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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.

KEYWORDS: Planning, Designing, Analysis, Elevated Fuel, Gas &Electric Station

1. INTRODUCTION

India is one of the fastest growing economies in the world and has a huge demand for energy. According to the Ministry of Petroleum and Natural Gas, India's gas demand is expected to almost double to reach 115 billion cubic meters (BCM) by 2030 and 170 BCM by 2050. However, India's domestic gas production is not sufficient to meet this demand and the country relies heavily on imports of liquefied natural gas (LNG) and compressed natural gas (CNG). Moreover, India's gas infrastructure is inadequate and unevenly distributed across the country, resulting in high transportation costs and low accessibility for consumers. 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 Gas stations that use elevated fuel tanks instead of underground or surface tanks. Elevated fuel tanks are cylindrical containers that are mounted on steel structures above the ground level. They have several advantages over conventional tanks, such as reduced land use, increased safety, improved efficiency, etc. 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**

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.

2. RESEARCH BACKGROUND

2.1. Bridge Design

Bridge design in India is a challenging and complex task that requires a comprehensive set of engineering consultancy services. Bridge design in India is a dynamic and evolving field that requires constant innovation and adaptation to meet the changing needs and demands of the society. Bridge design in India is also influenced by the cultural and environmental factors that shape the landscape and identity of the country.

After the approval of the design, the final design work can begin with rigorous calculations of forces, stresses etc. for all kinds of loads or attacks and then the structural detailing has to be done. The scaffolding and equipment, which will be needed for the construction of the particular type of bridge, also has to be worked out. Numerous drawings and tables with thousands of numbers and figures for all dimensions, sizes and levels must be made with specifications for the required type and quality of the building materials. This phase entails the greatest amount of work for the bridge engineer, and calls for considerable knowledge and skill.

Fig. 1 Double Decker Bridge

2.1. Fuel/Gas/Electric Station Design

Here we see the standard design of petrol Pump as per rules regulations, by Laws, etc. which is mandatory for designing of fuel station. Apart from that also location is very important and plot size as per capacity of fuel station.

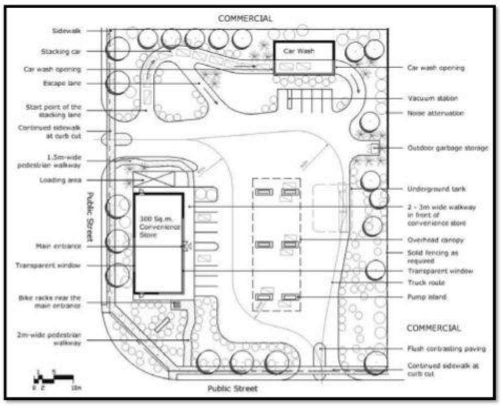

Fig. 2 Standard Plan Of Petrol Pump

3. METHODS FOR ELEVATED FUEL, GAS & ELECTRIC STATION

3.1 Plan Design & Analysis of Elevated Station

Structural design is the methodical investigation of the stability, strength and rigidity of structures. The basic objective in structural analysis and design is to produce a structure capable of resisting all applied loads without failure during its intended life. The primary purpose of a structure is to transmit or support loads. A structural design project may be divided into three phases, i.e., planning, design and construction.

The structural design of any structure first involves establishing the loading and other design conditions, which must be supported by the structure and therefore must be considered in its design. This is followed by the analysis and computation of internal gross forces, (i.e., thrust, shear, bending moments and twisting moments), as well as stress intensities, strain, deflection and reactions produced by loads, changes in temperature, shrinkage, creep and other design conditions. Finally comes the proportioning and selection of materials for the members and connections to respond adequately to the effects produced by the design conditions.

As we see that there is lots of parking plaza's in our country where we park our vehicles (Light & Heavy)

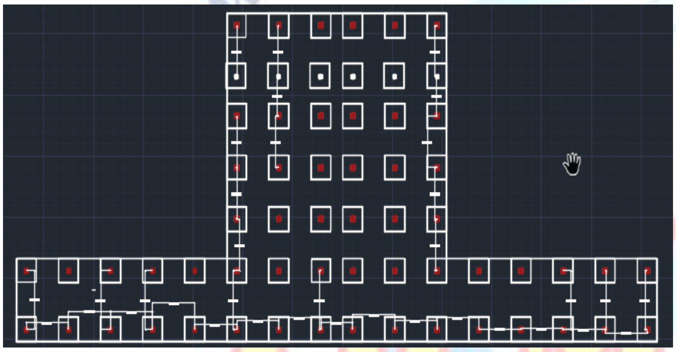

Fig. 3.1 Foundation Plan

Figure 3.1 depicts the schematic columnar and footing layout of the elevated station on ground following the columnar grid of 6600 and 7500 mm to create the extended bay which will be utilized for the station.

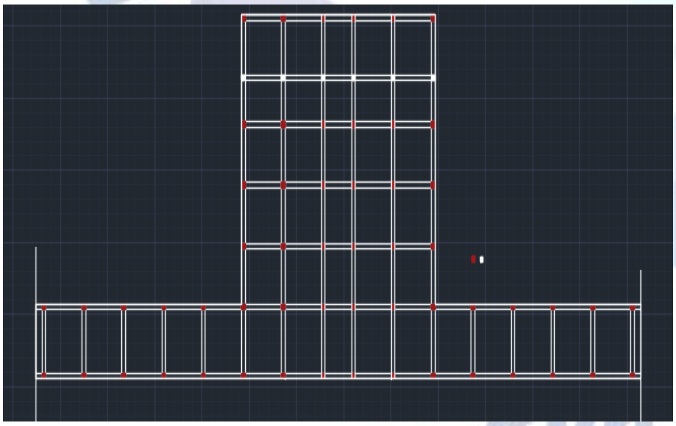

Fig. 3.2 Beam Plan

Figure 3.2 depicts the schematic beam of the proposed schematic elevated station

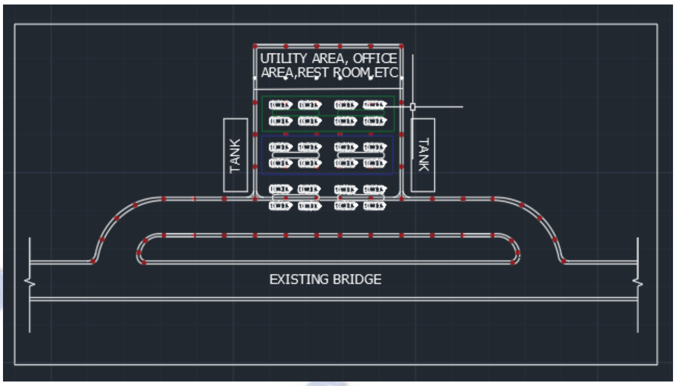

Fig. 3.3 Elevated Fuel Station Plan

Figure 3.3 depicts the schematic layout of the fueling station and other infrastructure with suggestive turning radius and other guidelines.

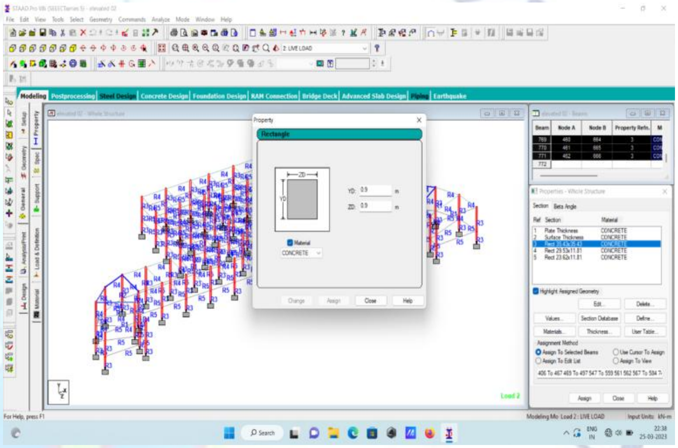

Fig. 3.4 Design For Column

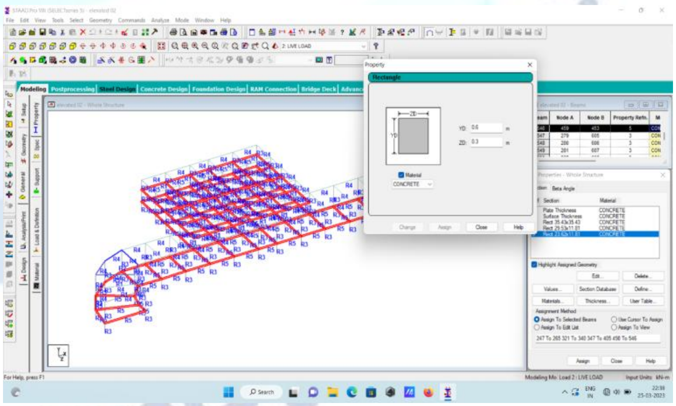

Fig. 3.5 Design For Plinth Beam

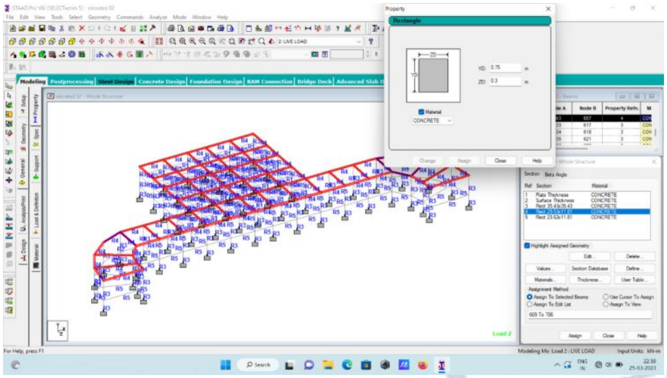

Fig. 3.6. Design For Floor Beam

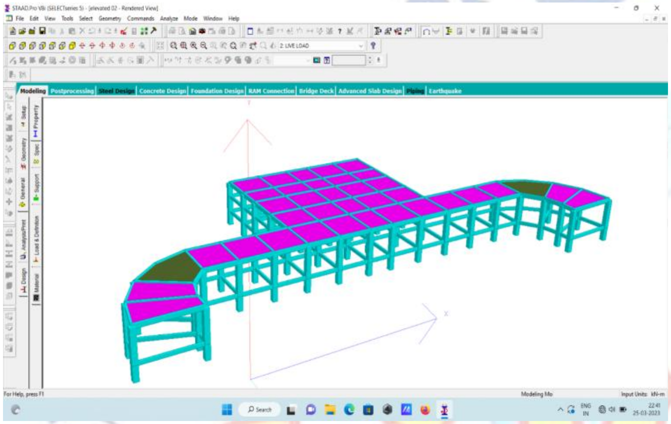

Fig 3.4 3D Plan For Column, Beam And Slab

Figures 3.3.6 describes the structural analysis simulated for the proposed layout of the elevated fuel station to the existing bridges infrastructure. The simulation is done via Staad Pro to check the design intervensions and the feasibility of the proposed schematic.

4. RESULTS AND DISCUSSION

Elevated fuel stations are designed to reduce the risk of fire and explosion in case of a spill or leak, as well as to save space and improve accessibility. The main components of an elevated fuel station are a steel platform, a fuel dispenser, a storage tank, and a piping system.

The performance of the elevated fuel station was evaluated in terms of safety, efficiency, and environmental impact. The safety analysis considered the potential hazards of fire, explosion, and structural failure. The efficiency analysis compared the fuel consumption and cost of the elevated fuel station with a conventional one. The environmental impact analysis assessed the emissions and noise levels of the elevated fuel station.

The results showed that the elevated fuel station had several advantages over the conventional one. The result and simulated analysis also show that the proposal can be construction with least interventions to the current existing bridges and flyovers infrastructures. The elevated fuel station had a lower probability of fire and explosion due to the increased distance from the ground and the use of fire-resistant materials. In theory, the elevated fuel station also had a higher fuel efficiency and lower operating cost due to the reduced pumping distance and pressure. The elevated fuel station had a lower environmental impact due to the lower emissions and noise levels.

The discussion and research highlighted the infrastructural possibilities and challenges and limitations of the elevated fuel station design. The main challenges were related to the structural stability, maintenance, and aesthetics of the elevated fuel station. The main limitations were related to the regulatory, technical, and social aspects of implementing the elevated fuel station concept.

This infrastructural intervention and proposal of Elevated fuel stations caters to many environmental and demographic constraints and many benefits such as Lower installation and maintenance costs, Better visibility and accessibility, Higher safety and environmental standards, etc.

5. Conclusions

This research to Elevated fuel stations validates the various aspects of a project or construction endeavor and feasibility factors such as:

Open tank: If local rules, regulations, and bylaws permit it, you may be allowed to construct an open tank that directly contacts the environment. However, it's important to adhere to any specific guidelines or requirements outlined by the relevant authorities to ensure compliance and safety.

Proposed plan and flyovers: It appear that you have attached a proposed plan to both existing and proposed flyovers. This could indicate that you are presenting or evaluating a plan for the construction or modification of flyovers. It's crucial to review the plan thoroughly and consider factors such as structural integrity, traffic flow, environmental impact, and any other relevant considerations.

Collaboration of different agencies: You mentioned collaborating three different agencies on a single platform. Collaborative efforts involving multiple agencies can help streamline processes, improve coordination, and enhance the overall efficiency of a project. By working together, the agencies can pool their resources, expertise, and knowledge to achieve common goals.

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.

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IS Code:

[5] SP : 7 - National Building Code.

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