from one another in order to improve performance of the design and analysis.

Objectives of the Study

1 To provide a common platform for all type vehicles & more different agencies collaboration in a single platform

1To provide socio-economic benefits and equal opportunities in public spaces to all citizens

2To help the public issues and pollution is addressed by way of design, while elevated Fuel Stations (Fuel, Gas & Electric) decongest the traffic

REVIEW OF LITERATURE

The exhaustive literature survey has been carried out through various sources. The comprehensive review of literature is presented below.

1.Harshavardhan M Sule Patil ET.AL [1]

The performance assessment of selected designed pier showed that, Force Based Design Method may not always guarantee the performance parameter required and in the present case the pier just achieved the target required. In case of Direct Displacement Based Design Method, selected pier achieved the behaviour factors more than targeted Values. These conclusions can be considered only for the selected pier. For General conclusions large numbers of case studies are required and it is treated as a scope of future work.

2.Abhijit Nanaji Chalkhure ET.AL [2]

The Multi Storied Car parking Building was designed as G+2. All the standards values were taken from the reference Codes to facilitate maximum utility. Column size as compare to large span of structure as Column (0.70 m x 0.50 m) also Beam (0.60 m x 0.55 m) & Slab thickness 0.10 m. Further we can make approximate Estimation of Building and also by using Revit Software Architecture to make good modelling of The Multi Storied Car parking Building G+2.

3.Dr. S. Mahendran ET.AL [3]

The multi-level car parking was designed as a complex building with G+5 and G+4 floors and analyzed,

which gives a great knowledge about the designing components. The layout of the building was planned with reference of Codes to facilitate maximum utility. For emergency purpose separate dog-legged staircase is provide on back side of structure. Automatic car parking system could be done as the further improvement of the project. The moments acting on all the RC elements have been identified and the design is done to carry the moments acting on the structure. The various difficulties in designing the RC structure have been understood.

4.PRAMOD KUMAR, ET.AL [4]

The traffic congestion problem can be regulated by providing multi storey parking at JALAHALLI CROSS. We hope this project will serve as a solution to various traffic congestion problems and can be used as a modeling the development of multi-storey parking's. We have designed the multilevel parking building using concept of framed structure which will survive the purpose of traffic congestion. Multilevel parking is of G+5. Basement and half of ground floor will be accommodated by cars. Half of the ground floor will be accommodated by a commercial shop. 1st and 2nd floor will be accommodated by motor cycle parking. 3rd, 4th and 5th floors will be accommodated by commercial shops. This system can help in economy and security-based aspects for the society. It is a currently, management information system. Play an important part in the life, however many of rules are poor and need to be progress. This research has been focus on improving the Bangalore parking system to be suitable for the life style.

5.MIRZA MUNIR AHMED, ET.AL [5]

Injury free work environment is an essential element for any successful project. Better safety performances can be achieved only if safety matters priority at all stages of project addressed adequately. Concrete efforts of owners, contractors, sub contractors and designers are equally important at different levels of project. It is necessary to develop such strategies that can help to reduce injury cases. Past safety studies investigated various methods to improve injury statistics but it still contains more room for improvement. This paper will present the application of risk assessment criteria (RAC) to identify critical, major, moderate and minor activities during fuel station operation. Health safety &

environmental hazards related to fuel stations activities will be identified, estimate the associated risks and necessary control measures for mitigation of identified risks will be highlighted in this study. The RAC used in this study is widely applying in upstream oil and gas sector in Pakistan. Poor maintenance, carelessness, house keeping, mechanical fault and robbery found to be the major causes of occurrences of unsafe acts and unsafe conditions at fuel stations. RAC are methods of work system design and helpful to address associated risks in a project. During study it was felt that many resources are available within an organization to minimize accidents/injuries but due to not fully utilization of these resources accidents/incidents happen. After calculating risks, application of available resources can be done more appropriately. In case of unavailability, requirements can be highlighted and applied strategically to get better results.

6.Dr. Awari Mahesh Babu [6]

The metro rail frameworks are high-limit open vehicles which are by and large observed in urban territories. Checking out the urban vehicle situation in Indian urban communities, this is the full length investigation of the Rapid metro rail framework in India. As of late the metro rail has come up as a favored option of mass vehicle in urban spaces looked with developing populace, high vehicular traffic, and expanded contamination. Metro Route Maps are made according to traffic study and assessed in precise way by utilizing GIS, Global Mapped and discover most brief doable courses. Focusing on the complexities of development setting up, Indian practice with those of its universal counterparts. There are steady advantages to the monetary specialists like government, private transporters, travelers, overall population and untalented workers. This Study focus on significant exercises for future foundation ventures. While the metro rail framework has excitingly improved it's between city networks. This investigation of metro rail clarifies the essentialness and outcome of raised and underground metro rail in India

7.Ching Sheng Ooi ET.AL [7]

This article aims to provide a comprehensive review on the condition monitoring techniques of underground storage tanks (UST). Generally, the UST has long been a favourite toxic substance reservation apparatus, thanks to its large capacity and minimum floor space

requirement. Recently, attention has been drawn to the safety risks of the complex cylindrical-shaped system and its surrounding environment due to contamination resulting from unwanted subsurface leakage. Studies on related countermeasures shows that numerous efforts have been focused on the damage remediation process and fault detection practice; however, it has also been observed that there are uncertainties in present technical complications involving the effectiveness of corrective actions and the robustness of condition monitoring techniques. As an alternative means to deliver spatial information on structural integrity, the feasibility of integrating non destructive evaluation (NDE) techniques with machine learning algorithms, on observing the degradation process of UST, so as to enhance condition monitoring competency, is discussed.

8.Bozena Kukfisz ET.AL [8]

Many countries lack clear legal requirements on the distance between buildings and petrol station facilities. The regulations in force directly determine the petrol station facilities' required distance to buildings, and such distances are considered relevant for newly designed and reconstructed buildings. Public buildings must be located no closer than 60 m to the above-ground liquefied gas tanks and liquid gas dispensers. Still, based on engineering calculations and the applied technical measures, it is possible to determine a safe distance for buildings that are constructed, extended and reconstructed, to which superstructures are added or whose utilisation method changes. The paper presents the results of calculations devoted to determining a safe distance between public buildings and LPG filling station facilities, using selected analytical models. The analyses were carried out for the LPG gas system commonly used in petrol stations, consisting of two gas storage tanks of 4.85 m³ capacity each, and a dispenser. It is legitimate to eliminate the obligation to observe the 60 m distance between LPG filling stations and public buildings and the mandatory distance of 60 m between liquefied gas dispensers and public buildings is not justified in light of the implemented requirements to use various protections at self-service liquefied gas filling stand.

9.Xiaotong Wang ET.AL [9]

Research on fuel cell hydrogen refueling stations is mostly concentrated on newly-built stations, and there are few studies on the combined hydrogen and CNG

refueling stations. The construction plan of combined hydrogen and CNG refueling stations is conducive to planning and layout, solving the difficulties in land use of hydrogen refueling stations, and reducing construction investment and operating costs. This paper analyzes the feasibility of the combined station construction, studies the construction plan and scale of the combined station, and proposes its general layout plan.

10.Venkata Laxmi K ET.AL [10]

A metro system is a railway transport system in an urban zone with a high limit, recurrence and the evaluation partition from other activity. Metro System is utilized as a part of urban communities, agglomerations, and metropolitan regions to transport huge quantities of individuals. A hoisted metro system is more favoured sort of metro system because of simplicity of development furthermore it makes urban regions more open with no development trouble. A metro system is a railway transport system in an urban area with a high capacity, frequency and the grade separation from other traffic. An elevated metro system is more preferred type of metro system due to ease of construction and also it makes urban areas more accessible without any construction difficulty. An elevated metro system has two major elements pier and box girder. The present study focuses on two major elements, pier and box girder, of an elevated metro structural system. Conventionally the pier of a metro bridge is designed using a force based approach. During a seismic loading, the behaviour of a single pier elevated bridge relies mostly on the ductility and the displacement capacity. It is important to check the ductility of such single piers. Force based methods do not explicitly check the displacement capacity during the design. The codes are now moving towards a performance-based (displacement-based) design approach, which consider the design as per the target performances at the design stage. Performance of a pier designed by a Direct Displacement Based Design is compared with that of a force-based designed one. The design of the pier is done by both force based seismic design method and direct displacement based seismic design method in the first part of the study.

11.Prabu. M ET.AL [11]

In this paper deals what are the problems occurring in high traffic intensity area in Trichy. The analysis

influences of traffic behavior of both the structural components of highway fly over bridge systems. Additionally, it is also demonstrated that beneficial effect on the superstructure response and sometimes produce detrimental effects on the system behavior and is dependent on the characteristics of the high traffic intensity. Here I consider the place of Trichy to Chennai Highway because there are a more traffic problems in peak hours. It is an overpass and underpass together form a grade separation. Stack interchanges are made up of many over passes. A Pedestrians safe crossing over busy road without impacting traffic. The present flyover bridge is designed to connect the two roads. However, in-situ bridge traffic monitoring is still one of the rugged works for researchers in their field applications. Carry out the preliminary survey for the various alignment and finalize the optimistic alignment based an Engineering and economic aspect. Prepare alignment plans, longitudinal sections and cross sections with reference to latest IRC specification and current international best practices for these IRC specifications and current international best practices for these types of works. Finally detailed design should be prepared and it will be ensure that which is stable for all type of environmental condition.

CONCLUSION

Design validation using STAAD Pro V8i: STAAD Pro V8i is a widely used structural analysis and design software. By utilizing this software, you can analyze the structural elements such as columns and beams in accordance with standard guidelines. Performing the necessary checks and calculations using STAAD Pro V8i can help ensure that the design meets safety requirements and is structurally sound.

This study creates an opportunity to conduct a comprehensive feasibility study, involving experts in architecture, engineering, regulatory compliance, and the fuel industry, to assess the viability of an elevated fuel station in your specific location.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

REFERENCES

- [1] International Journal of Innovative Research in Science, Engineering and Technology An ISO 3297: 2007 Certified Organization Volume 6, Special Issue 1, January 2017
- [2] Marve, S. R., Chalkhure, A. N., Jumde, S. R., Murlidhar, R., Khobragade, A. G. C., & Thakre, S. M. (2020). Design & Analysis of Multi-Storied Car Parking Building (G+ 2).
- [3] International Conference on Recent Trends in Engineering and Science (ICRTES 2017) 20th -21st January 2017
- [4] International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET) | e-ISSN: 2319-8753, p-ISSN: 2320-6710| www.ijirset.com | Impact Factor: 7.089| ||Volume 9, Issue 4, April 2020||

IS Codes:-

- [1] SP : 7 - National Building Code.
- [2] IS 456:2000-Design of reinforced structures.
- [3] IS 875 Part 1: Dead load considerations.
- [4] Part 2: Live load considerations.
- [5] Part 3: Wind load consideration.
- [6] IS 1893:2002- Earthquake effects.
- [7] SP: 16 - Design aid for reinforced concrete to IS 456.
- [8] IS 10987:1992 Code of practice for Design, Testing & Installation, Of Underground/Above Ground Horizontal Cylindrical Steel Storage Tank For Petroleum Product.
- [9] Amendments in Model Building Bye - Laws (MBBL - 2016) for Electric Vehicle Charging Infrastructure.