WAYSDE AMENITY CENTRE

NH-48, DELHI- JAIPUR EXPRESSWAY, MANESAR (GURGAON), HARYANA

Thesis submitted in partial fulfilment of the requirements for the award of the degree of

BACHELORS OF ARCHITECTURE

By

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BHOPAL

DECLARATION

I **Mohak Anand**, Scholar No. **2015BARC024**, hereby declare that the thesis titled **Wayside Amenity Centre, Manesar,** submitted by me in partial fulfilment for the award of degree of Bachelor of Architecture at School of Planning and Architecture, Bhopal, India, is a record of bonafide work carried out by me. The design work presented and submitted herewith is my original work and I take sole responsibility for its authenticity. The matter/result embodied in this thesis has not been submitted to any other University or Institute for the award of any degree or diploma.

Mohak Anand 20.07.2020

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CERTIFICATE

This is to certify that student, **Mohak Anand, Scholar No. 2015BARC024,** has worked under my guidance in preparing this thesis titled '**Wayside Amenity Centre'.**

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ABSTRACT

Wayside Amenity Centres act as multipurpose facilities along the highways and district roads for the purpose of providing a safe stopping point with essential amenities to all highway commuters during their journey. These complexes are located at frequent intervals across major roadways, providing basic services, to ensure a safe and convenient journey for long-distance travellers. Presently, more than a thousand such amenities are proposed across the country. MoRTH along with the NHAI have called for a private participation on a franchise basis to develop many such establishments. Private land owners having sufficient land area can join hands with NHAI to develop wayside amenities as a franchise of the authority under the brand names 'Highway Village' and 'Highway Nest'.

Wayside Amenity Centres are envisaged as complexes providing a variety of services and suitable resting space to commuters with fuel stations being an integral part of the facilities. However, the amalgamation of several market and consumer trends is fundamentally changing the fuel retail industry around the globe and placing additional pressure on profitability and relevance of fuel stations altogether. The next decade will observe dramatic changes in the fuel retail industry as a result of the emergence of alternative fuel types, advanced mobility models, improving technology, added regulatory and competitive pressures, evolving market trends and increasingly complex product patterns. The pace of change will continue to accelerate and strain legacy processes, systems, knowledge, and skills.

Inferences derived from the live and secondary case studies theorize key takeaways and fallacies for the comprehensive design of a fully equipped Wayside Amenities Centre and concludes that factors such as new adjacent value pools, improved services and consumer experience seem to have a highly proportional relationship to the success of a transformed and enhanced fuel station.

This thesis project puts forth a proposal for a fully functional Wayside Amenity Centre in sync with the local context, site and climatic conditions of the region with an efficient network of services keeping in mind the various functional provisions proposed on-site to serve all travellers on the Delhi-Jaipur Expressway and inhabitants in the neighbouring region of Manesar.

A comprehensive, functional and logical design is aimed at by analysing all the key parameters through the live and literature case studies of similar kind. The thesis report showcases the detailed design methodology from site selection to the final design proposal for the commercial project.

Keywords: Wayside Amenity Centre, Fuel Station, Highways, Services, Travellers, Design Scheme

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1. INTRODUCTION

1.1 Project Background

Wayside Amenity Centres are envisaged as complexes on National or State Highways and other district roads, providing a variety of services. These complexes are located at frequent intervals across major roadways, providing basic services and amenities, to ensure safe and convenient journey for long-distance travellers, such as ample parking space (separately for cars, buses & trucks), restaurants or food court, low-cost dhabas, telephone booths, ATMs, fuel stations, minor repair shops, hygienic washrooms, motels for short stay, village haats, wellness centres, medical stores, kiosks for sale of sundry items etc.

The provision of passenger oriented wayside amenities along major highway networks is essential as both the passengers and drivers require basic wayside utilities to make their travel safe, comfortable and convenient in order to reduce fatigue in a long-distance journey. There is a significant shortage of organised wayside amenities on major roadways which connect destinations, especially of tourism importance. There is a need to curb the demand for wayside amenities by tourists and other passengers.

1.2 Project Brief

The project includes proposals for restaurants and a food court, retail outlets with a wider range of offerings including hotel accommodation, drivers rest area and a fuel station – a multipurpose attraction offering a wide range of products and services in one convenient location. The intervention will impact all travellers on the Delhi-Jaipur Expressway and a population of nearly 25000 people in the neighbouring town of Manesar.

Proposed Functional Provisions:

- Restaurants and Food Court
- Retail Outlets
- Hotel Accommodation
- Drivers' Rest Area and Dhaba
- Fuel Station
- Public Washrooms
- Kiosks for sale of sundry items
- Wellness Centre
- Medical Store
- Car and Bus Parking
- EV Charging Stations
- Automobile Repair Shop

1.3 Rationale

Wayside Amenity Centres act as multipurpose facilities along the highways and district roads for the purpose of providing a safe stopping point with essential amenities to all highway commuters such as car/bus passengers and truckers during their journey, encouraging frequent breaks during the journey to reduce driver-fatigue related accidents, provide employment opportunities to local artisans and craftsmen to showcase their offerings and a safe location for truckers and passengers to park their vehicles and spend the night to reduce incidents of theft and robbery.

Presently, more than a thousand such amenities are proposed across the country at an interval of 50 kms on national highways. MoRTH along with the NHAI have called for a Public-Private Partnership to develop many such establishments. Private land owners having sufficient land area can join hands with NHAI to develop wayside amenities as a franchise of the authority under the brand names 'Highway Village' and 'Highway Nest'. (Highways M. o., Highway Village and Highway Nest, 2017)

The amalgamation of several market and consumer trends is fundamentally changing the fuel retail industry around the globe and placing additional pressure on profitability and relevance of fuel stations altogether. A convergence of alternative fuel types (especially electric vehicles), advanced mobility models, changing technology, increased regulatory and competitive pressures, disruptive market dynamics, and emerging consumer trends will bring dramatic change to the fuel retail industry over the next decade. The ongoing shifts will alter the contours of competitive advantage in the industry with fuel stations ultimately needing a transformation in their conventional business model.

Fuel retailers must develop a comprehensive response that adjusts the products and services they sell, adapts their network and business model, alters the layout and design of their fuel stations and convenience stores, and harnesses new digital tools. Therefore, this thesis aims to strategically provide a shift from a vehicle-centric operating model to a consumer-centric one, which means focusing on addressing the needs of the customers in an end-to-end fashion, by offering new product and service opportunities for the fuel station, designed to be a part of the multipurpose facility.

1.4 Aim

To design a fully functional Wayside Amenity Centre to serve all travellers on the Delhi-Jaipur Expressway and inhabitants in the neighbouring regions of Pachgaon and IMT, Manesar while complying with all spatial, technical and functional requirements, zoning regulations and building bye-laws.

1.5 Objectives

- The complex is intended to act as a support infrastructure to facilitate larger tourist segment moving across the road network, even for lesser known locations or destinations.
- The project aims to reduce the incidence of accidents and improve road safety, by providing drivers, especially truckers, a comfortable place to rest.
- The facility will potentially give an impetus to economic activities, including trade and employment.
- The project with a wide range of offerings is envisaged to provide new products and service opportunities to the fuel station, designed to be a part of the Wayside Amenity Centre, in lieu of changing trends in the fuel retail and automobile industry.
- The complex space is envisioned to be in sync with the local context, site and climatic conditions of the region with an efficient network of services keeping in mind the various functional provisions proposed on-site.

1.6 Methodology

1. Justifying the scope and purpose of the thesis topic based on the background study.
2. Selection of the project which fulfils the enlisted scope and functions. Studying and understanding the selected project, and enlisting the requirements.
3. **Site Study:** Documentation of site (detailed study of existing site conditions, geographical, natural and historical patterns, physical and social patterns, pedestrian and vehicular patterns, and site potentials along with constraints relative to the thesis project).
4. **Site Analysis:** Conducting a detailed study of the selected site to determine climatic conditions favourable to the site such as wind direction, temperature, rainfall pattern, possible design features that can be accommodated etc.
5. Compilation of data obtained from the site study and tabulating them.
6. Selection of live and literature case studies of buildings or projects with similar functions to extract the general idea of the thesis project.
7. **Live and Literature Case Studies**: Critical study of the buildings/projects and its various aspects. Understanding the various features implemented and critically analysing them. Conducting a survey or interviews with the user, owner and designer to understand

their perspectives. This provides a practical insight into the requirements of the project and needs of the potential owners, administrators and users of the building.

8. Conducting a detailed literature study of the topic to understand the basic features and details that are required while designing the built structure.
9. Studying bye-laws, other rules and regulations that have been set by competent authorities, or are specifically mentioned in the building standards pertaining to the project.
10. Compilation of additionally acquired data with previously obtained information to form a clear picture of the project in order to achieve the desired outcome.
11. Based on the compilation, framing the final design problem by defining the purpose, scope, requirements and other necessary aspects of the project.
12. **Concept Development Stage:** A concept is derived based on the overall understanding of the project.
13. **Design Development Stage:** The design is evolved based on the concept and the requirements of the project.
14. Reviewing at regular intervals if the work is progressing in the desired manner.
15. **Final Design Proposal:** Final design is produced with architectural plans, elevations, sections, 3-D views etc, to give a better understanding of the project.

2 LITERATURE REVIEW

2.1 MoRTH Policy for the Development of Wayside Amenity Centres

As per the nineteenth report of The Committee on Public Undertakings 2017-18 and information submitted by the National Highway Authority of India (NHAI), Ministry of Road Transport and Highways has planned to develop wayside amenities along national highways across India and asked NHAI to develop comprehensive wayside amenities for all kinds of passengers. These stopovers will provide suitable facilities for stop and rest across the highways network at an interval of 50 km along national highways on a sustainable economic model, taking into account the socio-economic profile of the respective regions. The project is planned to be developed on a Public Private Partnership (PPP) Model. (Tourism, 2017)

Under the brand name 'Highway Village,' facilities with an area of more than 5 acres will be developed and facilities with a smaller area of less than 5 acres will be developed under the brand name 'Highway Nest.' Accordingly, over one thousand such amenities would be developed nationally. NHAI has called for a public private participation wherein private landowners with an adequate land area can join forces with NHAI to establish highway amenities as a franchise of the authority. (Highways M. o., 2017)

Land availability with NHAI is constrained and collaboration with private land owners shall save public money needed for land acquisition along with providing livelihood to farmers. A ‘Franchise Model’ (as Operating Model) shall be the preferred model for the establishment of a wayside amenity centre by private land owners with NHAI responsible for overseeing the development. Consequently, NHAI has developed three customizable prototypes for the same with fuel stations being an integral part of each multipurpose facility. (Government M. , 2016)

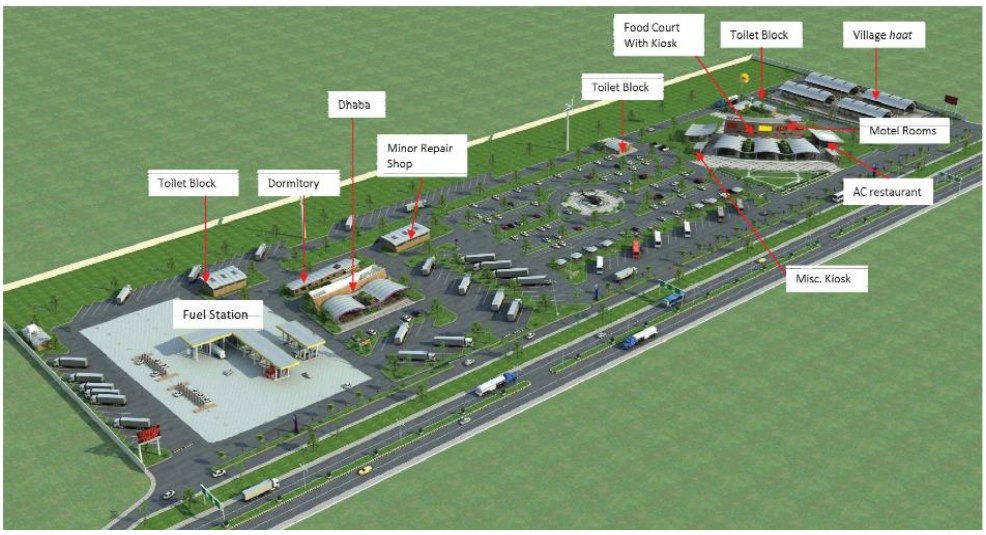


Figure 2.1: Comprehensive Facility for Cars, Buses and Trucks (Source: MoRTH)

Figure 2.2 (left): Prototype Facility for Truckers only (Source: MoRTH)

Figure 2.3: Prototype Facility for Car Passengers only (Source: MoRTH)

Criteria for location for the same shall be governed by the following factors:

- One franchise to be awarded every 40 kms.
- Minimum 5 kms away from any toll plaza to avoid congestion on highways.
- Minimum 5 kms outside the municipal limits to avoid congestion within the cities.

2.2 A Paradigm Shift in the Industry Dynamics of Fuel Retail

The days of a fuel station's role as a convenient fuel stop are numbered. An array of far-reaching trends is disrupting the fuel retail market. Changing market scenarios, shifting competitive dynamics, alternative types of fuel and evolving consumer expectations entail that oil marketing companies and fuel retailers are under pressure to reinvent the traditional fuel station as part of their overall business transformation. (Deepak Nagpal, 2019). Electric propulsion is on track to replace liquid fossil fuels rapidly. Fuel stations of today shall soon be redundant spaces for fuelling and servicing while the induction of the Smart City Grid in cities will enable an extensive distribution of charging electricity to the consumers.

The current trends will alter the contours of competitive advantage in fuel retail and require a major restructuring of the traditional business model. Fuel retailers should, therefore, formulate a comprehensive response by modifying the products and services they offer, develop their existing business model, alter the conventional design and format of fuel stations and stores, while harnessing new digital technologies. (Mirko Rubeis, 2019)

Consumers, in today's modern world, are spoilt for choice with a wide range of options at their disposal, that has brought a major change in their attitudes and lifestyles choices. They are always on the lookout for the best value for their money coupled with a seamless shopping experience. Convenience, location, price or customer experience, all compete to affect their purchasing power. And in an automated, digital future where even the driver may not be behind the wheel, there is an imperative to modernize. (Deepak Nagpal, 2019)

2.3 The Indian Scenario

Policymakers and the government have a huge task ahead of them as they push for installation of charging infrastructure at filling stations around the country. The policy think tank of the Government of India, Niti Aayog, is working closely with the Oil Ministry with an agenda to set up 1,000 charging stations at fuel stations alone on a Quick-Pilot Basis in a few metropolitan cities in India. By making substantial proposals for subsidies, the government has formulated schemes that will make it easier to establish 5,000 electric charging stations in cities and highways. This pilot electrical infrastructure deployment program aims to achieve India 's target of transitioning the existing fleet to electric vehicles by approximately 40 percent.

Figure 2.4 (left): Tata Power installed first set of Charging Stations in Mumbai (Source: Tata Power)

Figure 2.5: Shared Mobility Service, Ola, using a Charging Station at a HP Filling Station (Source: HP OMC)

As part of the national priority for the rollout of Electric Vehicles (EV) Public Charging Infrastructure, a list of Mega-Cities has been formalized, as per Census 2011, for the first phase of deployment of EV charging stations for the initial three years till 2022. The list of Mega-Cities include Delhi, Ahmedabad, Bangalore, Chennai, Mumbai, Hyderabad, Surat, Pune and Kolkata including existing expressways and other important highways connected to each of them. (Bisht, 2018) The idea is to establish atleast one charging station in cities at every 3 km radius and on both sides of the highways at every 25 km.

The Niti Aayog proposal calls for complete conversion of the traditional three-wheelers internal combustion engine (ICE) to EVs by 2023, and two-wheelers (for engines with or below 150 cc capacity) by 2025. (Singh, 2019)

An amount of ₹10,000 crore has been allocated for the first phase of Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) scheme. (Ghosh, 2019). The main focus of this scheme is the laying of EV charging infrastructure and electrification of public and shared transportation. The Union budget has also presented citizens with tremendous

opportunities and incentives to purchase electric cars that will essentially reduce the cost of ownership of electric vehicles as opposed to petrol and diesel vehicles.

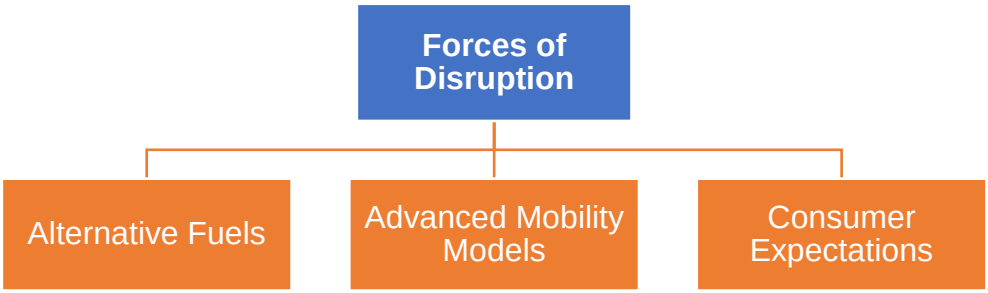
2.4 Design Constraints at a Fuel Station

Executives of Oil Marketing Companies (OMCs) express strong disapproval towards the idea of incorporating charging stations at fuel stations as long charging time and scarcity of space at filling stations is a deterrent to the entire proposition. The existing design of a typical fuel station in India is such that cars arrive from one end, receive fuel from dispensers within a matter of minutes and exit from another end of the fuel station. Replacing any one of these dispensers with a charging station or providing a separate premise within the bounds of the fuel station for the same would hamper the free flow of vehicular traffic and result in long queues to receive the desired services as charging EVs takes longer than fuelling vehicles with fossil fuels. This would bring inconvenience to the customers and slow down business.
Longer charging time would mean fewer customers serviced in a day at filling stations. Also, initially, there will be fewer EV customers. (Choudhary, 2019)

The development of charging stations at petrol pumps may be successful intermediate steps towards popularizing EVs, although charging points would proliferate after a while to virtually all locations that can support a car or a bike. Consumers will be able to charge their vehicles in parking lots, inside their homes and offices, or anyplace their vehicles could be parked idle for long durations of time. Eventually, only commercial car owners or those traveling long distances will go to filling stations to charge their vehicles or change car batteries, posing a substitution threat to fuel stations.
Thus, it is imperative that OMCs and fuel retailers consider venturing into EV charging strategically in order to effectively transform their existing business model and adapt with changing trends in the fuel industry as making minor tweaks in the current design module of fuel stations will clearly not suffice.

Through extensive reading and analysis of literature pertaining to the impact of transition in the fuel retail and automobile industry on the design of Wayside Amenity Centres, a few trends and points of importance were observed. The claims in literature present are supported with evidence and factual data corroboration. The legitimacy has been scrutinised through collecting qualitative data by conducting interviews through questionnaires of all involved and affected members of this discussion.

2.5 Forces of Disruption



2.5.1 The Rise of Alternative Fuels

The rise of electricity and other alternative fuels is caused by two factors. One is the enforcement of policies and regulations designed to limit fossil fuel emissions. This will increase the demand of EVs, hybrid and hydrogen-fuelled vehicles substantially. Technological advancements being the second. With battery costs going down and power being a cheaper alternative, equipment manufacturers are investing heavily in EVs. By 2030, more than a third of the entire fleet around the world will be fully electric. (Mirko Rubeis, 2019)

2.5.2 The Take-off of Advanced Mobility Models

Ride-hailing services like Uber, Ola, etc., have started to decrease the ownership aspirations of younger generations in the age of shared mobility.

The growth of these services shall be more rampant as Autonomous Vehicles (AVs) or driverless cars replace human drivers making shared mobility even cheaper and a desirable substitute amongst the generations to come. The result will be a decline in customer traffic at fuel stations and, lower fuel and convenience store sales. (Ben Carey, 2011)

2.5.3 The Evolution of Consumer Expectations

Retail customers and shoppers at convenience stores have become extremely demanding in general. They are always looking for high-quality, fresh and healthy food on the go, value for money, attractive store formats and a range of options. Among other trends disrupting the industry of fuel retail, heightened consumer expectations around personalization and convenience for a wide range of services and products to guarantee them a seamless digital and unique shopping experience, is at an all-time high. (Mirko Rubeis, 2019)

2.6 Market Environment Scenarios

The four underlying environments can be an illustration of the future, assist fuel retailers in recognizing signs of change in the market dynamics and assessing the effects on their respective sectors. However, conditions may continue to develop over time, leading to potential variability and inconstancy, and increase the likelihood of multiple scenarios existing in various geographies simultaneously. Hence, these are not end state scenarios.

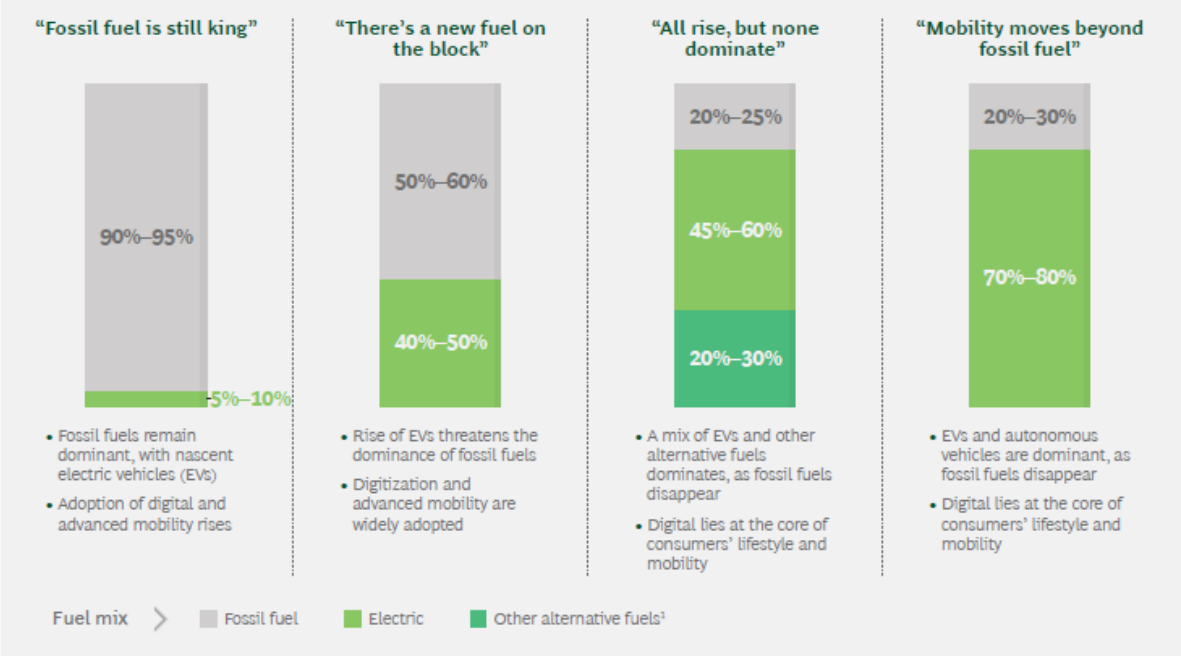


Figure 2.6: Four Different Market Scenarios are plausible. (Source: BCG Analysis)

The influence of all potential market environments scenarios indicates the harsh reality that traditional sources of revenue will evaporate. (Mirko Rubeis, 2019)

Fuel retailers must proceed strategically with utmost caution to ensure their operations remain productive and profitable, and that fuel stations survive this changing trend.

2.7 Adaptive Measures

2.7.1 Guide the Transformation of The Convenience Store

The demand of consumers for comfort, speed and quality food is increasing, and the convenience store format is capable of change. Across urban areas, convenience stores should consider changing to neighbourhood retail outlets that sell a range of high-quality products (and services) versus the typical restricted goods and commodities, and often an unpleasant experience. Fewer changes are required in the formats of a conventional convenience stores across highways that offer food on the go and rest areas for travellers.

Fuel retailers should also explore the unmanned store model to save money while providing a simple, seamless, digital experience for customers. They could offer their customers a variety of delivery models, such as click-and-collect and home delivery - a standard option these days in every retail experience. Fuelling heightened customer expectations through personalization and convenience is key. (Ben Carey, 2011)

Figure 2.7 (left): A typical Convenience Store by Shell India (Source: Shell India)
Figure 2.8: Flipkart to replace 40% of its Last-Mile Delivery fleet with EVs. (Source: Flipkart)

2.7.2 Become A Player in Last-Mile Delivery

The fuel retailers will participate in most stages of logistics and the shipment supply chain of parcels in urban areas, including warehousing (collecting and sorting) and distribution at the last mile. The close proximity of urban districts and the thousands of customers living there can make fuel stations, especially those part of Wayside Amenity Centres, an attractive location for micro warehouse spaces. Huge square footage of area in prime locations will come in handy as the need for last-minute delivery escalates in the era of internet shopping, creating an opening for retailers to make better use of underutilized spaces with fuel related products and services, and push less efficient convenience stores out of the way. (Ben Carey, 2011)

2.7.3 Making Most of the Prime Piece of Real Estate

The ultimate aim should be to create an environment in which customers visit fuel stations because they want to, not because they need to. (Mirko Rubeis, 2019)

Retailers must consider the possibility of upgrading the range of offerings at their fuel station - transform from an automotive cum utility-oriented facility to a multipurpose attraction that offers a wide range of services and products in one convenient location. As service-providers, the spectrum of possible amenities is endless, from a hotel or common office space to medical centres, wellness centres or perhaps laundry, dry cleaning, etc.

2.7.4 Invest in Charging Infrastructure and Advanced Mobility

This can allow them to draw traffic to the fuel station and partially make up for lost ICE customers, even if some EV owners charge their vehicles at home, work or other locations.

In some market's electricity charging can be enticing, but retailers should take into account possible difficulties to ensure a good return on their investments. (Mirko Rubeis, 2019)

Figure 2.9 (left): First ever Charging Station installed at any Fuel Station, at IOC Nagpur. (Source: IOC OMC)
Figure 2.10: Huge premises of Filling Stations at prime locations. (Source: IOC OMC)

2.7.5 Improve Existing Offerings and Push into Adjacent Value Pools

Adjacent Value Pools refer to segments that are new, but related to their core business. The dealers are primarily involved in the fuelling and repairing of cars. They also run their convenience stores to sell snacks, cosmetics and other items to customers. While the non-fuel revenue (NFR) accounts for a significant proportion of profited sales, it still exceeds the fuel related income for many retailers.

Usually, the services at any filling station are oriented towards the automobile, not the individuals driving them. Fuel retailers should shift from a vehicle-centric approach to consumer-centric one, ensuring that consumers are catered to in a holistic and comprehensive manner.

2.7.6 Enhance the Customer Fuelling Experience

The goal should be to build the customer experience through a smooth and engaging digitisation of the whole journey - from information about promotional transactions while the customer is on his way to the site, to easy mobile payment support. It is important to keep up with the evolving consumer expectations, including generational shifts in attitudes and preferences. With more consumer-driven, experienced and culturally agile fuel retailers, the big modernized OMCs can generate additional revenue and growth. (Deepak Nagpal, 2019)

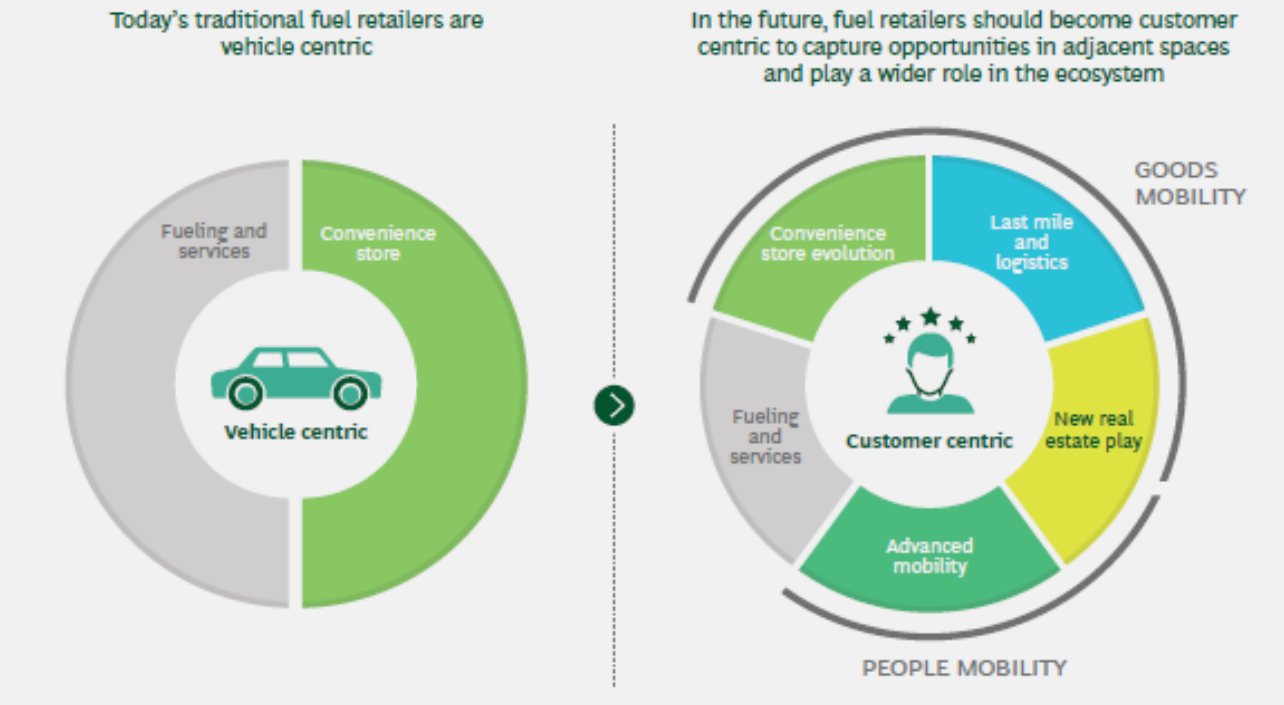


Figure 2.11: A Shift from a Vehicle Centric Approach to a Consumer Centric Approach. (Source: BCG Analysis)

The fuel retail industry has undergone a significant transition. The rise of alternative fuels and evolving consumer expectations are largely driven by the imbalances in supply and demand. This transition will fundamentally alter the norms and practices of the fuel retail industry, challenge retailers to attract and retain consumers and remain profitable while successfully adapting to the changing market dynamics.

There are apparent and serious long-term consequences for fuel retailers. There is no time to wait and see what's next. Fuel stations are ripe for change. They should now use digital technology extensively and expand into quickly growing new value pools. For markets where the changes are most drastic and severe, a complete restructuring of the fuel station and its surrounding architecture is essential.

The goal is to create a scenario in which consumers visit fuel stations because they want to, not because they need to. A fuel station needs to be able to do a much more in addition to fulfilling its basic utilitarian purpose.

3 SITE STUDY

3.1 Location

Manesar is a census town in Gurugram district of the state of Haryana, India, and is a part of the NCR of Delhi. Its proximity to the burgeoning city of Gurgaon has in recent years caused its character and demographics to change dramatically. It has many factories, offices, hotels, IT parks and educational institutes. There are several sightseeing spots around the area, some overlapping with Gurgaon. Manesar is 32 kilometers. from the Indira Gandhi International Airport and is located on National Highway 48, making it well connected with Delhi, Rewari, Dharuhera, Jaipur, Ahmedabad and Mumbai. (Desai, 2018)

The original Manesar village was a sleepy village of about 1000 dwellings on the Delhi-Jaipur highway, then numbered as NH-8. Since the late 1990s, it has transformed rapidly. Its growth has been helped by government's drive to move out factories from Delhi as well as the booming of Gurgaon city. Farmers have become millionaire or multi-millionaires by selling their lands. A majority of them are living upscale lives.

In order to meet the demands of foreign investors and also to set up high-tech non-polluting industrial units, the Haryana Government initially with the collaboration of Japanese entrepreneurs started setting up Industrial Model Township (IMT) at Manesar in 1992 through Haryana State Industrial Infrastructure Development Corporation. The said Corporation has developed about 700 hectares land at Manesar and now the developed land is being made available to all entrepreneurs of the world including India.

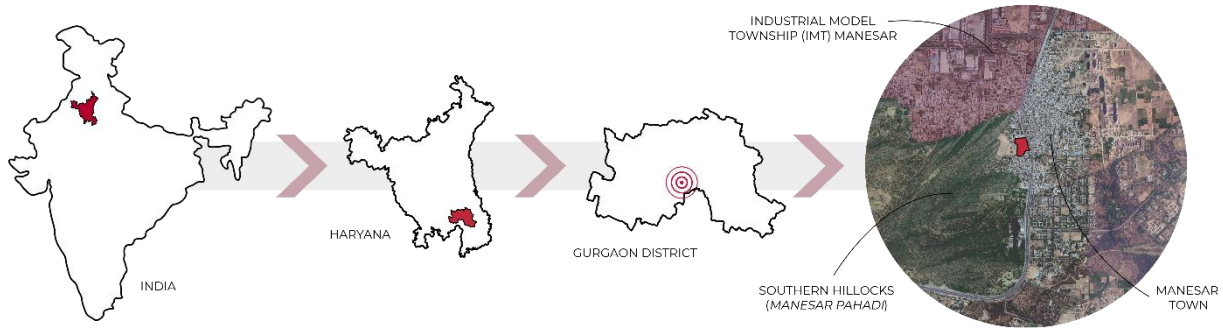


Figure 3.1: Site Location (Source: Author)

Site Location: NH-48, Delhi - Jaipur Expressway, Manesar (Gurgaon), Haryana

Site Coordinates: (Latitude: 28°21'2.58"N, Longitude: 76°56'17.13"E)

3.1.1 Site Justification

NH48 is a part of the 'Golden Quadrilateral', a National Highway network connecting the four major metro cities of India, viz., Delhi, Kolkata, Mumbai and Chennai. It is also part of the 'Golden Triangle', or the Tourist Circuit connecting Delhi, Agra and Jaipur. On an average, about 3,00,000 lakhs vehicles are entering and exiting Gurgaon, including NH48 expressway every day. The total daily traffic accounts about 3.8 lakhs PCUs. Maximum vehicles entering/exiting through NH48 (from Delhi side), followed by MG road and NH8 from Rewari/Jaipur side. (Planning, 2010)

Also, with the completion of the Kundli-Manesar-Palwal (KMP) expressway in November 2018, traffic along NH48 in Manesar is expected to increase proportionally with huge volumes of traffic already entering/exiting through NH48 from Rewari/Jaipur side. Along with the Eastern Peripheral Expressway, this Western Peripheral Expressway is expected to divert more than 50,000 heavy vehicles away from Delhi, completing the largest ring road around Delhi. However, there are no authorized Wayside Amenity Centres for a 65 kms stretch from Pachgaon to Delhi.

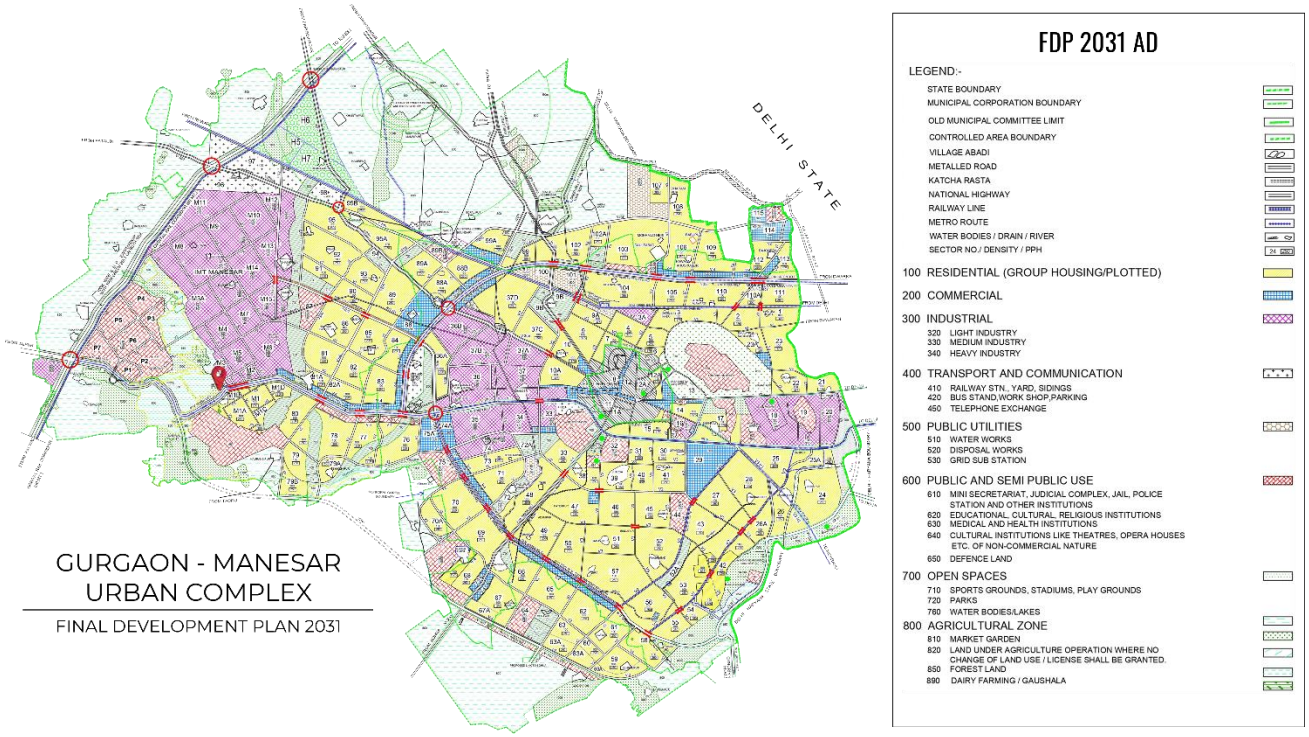


Figure 3.2: Gurgaon Manesar Urban Complex FDP 2031(Source: GMDA)

3.2 Site Details and Surroundings

- Area: 22123.75 sq. m. (5.46 Acres)
- Perimeter: 675.10 m.

Parameters	Commercial Premise	Fuel Station Premise
Area	16564.84 sqm. (4.09 Acres)	5558.44 sqm. (1.37 Acres)
Ground Coverage:	30%	20%
FAR	1.5	2

Figure 3.3: Site Plan and Surroundings (Source: Author)

- Width of Service Roads: 10 m (LHS) and 10.5 m (RHS)
- Width of abutting Arterial Roads: 10.5 m (3-lane LHS and RHS)
- Length of abutting Arterial Roads: 2807 kms (Delhi to Chennai)
- Ownership: Manesar Village Panchayat

3.3 Connectivity and Accessibility

The connectivity between Gurgaon and Manesar is critical as both the areas are expected to grow together. The three major roads connecting them are NH48, Khandsa road and Pataudi road. But currently, the connectivity is provided mainly by the expressway. NH48 is a dual carriageway type with three lanes on either side of the median strip or central reservation. The width of each carriageway is 10.5 meters with a total Right of Way of 23.5 meters.

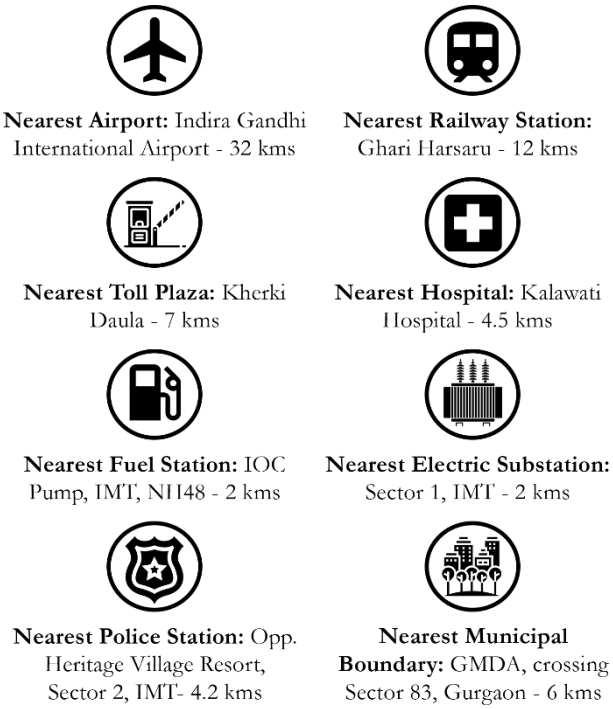


Figure 3.4: Site Proximity to Essential Services
(Source: Author)

The highway stretch in front of the site has adjoining service lanes on both sides with sufficient width to provide access for local traffic and thereby facilitating least interference to fast moving through traffic on the main road. The service lane (LHS) in front of the site is in a poor condition and exists as an unmetalled road but provides sufficient width to be treated as 'acceleration and deceleration lanes' with respect to the proposed functions on site. The site has village roads abutting it on two sides of non-uniform cross sections. The rural roads inside the deeper ends of the village are extremely narrow with inconsistent widths.

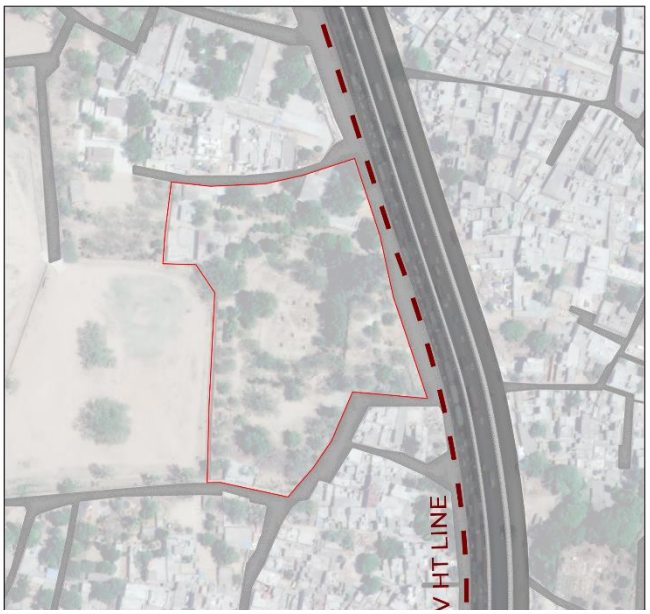


Figure 3.5: Road and Electric Transmission Network
(Source: Author)

Haryana Industrial Infrastructure Development Corporation is the nodal agency for development of Industrial Model Townships in the state of Haryana. HSIIDC also has the responsibility of providing the infrastructure facilities in these Industrial Townships and estates.

The electrical infrastructure is being operated and maintained by HVPNL / DHBVNL for the industrial areas depending upon the jurisdiction. The site has a 11kV High Tension (HT) Line

running along the length of the highway drawing power from the 66/11 kV substation in Sector 1, Manesar.

Substation and Electric Distribution Automation for the consumers of Manesar exists through the 11 kV distribution network being fed through 66/11 kV substations in various sectors of IMT and Old Manesar. Manesar draws electricity from substations located in Badshahpur. Presently, GUMC receives power from two main 400/220 kV substations namely Daultabad (945 MVA) & Secor-72 (630 MVA) with cumulative transformation capacity of 1575 MVA.

3.4 Context Study

Manesar census town is a densely populated and unplanned sub-district located in Gurgaon. Majority land parcels belong to the Gram Panchayat with unauthorized developments cropping up in various parts of this old sector. Total geographical area of Manesar census town is 15 km^2. Population density of the census town is 1595 persons per km^2. There is only one ward in this census town which is Manesar (154) Ward No 01 and the population of this ward is about 23,448 as per Census India 2011. There are 5074 households in Manesar and on an average, 5 persons live in each family. Population has increased by 52.3% in last 10 years.

Figure 3.6: Figure Ground Map (Source: Author)

3.4.1 Zoning Regulations and Building Bye-Laws

- **Wayside Amenity Centre**
  - **Ground Coverage and Floor Area Ratio (FAR):** The building or buildings shall be constructed only within the portion of the site marked and nowhere else. For the area earmarked as Flagship Retail Outlet i.e. the Commercial component, will have maximum ground coverage not exceeding 30% of the area and the maximum FAR shall not exceed 150%.

- **Basement:** In the area earmarked for the Flagship Retail Outlet, twin level basement within the building zone of the site will be permitted provided it flushes with the ground and is properly landscaped. The basement may in addition to parking could be utilized for the generator room, lift room, firefighting pumps, water reservoir, electric substation, air conditioning plants and toilets, if they satisfy the public health requirements and for no other purposes. Area under stilts (only for parking) and basement shall not be counted towards FAR. Basement shall not be used for storage purposes but will be used only for ancillary services of the main building and it is further stipulated that no other partitions of basement will be permissible for uses other than those specified above.
- **Height:** The height of the building block, subject of course to the provision of the site covers and FAR shall be governed as, the maximum height of the buildings used for the Flagship Retail Outlet in the area earmarked shall be 50 meters inclusive of parapet. Plinth height of the building shall be minimum of 46 cm above the center of the finished level of the road.
- **Boundary Wall:** The height as applied to a boundary wall shall mean the vertical measurement of the wall from the center of the finished level of the road to which the site has an access. Height of the boundary walls along the rear and side boundaries of the site shall be 1.8m from plinth.
- **Approach to Site:** Only one entry and one exit shall be permitted on site. The site shall have an approach through the Delhi-Jaipur Highway (NH48), as shown in the plan. No commercial built entity is allowed for 60m from the centre of the highway median as it is restricted solely for green belts and basic highway utilities.
- **Bar on Sub-Division of Site:** The site for the retail outlet shall not be sub-divided under any circumstances whatsoever.
- **Fire Safety Measures:** Setbacks of 6 meters will be left on all sides for fire tender movement. The provisions of proper fire safety will be conforming to the provisions of Rules 1965/NBC.
- **General:** The water storage tanks and other plumbing works etc. shall not be exposed to view each face of building but shall be suitably encased. No applied decoration like inscription, crosses, names of persons or buildings are permitted on any external face of the building. Sign Boards for entry and exit shall be displayed on the site as approved in the building plans.

  The sign boards shall be provided with proper lighting i.e. green light for Entry Board and red light for Exit Board. Garbage Collection Centre of appropriate size shall be provided within the site. No advertisement shall be permitted. (Government H. , 2017)

- **Fuel Station**
  - **Minimum Distance from the Road Intersections:**

    a) For minor roads having less than 30 m. R/W 50 m.

    b) For major roads having R/W 30 m. or more 100 m.
  - The minimum distance of the property line of pump from the center line of the road should not be less than 15 meters on roads having less than 30 m. R/W. In case of roads having 30 m. or more R/W, the R/W of the road should be protected.
  - **Plot Size:**

    a) Only filling stations 30 m. x 17 m. and small size 18 m. x 15 m. (for two and three wheelers)

    b) Filling-cum-service station minimum size 36 m. x 30 m. and maximum 45 m. x 33 m.

    c) Frontage of the plot should not be less than 30 m.

    d) Longer side of the plot should be the frontage.
  - **Other Controls:**

    a) Filling-cum-service station size (36 m. x 30 m.) and (45 m. x 33 m.)

    i) Ground coverage 20%

    ii) FAR: 2

    iii) Max. Height 6 m.

    iv) Canopy Equivalent to permissible ground coverage within setback line.

    v) Front Setback Min. 6 m. (Organization, 2016)

- **Access Permission to Fuel Stations, Private Properties, Rest Area Complexes and other such facilities along the National Highway**
  - In order to provide safe length for weaving of traffic, fuel stations along National Highways shall be located at the minimum distance from an intersection (gap in the central median be treated as intersection).
  - There shall not to any median gap on a divided carriageway within a distance of 300 m on each side of the fuel station. This minimum distance i.e. 300 m shall be measured between the start of the median gap and the nearest tangent point of access/egress road of the fuel station, as is applicable, in a direction parallel to the centre line of the nearest carriageway of the National Highway.
  - **Access for New Fuel Stations on Divided Carriageway Sections:** The access to the fuel station on divided carriageway sections of National Highways shall be through deceleration and acceleration lanes.

The deceleration lane would take off from the edge of the paved shoulder and taken upto the edge of ROW, from where the boundary of fuel station would start. its length would be 70 m, measured along the travel direction on the highway. The acceleration lane would be of 100 m length. Its starling stretches of 70 m length would be with a curvature of minimum radius of 650 m and the remaining 30 m tapered so as to facilitate vehicles coming out of fuel stations, merging with fast moving through traffic on main carriageway in a safe manner. The width of deceleration and acceleration lane shall be 5.5 m with shoulder of 2.25 m. The shoulder shall be provided towards the outer side of the access / egress.

- There would be buffer strip from the edge of the ROW and would extend minimum 3m Inside the fuel station plot. Its minimum length would be 12 m.
- **Drainage:** There shall be an adequate drainage system on the access to the fuel station aid inside its area so as to ensure that surface water does not flow over the highway or any water logging takes place. For this purpose, the fuel station and access area would be at the last 300 mm below the level at the edge of the shoulder on the highway. The surface water from the fuel station and access road would need to be collected in a suitable underground drainage system and led away to a natural course through the culvert.

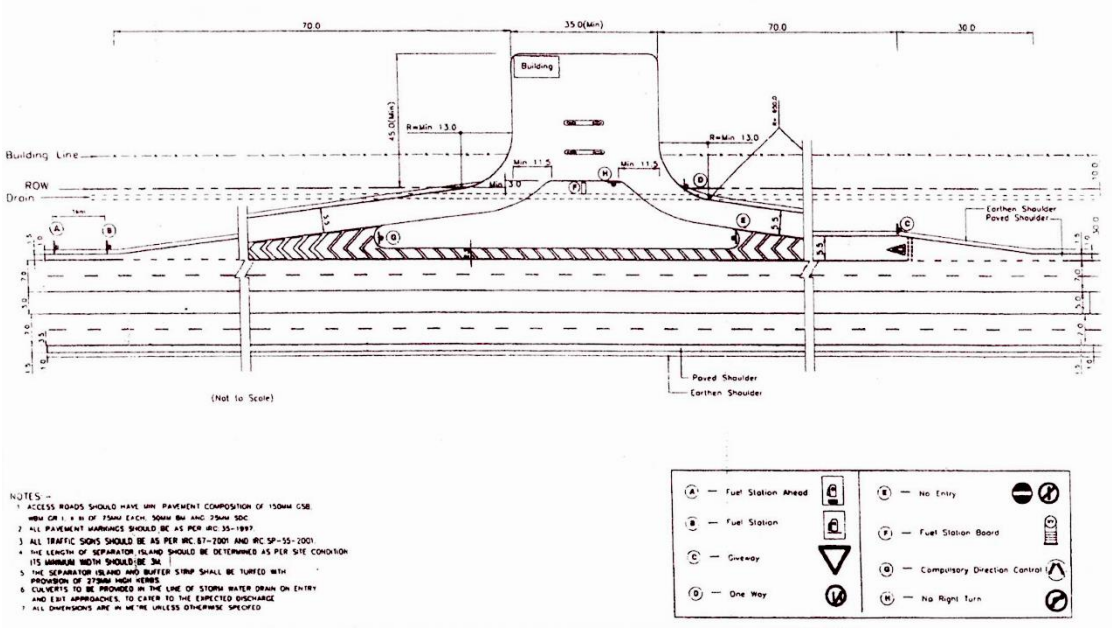
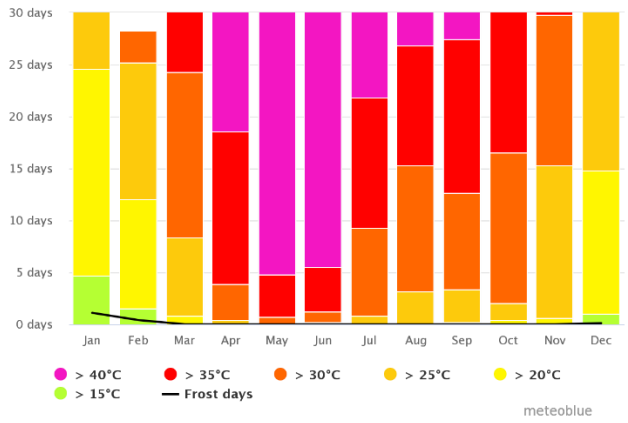


Figure 3.7: Access Permission to Fuel Stations, Private Properties, Rest Area Complexes and other such facilities along the National Highway. (Source: MoRTH)

- **Other Building Design Norms in accordance with specifications enlisted in the Haryana Building Code and National Building Code** (Standards, 2016)**,** including parking requirements, FAR inclusions and exemptions, Fire and Light Safety norms etc. (Refer Annexure I)

3.5 Climatic Data and Interpretation

The climate of Manesar can be classified as tropical steppe, semi-arid and hot which is mainly characterized by the extreme dryness of the air except during monsoon months, intensely hot summers and cold winters. During three months of south west monsoon from last week of June to September, the moist air of oceanic origin penetrates into the sub-district and causes high humidity, cloudiness and monsoon rainfall. The period from October to December constitutes post monsoon season. The cold weather season prevails from January to the beginning of March and followed by the hot weather or summer season which prevails upto the last week of June.



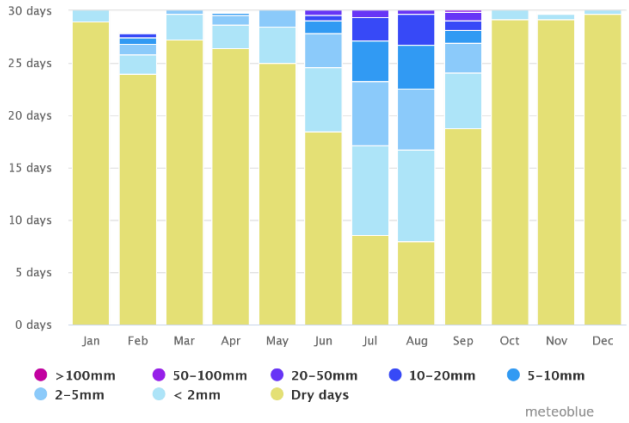
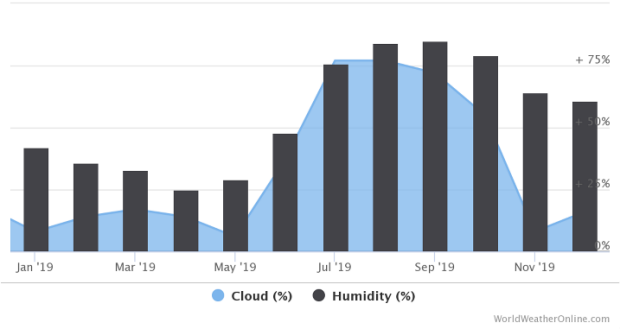


Figure 3.8 (left): Maximum Temperatures around the year (Source: Meteoblue)
Figure 3.9: Precipitation Levels throughout the year (Source: Meteoblue)

The region experiences hot summer and cold winter with dry air, except during the monsoon. About 77 per cent of annual rainfall in the region is received during the monsoon months. The mean daily maximum temperature is about 40-degree Celsius in the months of May and June. It may go up to 45 degrees Celsius or more in June. During winter the mean daily maximum temperature in January in 21 degrees Celsius and minimum is about 7 degrees Celsius.



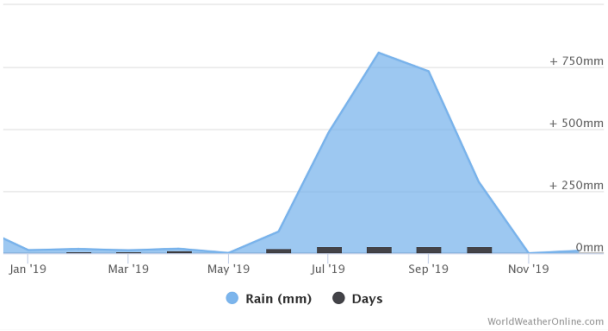


Figure 3.10 (left): Average Clouds and Humidity (Source: Meteoblue)
Figure 3.11: Average Rainfall Amount (Source: Meteoblue)

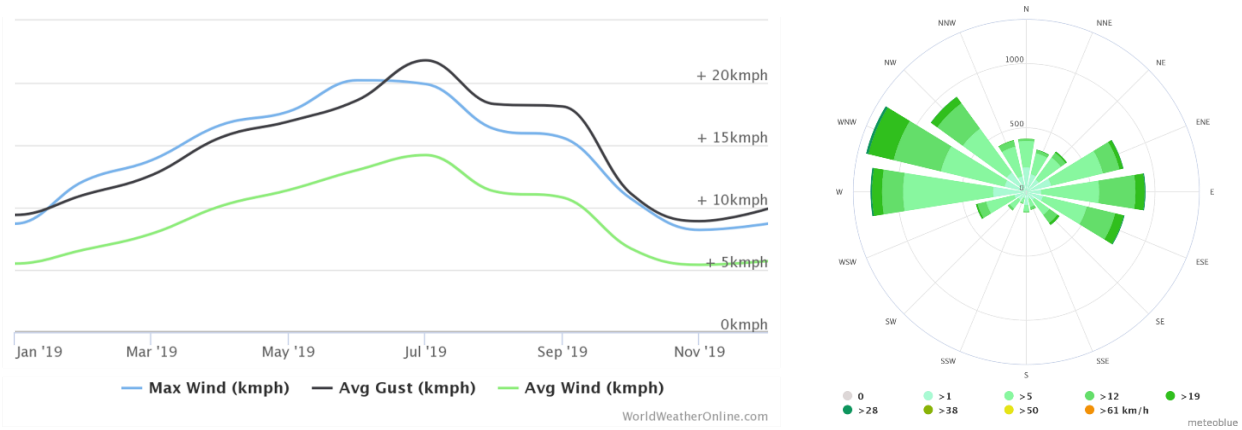


Figure 3.12 (left): Average Wind Speed (Source: Meteoblue)
Figure 3.13: Wind Rose for the region of Manesar (Source: Meteoblue)

Wind majorly flows from the western direction as per the diagram and data analysed. Average wind speed ranges from 5 to 19 km/hour, ensuring a moderate wind speed in the region.

3.5.1 Geomorphology and Soil Types

The area is conspicuously flat topography, however, in the north-eastern part small isolated hillocks of Precambrian rocks are exposed. The alluvial plain is formed by the Sahibi River which is tributary of River Yamuna. Soils of the GMUC are classified as tropical and brown soils, existing in the north western extreme, northern and north eastern parts of the region and water logged and salt affected soils in the southern parts of the region.

The soils are medium textured loamy sand is the average texture in Gurgaon and Sohna blocks. In Pataudi and Sohna blocks the organic content of soils is lowest, just up to 0.20 per cent (very low category). In the rest of the region, organic contents are 0.2 to 0.40 percent and falls in low category. The region comprises of sand dunes, sandy plains, alluvial plains, salt affected areas, low lands, lakes, hills and pediments. The soil varies from sand to loamy sand in sand dunes and sandy plain areas, sandy loam to clay loam / silty clay loam in alluvial plains, calcareous, loamy sand to loam in salt affected plains, silty loam to loam in low lands and calcareous, loamy sand to loam in hills.

Figure 3.14: Soil Conditions on Site (Source: Author)

Loam is great for supporting foundations because of its evenly balanced properties, especially how it maintains water at a balanced rate as long as no miscellaneous soils find their way onto the surface. It offers a Soil Bearing Capacity of nearly 100 kN/m^2.

A number of major minerals, though in small quantities, are also found. The region possesses mainly brick earth, salt petre and quartzite. Excellent quality slate is found in broadly Rewari and Gurgaon districts. Brick earth or ordinary clay suitable for manufacturing of bricks is available in plenty in almost every part of the region. Practically inexhaustible deposits of quartzite are found in the Aravali ranges in the districts of Faridabad, Gurgaon and Rewari.

3.5.2 Contour Map and Slope Analysis

The contour interval range within the bounds of the site is 245 to 254 meters, accounting for a level difference of 9 meters on site. Contour intervals considered are 1 meter each.

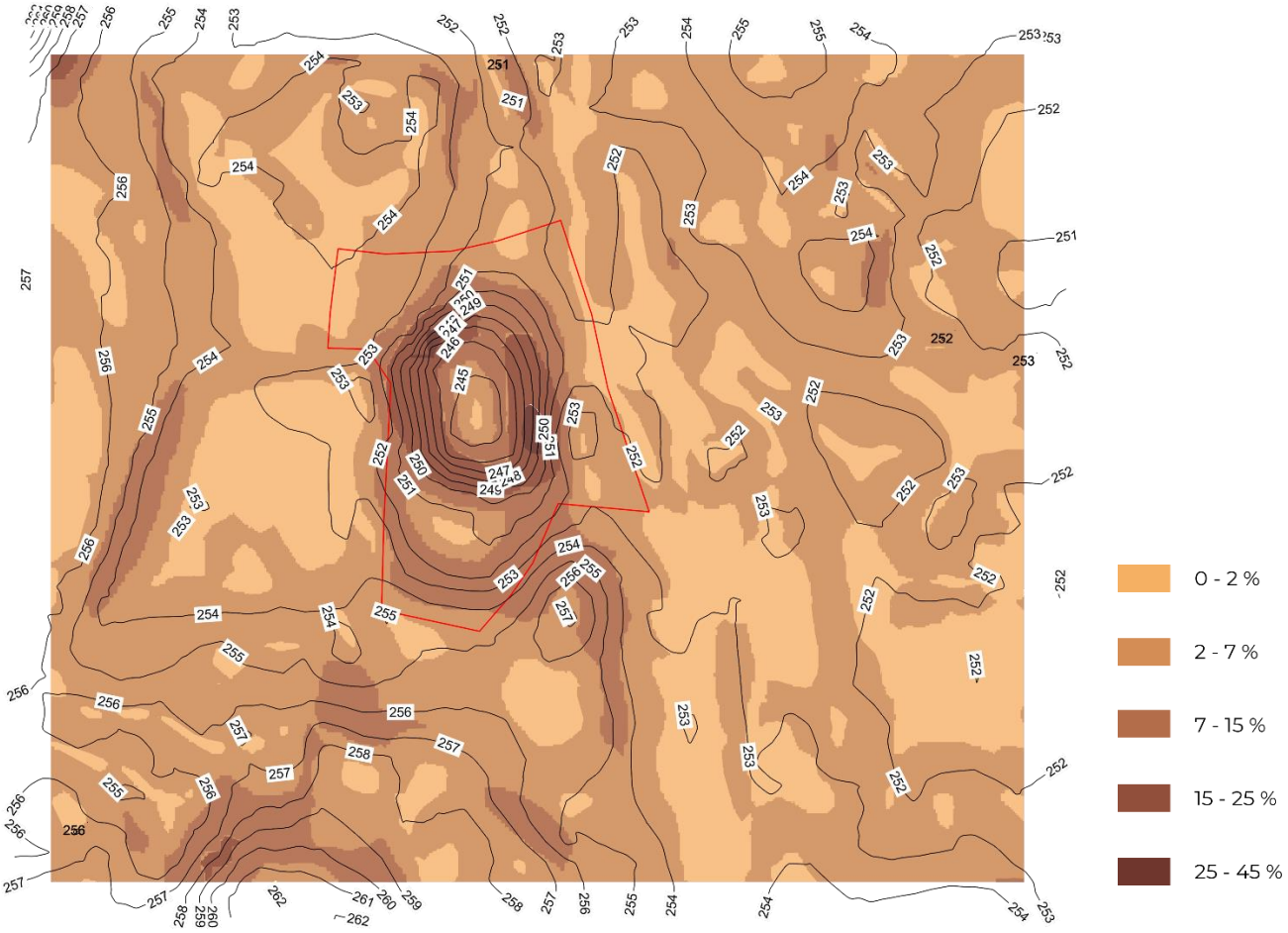


Figure 3.15: Contour Map (Source: Author)

A sudden drop evidently visible in the center of the site is a Rainwater Harvesting Recharge Pit built by Hero Honda Corporation in 2015 under the CSR Program for the Manesar Village, which is now dysfunctional. The slope range at the center of the site ranges between 2 to 25%. The slope range around the Rainwater Harvesting Recharge Pit ranges between 2 and 15%, giving scope for ample

buildable space. The existing contours are dynamic and pose a challenge for any type of construction to take place on site while preserving its natural contours.

The site has dense vegetation with roots spreading deep into the ground, holding the soil together and preventing it from eroding. It is hardly accessed by the locals of the village. The site has been the same for many years now.

Figure 3.16 (left): Rainwater Harvesting Recharge Pit present on site. (Source: Author)
Figure 3.17: Gradual Slope around the center of the site. (Source: Author)

3.5.3 Types of Vegetation on Site

Name	Image	Physical Features	Drought Tolerance	Soil	Root System	Air Quality	Absorb Noise	Absorb Dust	General Comments	Category
Alstonia Scholaris (Devil Tree)		Ht : 12-15 m Evergreen Leaf : broad Shade : diffused Growth : Fast	✓	Sandy, loam, medium dry	Shallow	✓✓ Removes gaseous pollutants		✓		Large tree
Azadirachta Indica (Neem)		Ht : 18-25 m Large and semi-evergreen Leaf : medium Shade : dense Growth : fast	✓	Rocky, sandy, poor soil	Deep	✓ Removes gaseous pollutants, SO2	✓	✓	Improved soil, pest control	Large tree
Ficus Benghalensis (Banyan)		Ht : 15 m Large and semi evergreen Leaf : large Shade : dense Growth : fast	✓✓	Sandy, loam, rocky, porous	Deep and spreading	✓	✓	✓		Large tree
Mangifera Indica (Mango)		Ht : 12 m Large and evergreen Leaf : large and glossy Shade : dense Growth : fast	✓	Sandy, loam, porous	Deep and spreading	✓	✓	✓		Large tree
Syzygium Cumini		Ht : 16 m Large and evergreen Leaf : medium Shade : dense Growth : fast		Porous	Deep	✓	✓	✓ (Assumed)	Solid waste needs to be managed	Large tree
Bougainvillea Spectabilis		Ht : 1-12 m Small, evergreen Leaf : medium Shade : Diffused Growth : fast	✓	All types	Shallow	✓		✓	Climbing wood vine, highly adaptable	Hedge/shrub
Thevetia Peruviana		Ht : 3-4 m Small, deciduous Leaf : scally, long Shade : diffused Growth : fast	✓	Dry, all types	Shallow	✓		✓	Ornamental, shallow rooted	Small tree
Koelreuteria Elegans		Ht : 7-8 m Small, deciduous Leaf : small Shade : diffused Growth : very fast	✓✓	All types	Shallow to medium deep		✓		Landscape tree, parking, street tree	Small tree
Mimusops Elengi (Maulsari)		Ht : 10-12 m Large evergreen Leaf : small Shade : dense Growth : very fast	✓✓	Fertile sandy, loamy soil	Shallow	✓ Removes gaseous pollutants	✓		Avenue	Large tree
Lagerstroemia Indicum		Ht : 8 m Small, semi evergreen Leaf : medium Shade : diffuse dense Growth : medium	✓✓	Sandy, loam	Shallow	✓ Removes gaseous pollutants				Shrub
Ficus Infectoria (Pilkhan)		Ht : 14 m Small, deciduous Leaf : medium Shade : dense Growth : medium		Dry, sandy, loam	Deep	✓ Removes gaseous pollutants	✓			Large tree
Ficus Elastica (Rubber tree)		Ht : 14 m Large and evergreen Leaf : large Shade : medium Growth : fast		All types	Shallow to medium deep	✓ Removes pollutants and formaldehyde		✓		Large tree
Callistemon Viminalis (Weeping bottlebrush)		Ht : 7-9m Small and evergreen Leaf : small, scaly Shade : diffused Growth : moderate	✓✓		Shallow to medium deep			✓	Attractive red flowers	Small tree

Name	Image	Physical Features	Drought Tolerance	Soil	Root System	Air Quality	Absorb Noise	Absorb Dust	General Comments	Category
Bauhinia Purpurea (Kachnar)		Ht : 9 m Medium and evergreen Leaf : medium Shade : medium Growth : fast	✓✓	Sandy, loam	Shallow		✓			Large tree
Tamarindus Indica (Imli)		Ht : 9m Large and semi-evergreen Leaf : small Shade : diffused Growth : medium	✓✓	Dry, sandy	Deep	✓			Handsome form, messy fruits	Large tree
Ailanthus Excelsa (Maharukh)		Ht : 18-25 m Large and deciduous Leaf : medium Shade : dense Growth : fast		Porous, sandy	Deep	✓ Removes gaseous pollutants	✓	✓	Shade and shelterbelt	Large tree
Ficus Microcarpa (Laurel Fig)		Ht : 12-15 m Large and evergreen Leaf : glossy green, medium Shade : dense Growth : fast		All types, little or no soil	Shallow		✓		Invasive tree, can tolerate shade	Large tree
Tabernaemontana Divaricata (Chandani)		Ht : 1-2 m Small, evergreen Leaf : medium Shade : diffused Growth : fast			Shallow			✓	Wind breaker, ornamental, wasteland, bush, evergreen foliage	Shrub
Euphorbia Neriifolia		Ht : 3-4 m Small, deciduous Leaf : fleshy Shade : diffused Growth : fast	✓✓	All types, rocky	Shallow				Succulent bush, ornamental	Shrub
Grevillea Robusta		Ht : 10-15 m Small, semi-evergreen Leaf : fleshy Shade : diffused Growth : fast	✓	All types, rocky	Shallow				Attracts birds	Large tree
Ficus Racemosa (Gular)		Ht : 18-25 m Deciduous Leaf : medium Shade : diffused Growth : fast	✓	All types	Deep	✓	✓			Large tree
Albizia Lebbeck (Siras)		Ht : 15-20 m Semi-evergreen Leaf : small, bipinnate Shade : diffused Growth : fast	✓	Porous, sandy	Deep	✓	✓	✓		Large tree
Vachellia Nilotica (Kikar)		Ht : 7-12 m Evergreen Leaf : elongated, fern like Shade : diffused Growth : fast	✓✓	All types	Deep	✓			Ornamentation, grows in arid areas	Large tree
Dalbergia Sissoo (Seesham)		Ht : 20-25 m Evergreen Leaf : medium Shade : diffused Growth : moderate	✓	Fertile sandy, loamy soil	Shallow to medium deep	✓	✓	✓	Shade and shelterbelt	Large tree
Ficus Religiosa (Peepal)		Ht : 25-30 m Semi-evergreen Leaf : cordate shaped Shade : diffuse-dense Growth : fast	✓	All types	Deep and spreading	✓	✓	✓	Broad foliage, shade	Large tree
Morus Alba (Toot)		Ht : 9 m Medium and evergreen Leaf : medium Shade : dense Growth : fast		Porous, dry soil	Shallow to medium deep	✓	✓ (Assumed)	✓		Large tree

Figure 3.18: Types of Vegetation on site. (Source: Author)

3.5.4 Water Supply and Drainage Systems

Haryana State Industrial and Infrastructure Development Corporation (HSIIDC), which is a Public Limited Company owned by the Government of Haryana is responsible for Water Supply System, Sewage and Drainage system in Manesar, the primary sources of water supply in Gurgaon and Manesar is underground water and surface water from Gurgaon Water Supply (GWS) canal after treatment. Many years ago, the GWS canal was constructed by the Irrigation Department of Haryana basically

for drinking water of Gurgaon city and other towns/villages. Dependability of local underground water has considerably reduced, and it has come under the over-exploited zone. The quality of underground water in Gurgaon and Manesar is deteriorating making it unfit for human consumption in parts of the town. The quality of raw water in the canal is healthy and treatable. This canal water is already a source for many towns and villages including Gurgaon. Water is also extracted from tube wells drilled in various parts of the town. Water is supplied directly from the tube wells into the distribution network.

The distribution system in HSIIDC areas has been laid on a sectoral basis, and water is received in ground level reservoirs and then pumped to Overhead Service Reservoir (OHSRs) from where it is supplied through the distribution system. Disinfection of water is done by chlorine. The existing tube wells are demonstrating a marked decrease in yield and deteriorating water quality according to the Manesar Water Supply Project Draft Report, 2014.

The districts water table alone seeing a precipitous 82% decline in the past 12 years, from 19.85 meters in 2006 to 36.04 meters in 2018. Pre-monsoon data collected by Gurugram's groundwater cell shows the water table fell to 36.21 m. below ground level in 2016. In 2006, this was 19.85 m., showing an alarming decline of about 17 m. over the decade.

According to the Central Ground Water Board (CGWB), the water level in Gurgaon in 2003 was 43 meters below ground level (mbgl) in 2006; it declined to 51 mbgl. The fall in the water level has been reported to be as high as 3 m per year in this period. An integrated groundwater resource mapping of Gurgaon district has revealed that the water table is falling at a rate of 1-1.2 m annually. According to HUDA, the groundwater table had dropped from 12-15 m in 1986 to 35-40 m by 2006. In this context, the CGWB has warned that once the water table dwindles below 200 m, only rocks will be left. The alarming drop in Gurgaon's water table has woken up the Central Ground Water Authority (CGWA) under the Union ministry of water resources. (Ministry of Water Resources, 2017)

The Manesar Water Scenario: The water supply and drainage of the region is based on network of canals in the Yamuna basin that bring in drinking water as well as carry the treated waste water discharge back through the Najafgarh drain. The drinking water supply to Gurgaon is distributed after treatment at HUDA WTP plant in Basai. The drains based on gravity and terrain carry the waste to sewage treatment plants in Behrampur and Dhanwapur. These drains and canals have a huge impact on the local ecology of the landscape.

Water table, also called Groundwater Table, is the upper level of an underground surface in which the soil or rocks are permanently saturated with water. The ground water table is an invaluable resource for multitude of activities in the region. Unfortunately, rapid urbanization has resulted in a surge of water usage for construction to irrigation. This has resulted in depletion of the ground water table as rapidly as 1 meter to 1.2 meter per year. Such intensive extraction of ground water has pushed the levels by 10 m. around the HSIIDC site (indicated in red) within a decade. Unless drastic recharging mechanisms are installed in the region the future for water looks bleak.

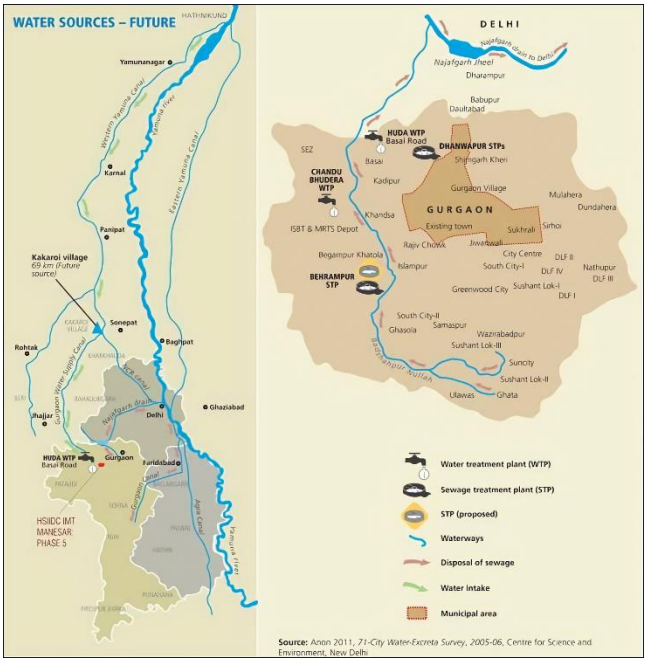


Figure 3.19: Water Sources and Supply Network (Source: HSIIDC)

Identifying the Underground Aquifers: Google Earth Satellite imagery reveals the subtle terrain across the IMT Manesar site. The existing site topography study reveals the low points on the site along which the storm water drains northwards leading to the Najafgarh drain. The water catchment map highlights the possible ground water channels / aquifers (underground aquifers most likely run along the surface drainage patterns).

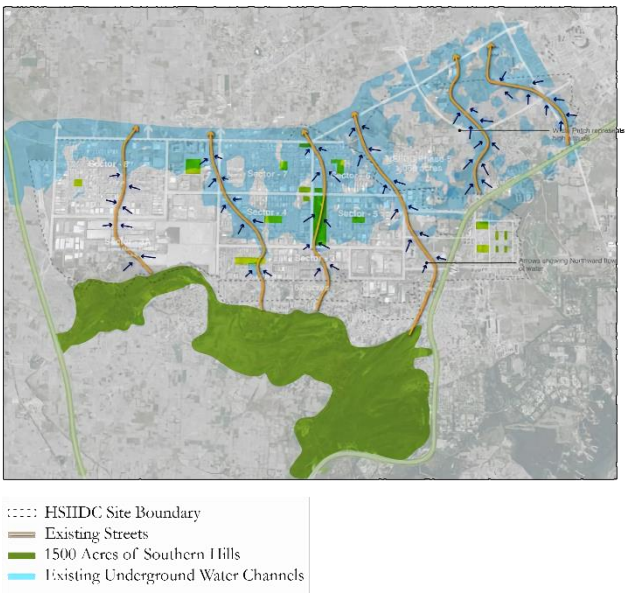


Figure 3.20: Existing Water Channels and Underground Aquifers (Source: HSIIDC)

The underground aquifers channels are indicated with the blue colour draining towards the Najafgarh drain to the north side. The existing low points are vulnerable to water clogging and are the best locations for ground water recharging wells. The yellow arrows indicate the primary system of surface drains that predominantly moves towards the north, while the deep blue arrows represent the local secondary system that feed the primary drain channels. The remaining patches represent higher altitudes as compared to the surrounding areas shown in blue.

This representation of water table mapping can help identify vulnerable site to flooding and strategic storm water management systems, planned along these low-lying areas can help avoid the risk of flooding during heavy downpours. These areas are also ideal for rain water harvesting sites.

Current Infrastructure Provisions: A new treatment plant is being prepared of double the existing capacity of 15 MLDs on a 30 acres parcel located to the northern edge of IMT Manesar. The diagram illustrates the proximity of the site to the newly constructed canal amongst the other canals that carry treated sewage water from Manesar to Najafgarh drain flowing northwards.

The nature of topography allows the water to flow northward along the main surface drainage channel as shown in the diagram. including minimising storm water runoff during heavy rains to avoid the risk of flooding, collecting the water in natural waterbodies along the existing pattern, maximising ground water recharge opportunities through rain water harvesting.

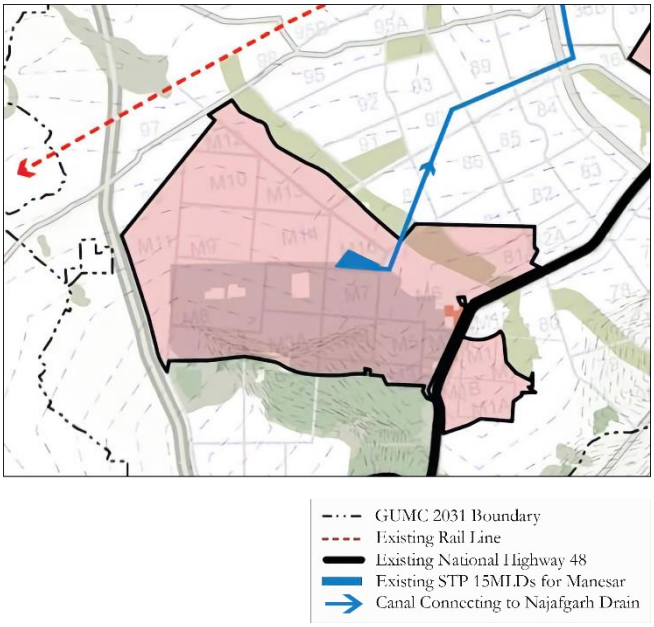


Figure 3.21: Existing Infrastructure Provisions (Source: HSIIDC)

3.6 Cumulative Site Analysis

Parameters	Commercial Premise	Fuel Station Premise
Ground Coverage	30%	20%
Buildable Area	4969.452 sqm.	1111.68 sqm.
FAR	1.5	2
Built-Up Area Available	16564.84 sqm.	11116.88 sqm.
Setbacks	6m (min. on all sides)	6m (front)
Height Restrictions	50m including parapet	Equivalent to ground coverage within setback line
Basement	Twin-level permitted	-

Site Dimensions (meters): AB: 112.62, BC: 159.94, CD: 47.9, DE: 79.39, EF: 52.27, FG: 121.04, GH: 21.54, HI: 21.1, IA: 59.39

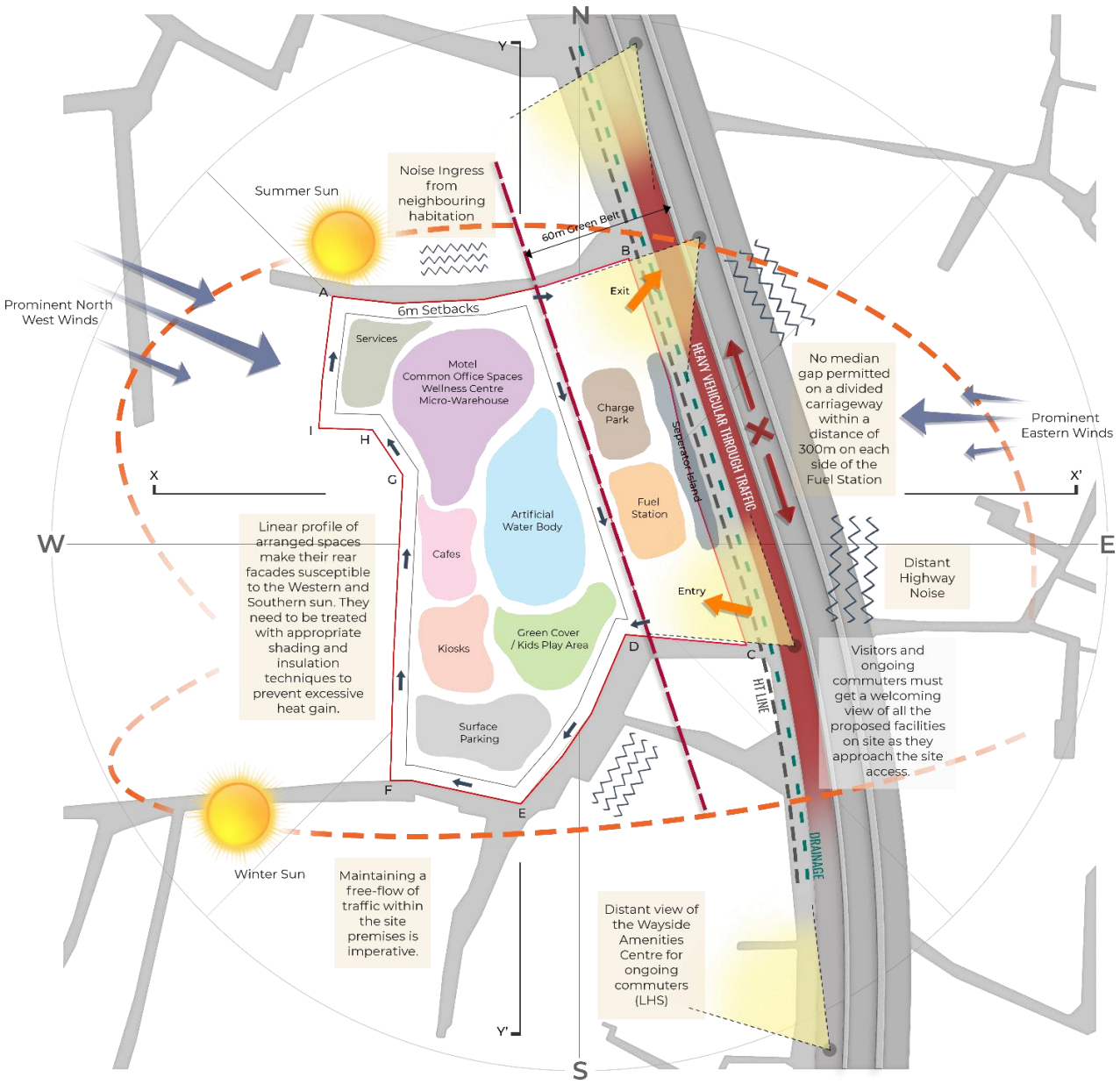


Figure 3.22: Site Analysis (Source: Author)

Figure 3.23: Site Section XX' (Source: Author)

Figure 3.24: Site Section YY' (Source: Author)

4 CASE STUDIES

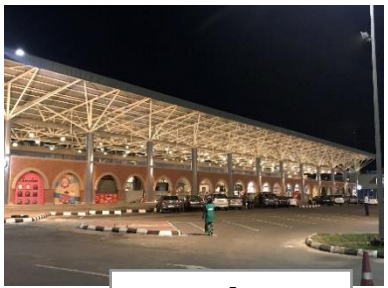
4.1 Criteria for Selection

Live case studies have been conducted for two Wayside Amenity Centres that constitute a range of contrasting frameworks such as their layout and organization of spaces, ownership status, operational strategies, revenue sharing structure with their respective OMCs, scale of establishments, products and service offerings and area of the premises. However, apart from the contrasting features, the common parameters for selection of the two cases include the presence of fuel stations in front of the premises and travellers' facilities such as restaurants, retail outlets, public toilets and automobile repair shops.

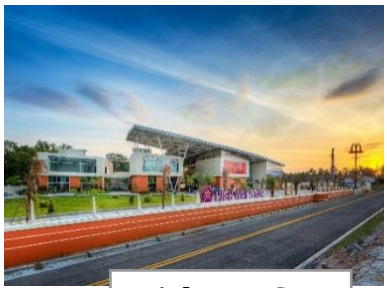
The criteria for selection was narrowed down and governed primarily by the fact that sufficient area should be available at both the sites to make retailers consider the possibility of incorporating a full-fledged charging infrastructure at their fuel station while leveraging the prime chunk of real estate effectively by allowing customers to avail a range of products and services at the stopovers while their vehicles are being charged.

Therefore, for two main reasons, highway sites are expected to be more robust and likely to experience longer economic residual existence than the others. Firstly, electrification of heavy-duty vehicles like trucks, buses, and lorries is likely to take longer than the electrification of light-duty vehicles including cars and vans. As a result, heavy-duty automobiles will continue to make regular stops for refuelling at highway locations in the foreseeable future. Second, customers who drive EVs can afford to stop for longer time periods at highway fuel stations for recharging and non-fuel transactions relative to city-based fuel stations.

J Plaza



Foodway



Highway Star

Figure 4.1: Case Studies Covered (Source: Author)

4.2 Live Case Study 01: J Plaza, Delhi-Jaipur Expressway, Manesar, Haryana

Figure 4.2 (left): 'J Plaza' located adjacent to the Fuel Station premises. (Source: Author)
Figure 4.3: Panoramic view of the Jamnagar Filling Station. (Source: Author)

4.2.1 Project Overview

Location: Kukrola, Manesar on Delhi-Jaipur Expressway

Site Area: 2.79 Acres (11310.84 sq. m.)

Architects: Di Arq, Gurgaon

Client: Jamnagar Filling Station

Land Ownership: Jamnagar Filling Station

Functional Provisions: Restaurants, Fuel Station

Status: Under Construction

The project comprises of restaurants and a fuel station as part of the facility, located in Village Kukrola, Manesar on the Delhi-Jaipur Expressway. The master planning for this 2.79-acre project on the Delhi-Jaipur expressway has been executed by Di Arq (Ar. Mehboob Khan) based in Gurgaon. The facility houses a range of restaurants such as Bikanerwala, KFC, Subway and Cafe Coffee Day.

The complex was built in phases which was originally a private farmhouse. The CLU for the construction of a fuel station was provided in 2004 for an area of 1925 m^2 and for the Flagship Retail Outlet in 2010 for area of 3560 m^2. The wayside amenity is still under construction with restaurants occupying the ground floor. The structure can be extended till (G+7) floors. Currently, a motel and warehouse are being proposed on the upper floors.

Located only 25 kms from Gurgaon, the multipurpose attraction offers a wide range of services and products in one convenient location catering to all travellers on the Delhi-Jaipur Expressway and a population of nearly 25000 people in the neighbouring town of Manesar.

4.2.2 Relevance of Case Study

To understand the layout and organization of spaces in a constrained area for a Wayside Amenity of relatively smaller area with similar contextuality, especially in terms of its location, building height, proposed functions and incorporation of a Fuel Station in front.

4.2.3 Location and Proximity

The J Plaza is situated along one of the busiest stretches on Delhi-Jaipur Expressway. Being close to the Kherki-Daula Toll Plaza, the total daily traffic along NH48 accounts for 3.8 lakh PCUs as per the Gurgaon Mobility Plan 2021. Maximum number of vehicles entering and exiting through NH-48 are through Delhi, followed by MG Road and finally from Jaipur/Rewari side.

Figure 4.4: Site Location (Source: Author)

- 25 kms from the District of Gurgaon.
- 6 kms from the Town of Manesar.
- 3.5 kms from Pachgaon and KMP Expressway.

4.2.4 Salient Features

• Separate premises for the Facility and Fuel Station.	• Kids Play Zone organized in top left corner of site.
• Flagship Retail Outlet with separate restaurants.	• Public washrooms built separately.
• Bikanerwala with a 5,525 sq. ft. carpet area on G.F.	• 40 car and separate bus parking bays.
• 150 persons seating capacity in Bikanerwala.	• Glass facades offering panoramic views.
• KFC with a 2,830 sq. ft. carpet area on G.F.	• Toilets for special needs and water filter facility.
• Subway with a 1,650 sq. ft. carpet area on G.F.	• Unloading and services bay in the basement.
• Enclosed air-conditioned spaces.	• DG Set with a metered supply.

• Cafe Coffee Day and Kiosks built as separate wings.	• Water supply by Borewell with STP present on site.
• IOC Fuel Station of 0.5 acres area.	• Motel and Warehouse proposed on upper floors.

4.2.5 Site Details and Surroundings

Figure 4.5: Site Plan and Surroundings of the J Plaza. (Source: Author)

4.2.6 Concept and Structural System

The establishment possesses an RCC framed structure coupled with aluminium composite panels and a tinted glass facade on the exterior. Stringent building bye-laws and zoning regulations have dictated the building profile and layout for this structure, in a constrained space. Considering the subtropical, composite climate of Gurgaon-Manesar, the facility was intended to have heat absorbing, tinted glass facades which provided sweeping views of the lush, green surroundings. An elliptical floor plate was conceived for the first three floors to achieve the same. Fully enclosed, air-conditioned interiors have been planned with multiple fenestrations to allow ample sunlight within the structure.

The structure was established as a single building block with vacant floors available for occupancy, consequently the interiors were developed as per the needs of the tenant. Subway restaurant was constructed later on the ground floor as a separate wing attached to the main building.

4.2.7 Project Drawings

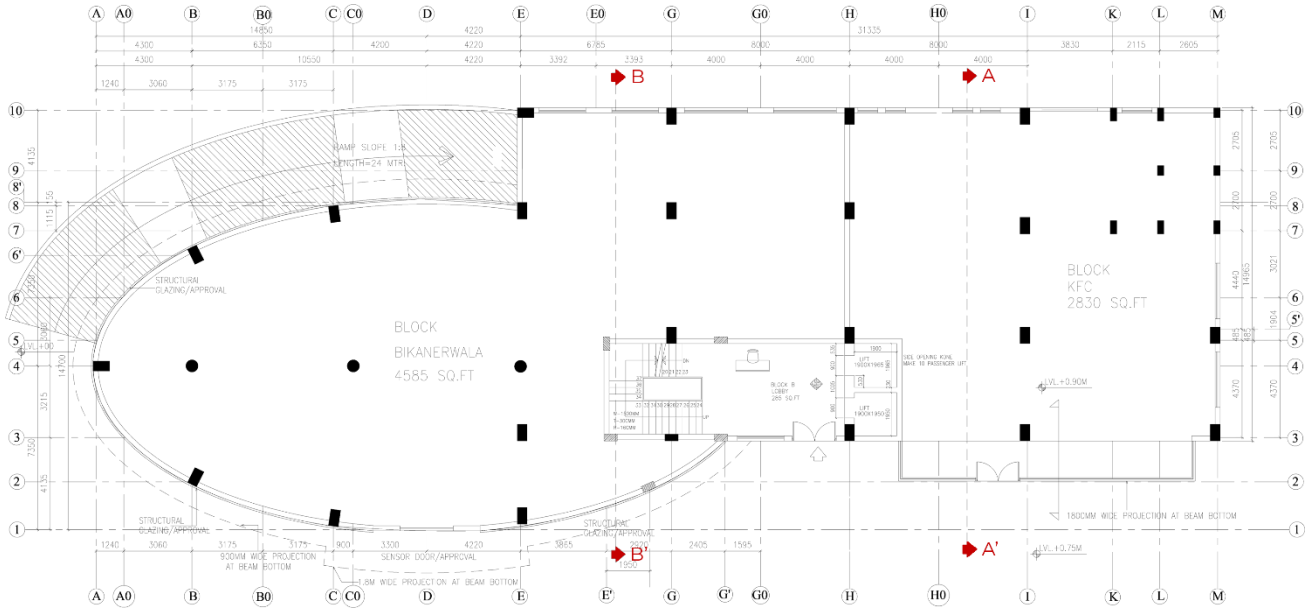


Figure 4.6: Ground Floor Plan (Source: DiArq Architects)

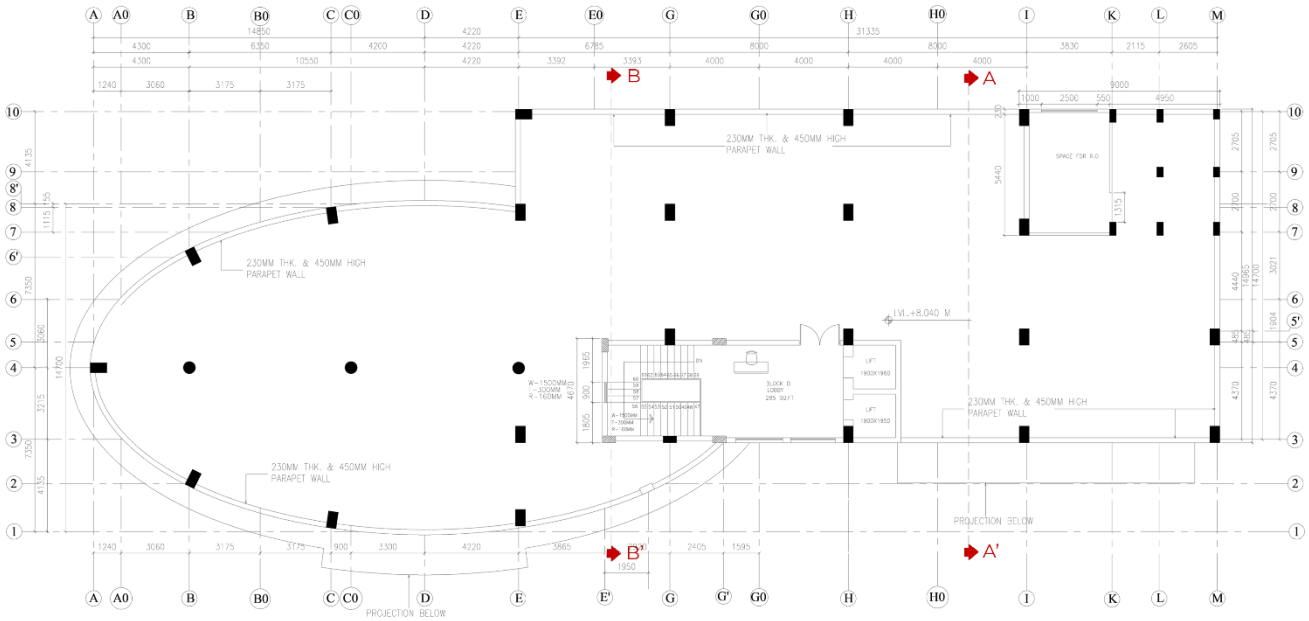


Figure 4.7: Terrace Floor Plan (Source: DiArq Architects)

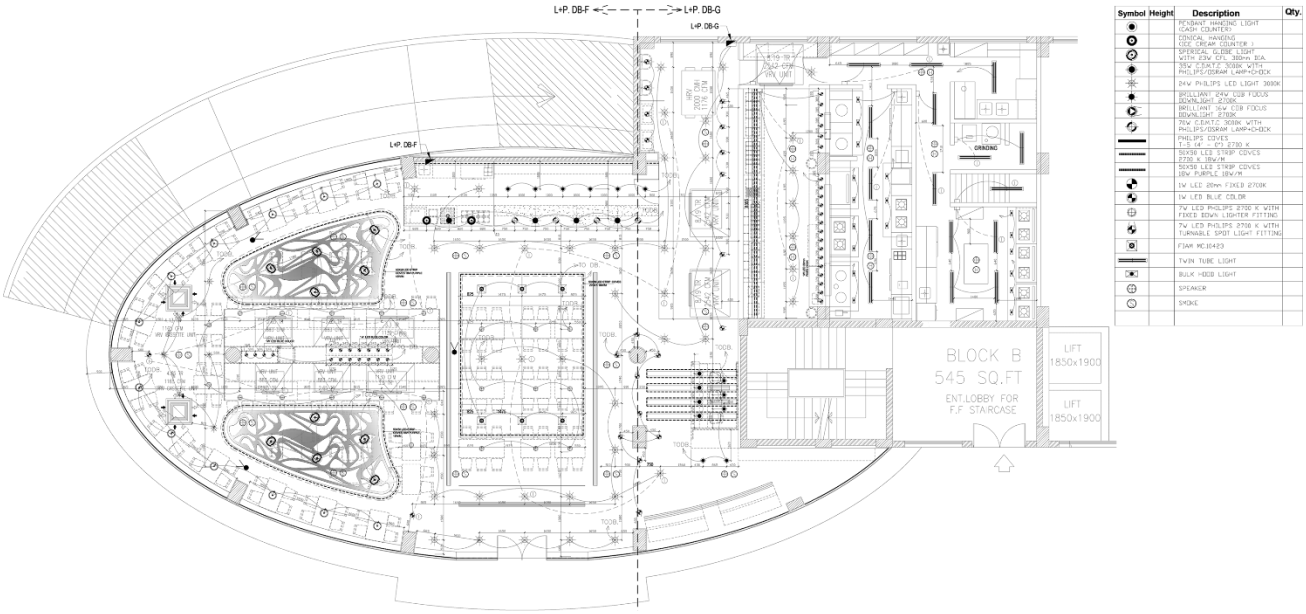


Figure 4.8: Lighting and Seating Plan (Source: DiArq Architects)

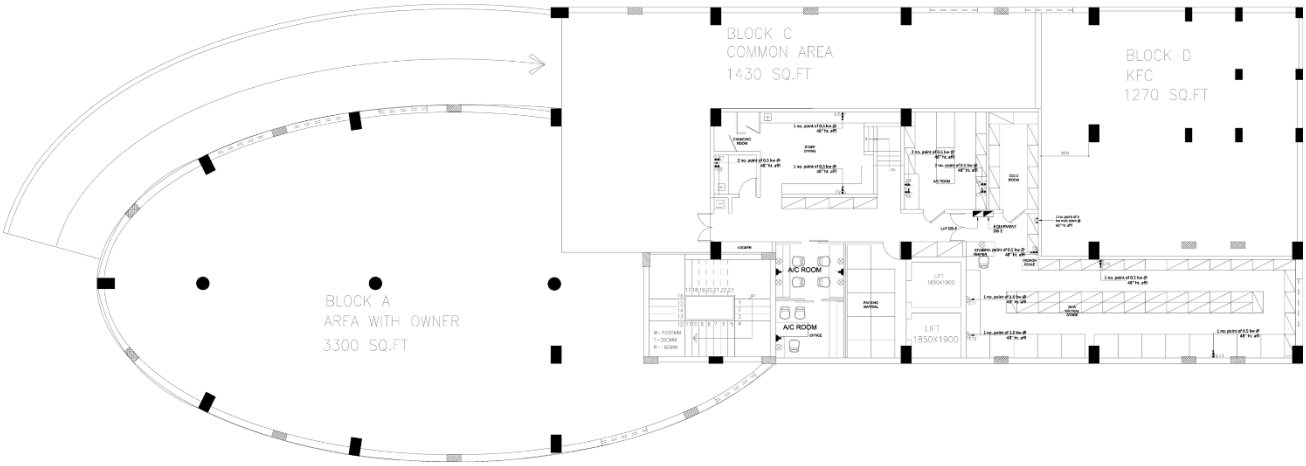


Figure 4.9: Basement Floor Plan (Source: DiArq Architects)

The loading/unloading bay is planned in the basement, access to which is facilitated through the ramp organized along the elliptical floor plate. Facilities for the restaurant staff and other storage and packaging units are designed in the basement. Other services such as HVAC, exhaust systems, water tanks are organized on the Terrace. The final building profile is envisioned to have a glass facade.

Figure 4.10: Existing Conditions of the Complex (Source: Author)

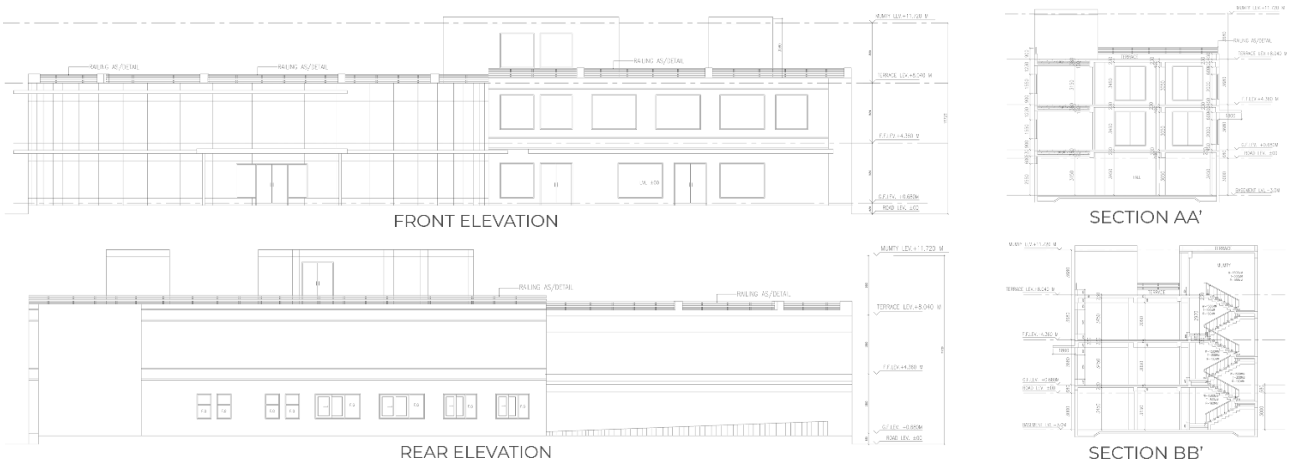


Figure 4.11: Building Sections (Source: DiArq Architects)

Figure 4.12 (left): Front and Rear Building Elevations (Source: DiArq Architects)

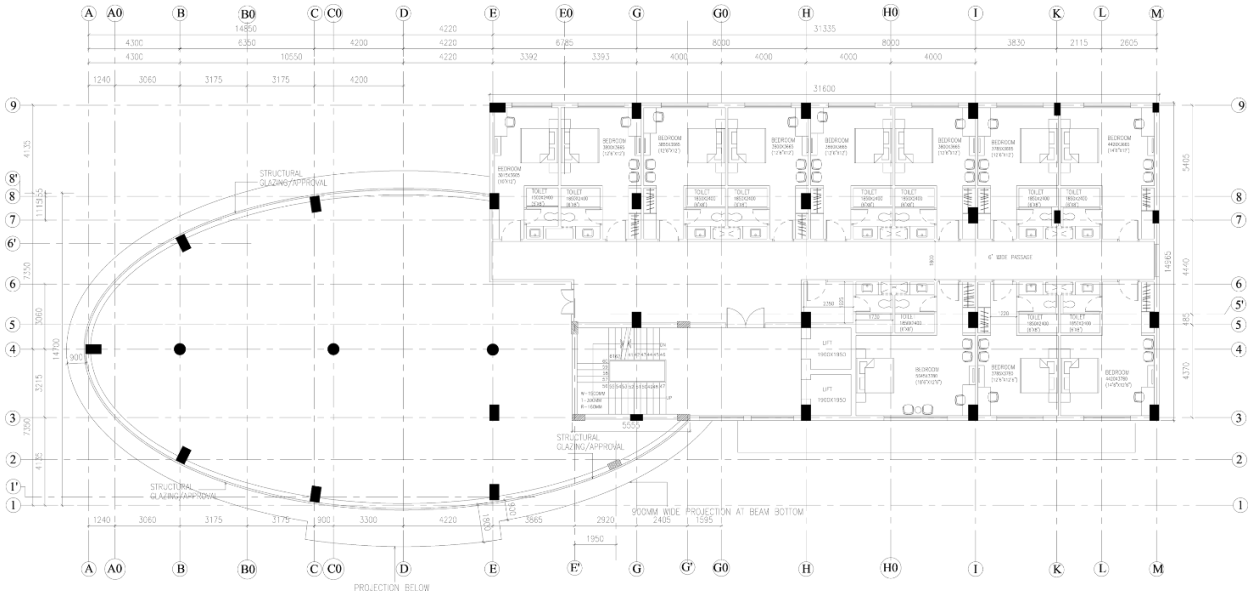


Figure 4.13: Proposed Motel Typical Floor Plan (Source: DiArq Architects)

The available FAR allows the structure to be extended till G+7 floors. A Motel and a Warehouse is being proposed on the upper floors. The design and conceptualization of the Guest Rooms is currently underway. A total of 10 standard rooms and 1 deluxe room will be accommodated on one typical floor.

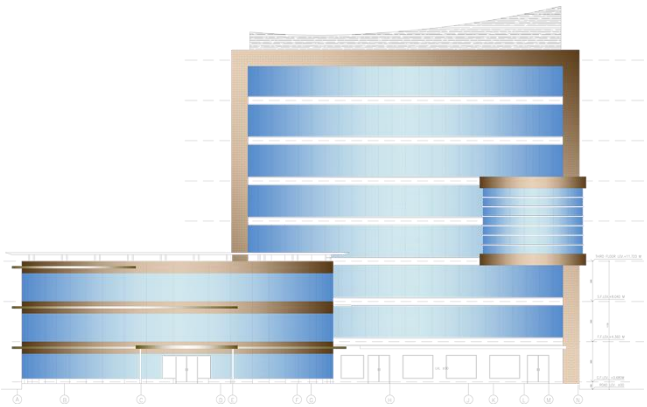


Figure 4.14: Proposed Front Elevation (Source: DiArq Architects)

4.3 Live Case Study 02: Foodway, Mumbai-Pune Expressway, Sarsan, Maharashtra

Figure 4.15 (left): Wayside Amenity 'Foodway' with a Linear Built Profile. (Source: Author)
Figure 4.16: Well-lit Indian Oil COCO Filling Station at night. (Source: Author)

4.3.1 Project Overview

Location: Sarsan, Khalapur on Mumbai Pune Expressway

Site Area: 4.65 Hectares (11.49 Acres)

Architects: StudioBoxx, Mumbai

Project Management Consultants: StudioBoxx, Mumbai

Client: Expressway Truck Terminus and MSRDC

Land Ownership: Maharashtra State Road Development Corporation Ltd. (MSRDC)

Functional Provisions: Food Court, Fuel Station and Truck Terminus

Status: Completed in 2018

The project comprises of a food court, fuel station and truck terminus facility, located in Sarsan, Khalapur on the Mumbai Pune Expressway. The master planning for this 11.49-acre project on the Mumbai-Pune expressway has been executed by StudioBoxx Architects based in Mumbai. Architecture, Interior Design and Project Management services have also been provided by the architecture firm. The project houses one of the largest food facilities and fuel station in the country.

Located at the epicentre of the pulse, Foodway endeavours to drive the energy of the people residing in the twin cities. Being at the core of the landmark expressway, the exposure that brands enjoy at this thriving location is unparalleled.

The one striking feature that stands out from the other establishments is that this built facility is distinguished into Quick Serve Restaurants and fine dining, thus profusely satisfying the tastes of both.

4.3.2 Relevance of Case Study

To understand the layout and organization of spaces for a Wayside Amenity of relatively larger area with similar contextuality, especially in terms of its linear built profile and incorporation of a Fuel Station in front. Helps study the movement pattern of users in a large facility.

4.3.3 Location and Proximity

Foodway nestles along one of the busiest stretches on Mumbai-Pune Expressway. Being close to the Khalapur Toll Plaza, it receives a traffic of close to 5 lakh vehicles on average.

- 1500m from the Khalapur Toll Plaza.
- 8 kms from Adlabs Imagica.
- 18.6 kms from Lonavla.
- As a result, 36000 footfall each day.

Figure 4.17: Site Location (Source: Author)

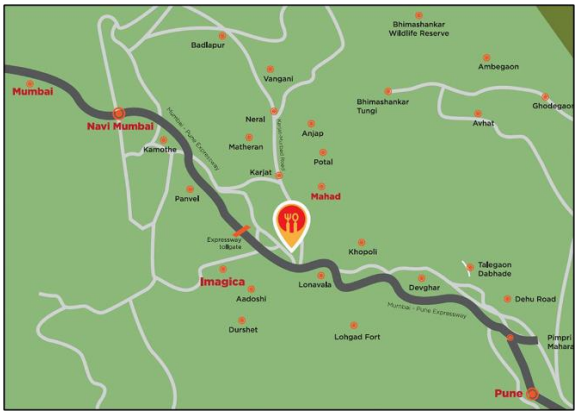


Figure 4.18: Location and Proximity Map (Source: MSRDC)

Figure 4.19: 3D Conceptual View of the Site (Source: MSRDC)

4.3.4 Salient Features

• Food Court with a 40,000 sq. ft. carpet area.	• Totem of 22m height with 2.5m height per level.
• 3,000 persons per hour serving capacity.	• Toilets for special needs and drinking water facility.
• 60,000 persons per day serving capacity.	• Loading/unloading bay via service passage.
• 1,200 persons total seating capacity.	• Multiple DG's with metered supply.

• 575 persons seating capacity on the ground floor.	• Water supply by tankers and STP present on site.
• 12,500 sq. ft. common dining area.	• IOC Fuel Station of 0.88 Ha area.
• Semi-open and double height dining space.	• Service capacity of 3,000 customers per hour.
• 125 car and 10 bus parking bays.	• 10% YoY traffic rise expected at facility.
• Truck Terminus with 125 parking bays.	• 1,500 turnover of vehicles per hour.

4.3.5 Site Details and Surroundings

Figure 4.20: Site Plan and Surroundings of the Foodway (Source: Author)

4.3.6 Concept and Structural System

The facility possesses an RCC framed structure with a principal grid of 8m x 8m with a pre-engineered lightweight roofing structure covered with thermally insulated double roofing, supported by circular

columns on the front. The front facade of the structure comprises of a uniform archade ensuring multiple accesses for visitors with no one major entrance route.

The whole structure is essentially a double-height, semi-open space to facilitate a naturally lit and ventilated dining area. This produces a ‘stack effect’ within the premise to ensure a comfortable environment for visitors. The semi-openness of the structure is conducive for the facility considering the tropical, wet and dry climate of Mumbai-Pune.

The food court possesses a linear building profile with anchor shops arranged in the corners, washrooms in the centre and kiosks for the sale of sundry items along the front facade. The objective of the same is to ensure users access the facility in an end to end fashion. The loading/unloading bay is organized along the rear, and other services on first floor.

4.3.7 Project Drawings

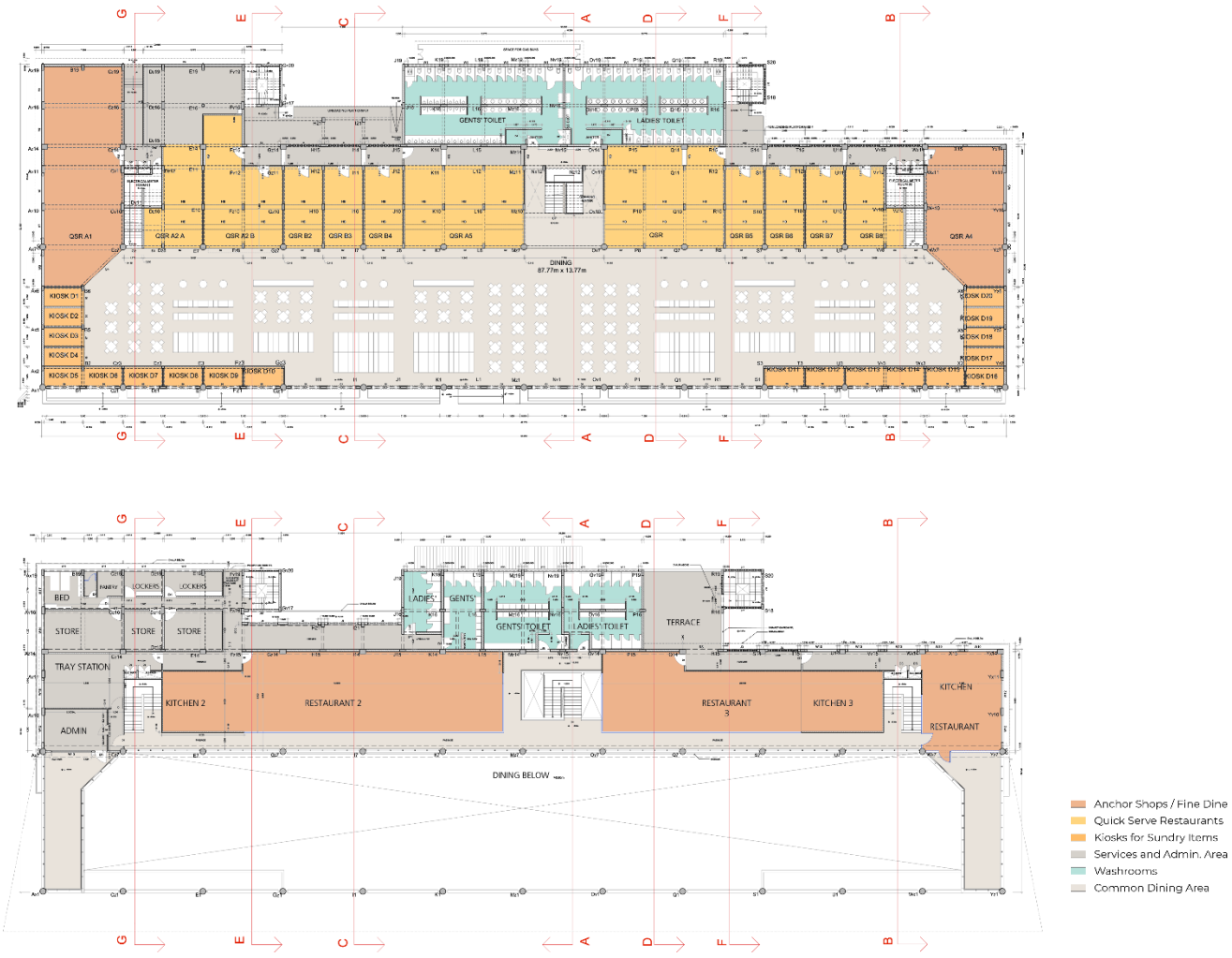
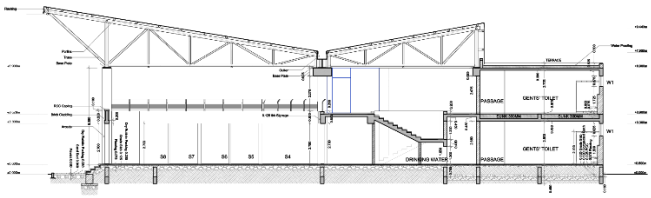
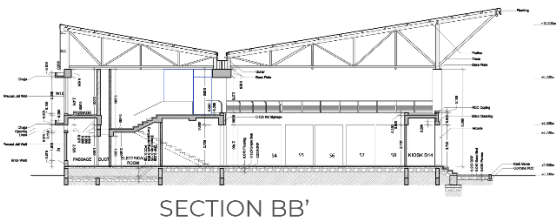


Figure 4.21(top): Ground Floor Plan (Source: StudioBoxx Architects)

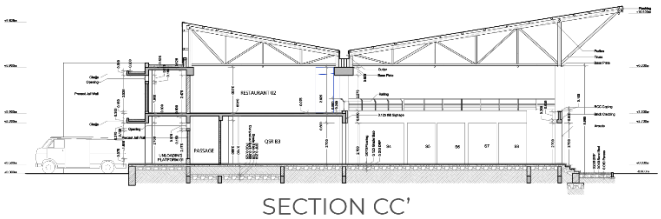
Figure 4.22: First Floor Plan (Source: StudioBoxx Architects)



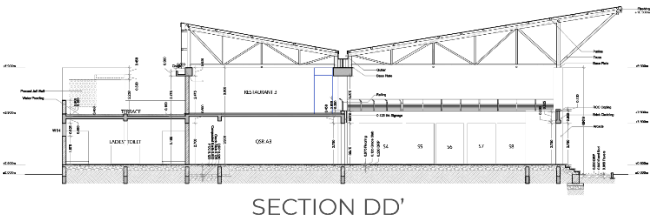
SECTION AA'



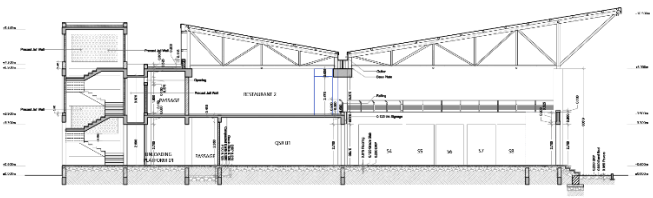
SECTION BB'



SECTION CC'

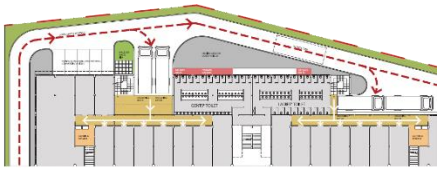


SECTION DD'



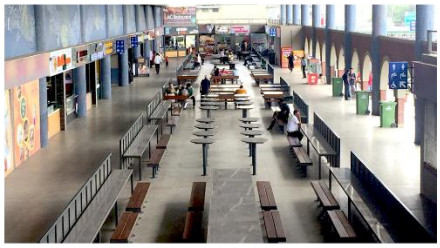
SECTION EE'

Figure 4.23: Building Sections (Source: StudioBoxx Architects)



Loading/Unloading Bay Area

Rendered Interiors of Food Court

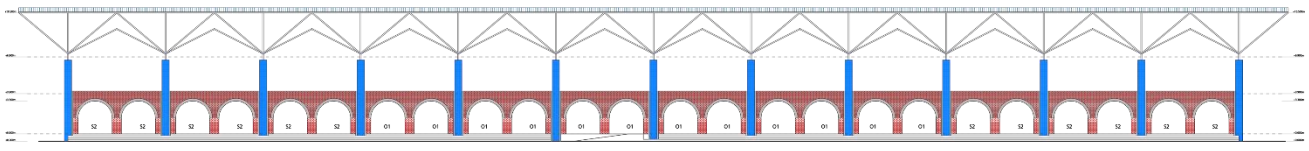


View from First Floor

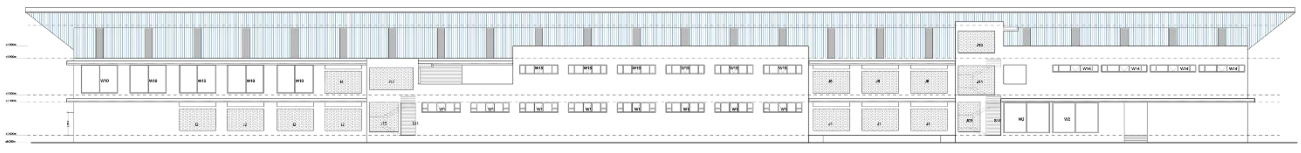
Archade Entrance

Existing Washrooms

Figure 4.24: Existing Site Conditions (Source: Author)



FRONT ELEVATION



REAR ELEVATION

Figure 4.25: Building Elevations (Source: StudioBoxx Architects)

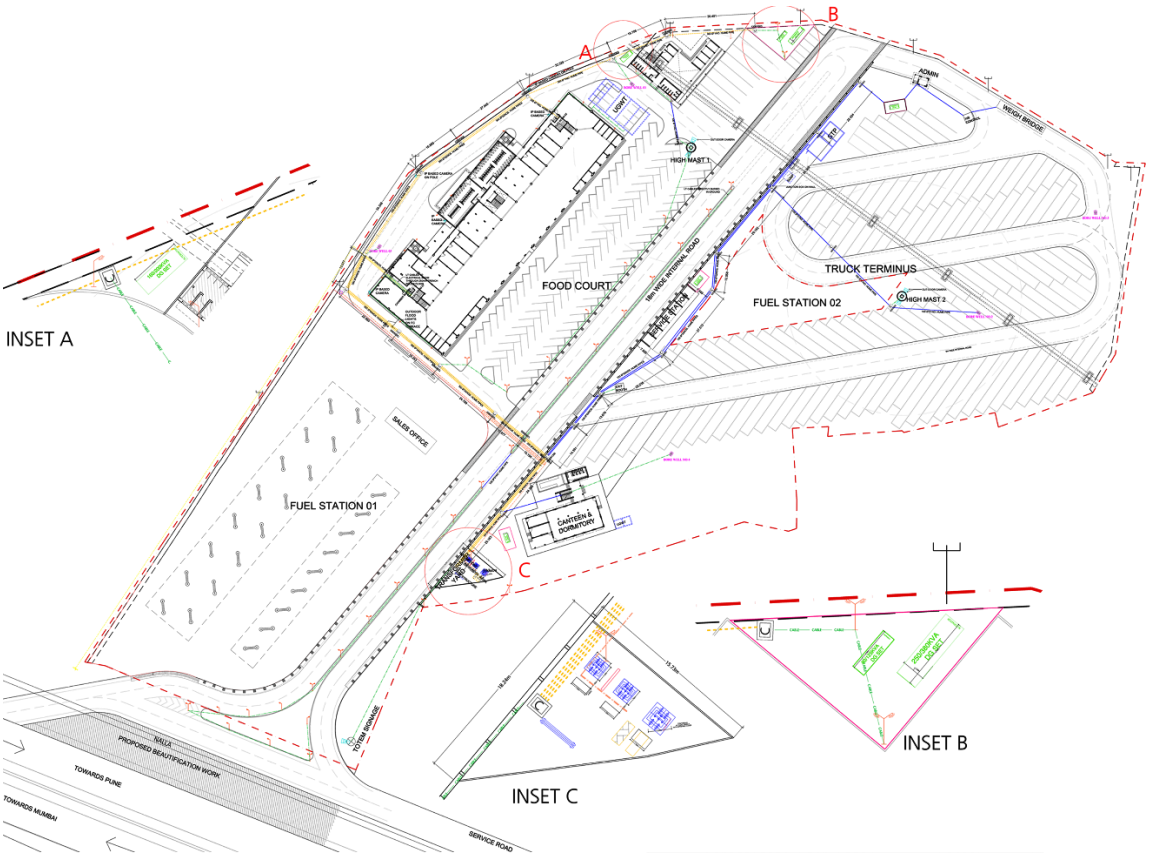


Figure 4.26: Electric Layout (Source: StudioBoxx Architects)

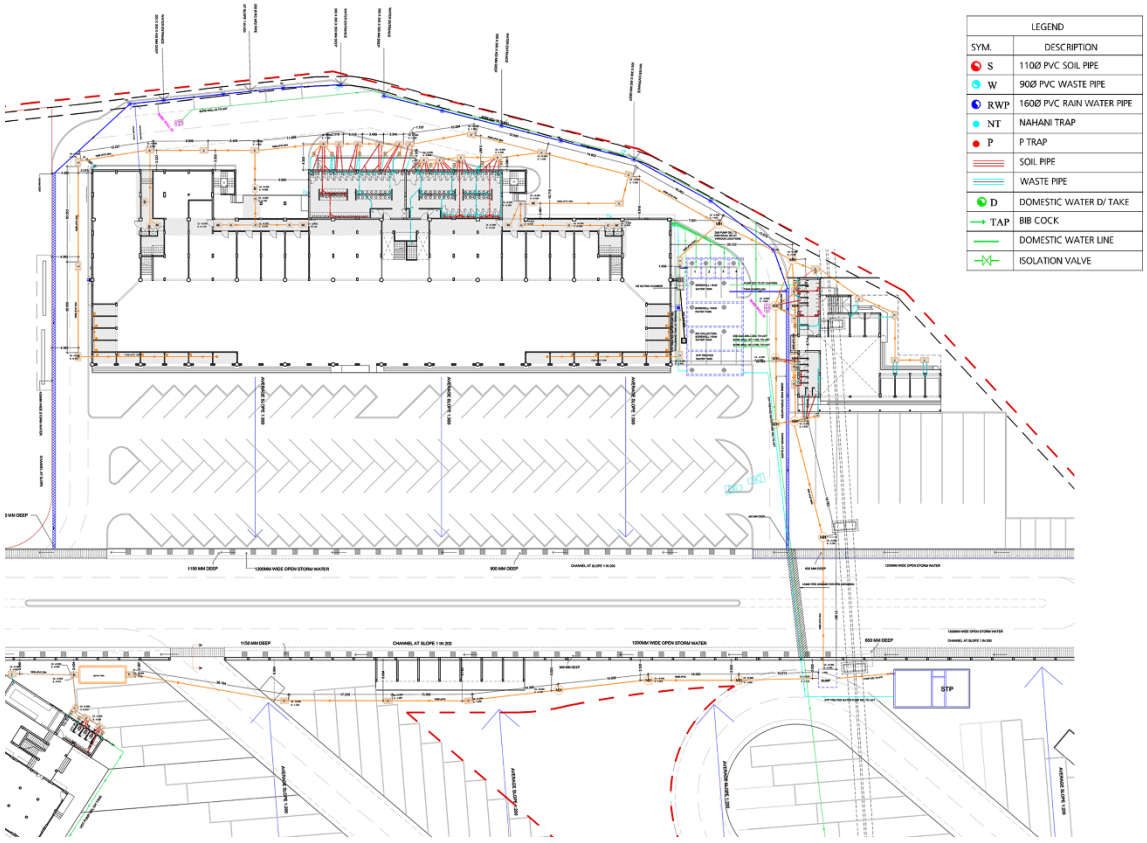


Figure 4.27: Plumbing Layout (Source: StudioBoxx Architects)

The HT Line for the entire complex is tapped from behind the facility, an electric line leading to Sarsan Village. A Transformer Yard is planned along the access road with separate DG Sets for both premises. The Food Court facility houses a 160/200 kVA DG at Point A with a 250/380kVA and 80/125kVA (McDonald's) DG Set at Point B. The premise of Truck Terminus has three 15/60 kVA DG Sets at various locations. Electric lines run underground through Hume Pipes and trenches, and lead to the High Mast floodlights also.

The Underground Water Tank is located right adjacent to the Food Court facility with three Borewell/Raw water chambers and one STP treated water chamber. There are 2 Borewell chambers on the Food Court and 3 on the Truck Terminus premise, yet water supply is provided through mobile water tankers till date. All stormwater is collected and directed to the nearby tributary via Hume Pipes, while all wastewater is collected in a Sump Well first before it is directed to the STP, located on the lowest contour. Sewage is discharged via sewers running along highway.

4.4 Literature Case Study: Highway Star, Kolar-Tirupati Highway, Bangalore, Karnataka

Figure 4.28 (left): Shell Filling Station located at the access of the premises. (Source: Shell India)
Figure 4.29: Dynamic built form of the 'Highway Star'. (Source: BDP Architects)

4.4.1 Project Overview

Location: Kolar, Vadagur on Bangalore-Tirupati Highway

Site Area: 2.36 Acres (9,575 sq. m.)

Architects: BDP Architects, Delhi

Project Management Consultants: Potential PMC

Client: Highway Star Rest & Recreation Pvt. Ltd.

Land Ownership: Highway Star Rest & Recreation Pvt. Ltd.

Functional Provisions: Food Court, Fuel Station, Retail Outlets and Guest Rooms

Status: Completed in 2015

The project provides services along the main motorway connecting Bangalore to Tirupati in Southern India. With the aim of creating a preferred stop over for travelers, a dynamic built form is created with a sweeping profile with cantilevered spaces. The program includes a food court, retail outlets, rest pods and driver facilities. The varied functions are held together under an overarching floating roof which acts as a prominent design feature creating a landmark presence for the project.

Highway Star is a comprehensive stopover facility, nearly 75 kms away from Bangalore on the National Highway 04. It provides hospitality for a variety of travelers with its seamless infrastructure and wide selection of services. The project draws its strength essentially from its core demand to provide a pleasant break on a long journey. The key aspects considered while designing the facility were for it to stand out and become the preferred stop for travellers.

4.4.2 Relevance of Case Study

To study the organization of spaces for a Wayside Amenity with Retail Outlets and Rest Pods in a constrained area. The project is smaller in scale but provides a fair understanding of seamless transition between different spaces while maintaining an eccentric building profile.

4.4.3 Location and Proximity

Highway Star nestles along the Hoskote-Kolar-Mulbagal stretches on the Bangalore-Tirupati Highway. The stretch between Kolar and Mulbagal is a four-lane carriageway completed in 2009-10 by the NHAI. NH-04 has effectively reduced travel time esp. for pilgrims by nearly 40%, while earlier buses took around six hours and cars nearly four hours to reach Tirupati from Bangalore.

Figure 4.30: Site Location (Source: Author)

- 21 kms from Mulbagal Town.
- 11 kms from the District of Kolar.
- 4 kms from Village Vadagur.

4.4.4 Salient Features

• 45,000 sq. ft. retail led mixed use project.	• Guest Rooms, Lounge and Business Centre on F.F.
• Site area is 2 acres excluding Fuel Station.	• Facility a mix of covered and semi-open spaces.
• Retail Outlets and Food Court on G.F. for users.	• Curvilinear roof of 32,000 sq. ft. with skylights.
• Restaurants on G.F. and two with drive-in space.	• Enclosed and double height Food Court.
• Major restaurants with outdoor terraces on F.F.	• Exclusive parking for people with special needs.
• Retail outlets targets footfall near F&B area.	• Kids Play Area and lawn accommodated in the rear.

• Facilities for drivers including toilets and rest area.	• DG Set with metered supply.
• Services and Unloading area on the west of site.	• Shell Fuel Station of nearly 0.35 acres area.
• Toilets for special needs and drinking water facility.	• 500 turnover of vehicles per hour.

4.4.5 Site Details and Surroundings

Figure 4.31: Site Plan and Surroundings of the Highway Star (Source: Author)

4.4.6 Concept and Structural System

The initial chosen concept was derived from sweeps along the ground which emanate from a point and provide a dynamic form with cantilevered boxes at the end of the sweep. Similar lines are also manifested in the landscape. The other element developed, keeping in mind visibility, was the main roof which acts as a tree for most of the development and also creates a striking feature that will stand

out as a landmark. The pebble-like forms of the pods within the landscaped areas resemble the rock formations found on the way to the site from Bangalore.

The ground floor is clad in terracotta tiles to provide a warm palette while the upper levels are plastered and painted to provide a cost-effective finish. This also allows a colour contrast between the lower level and the cantilevered upper floor.

4.4.7 Project Drawings

Figure 4.32: Ground Floor Plan (Source: Author)

Figure 4.33: First Floor Plan (Source: Author)

Figure 4.34: Initial Concept Sketch 01 (Source: BDP Architects)

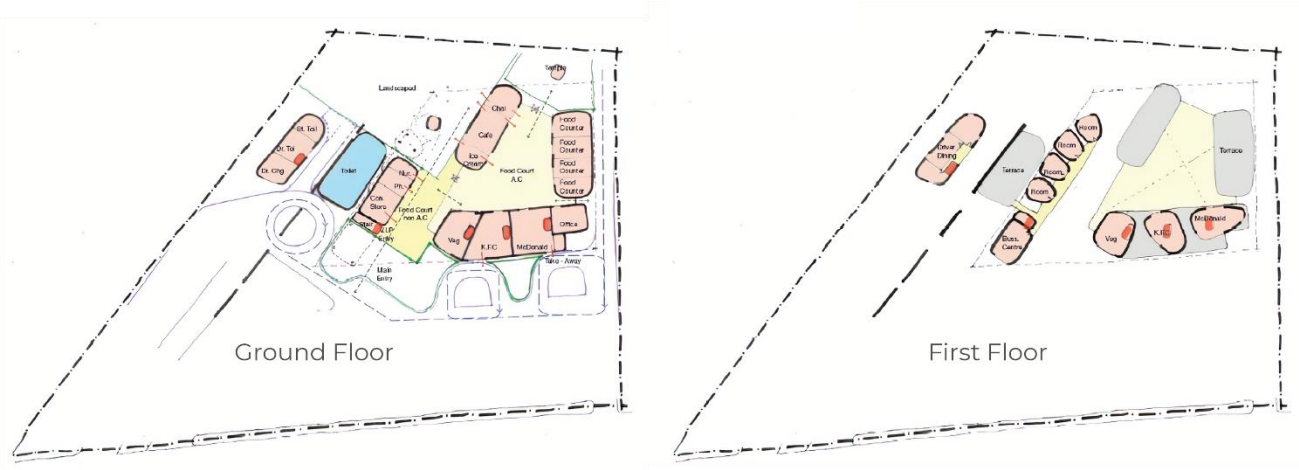


Figure 4.35: Initial Concept Sketch 02 (Source: BDP Architects)

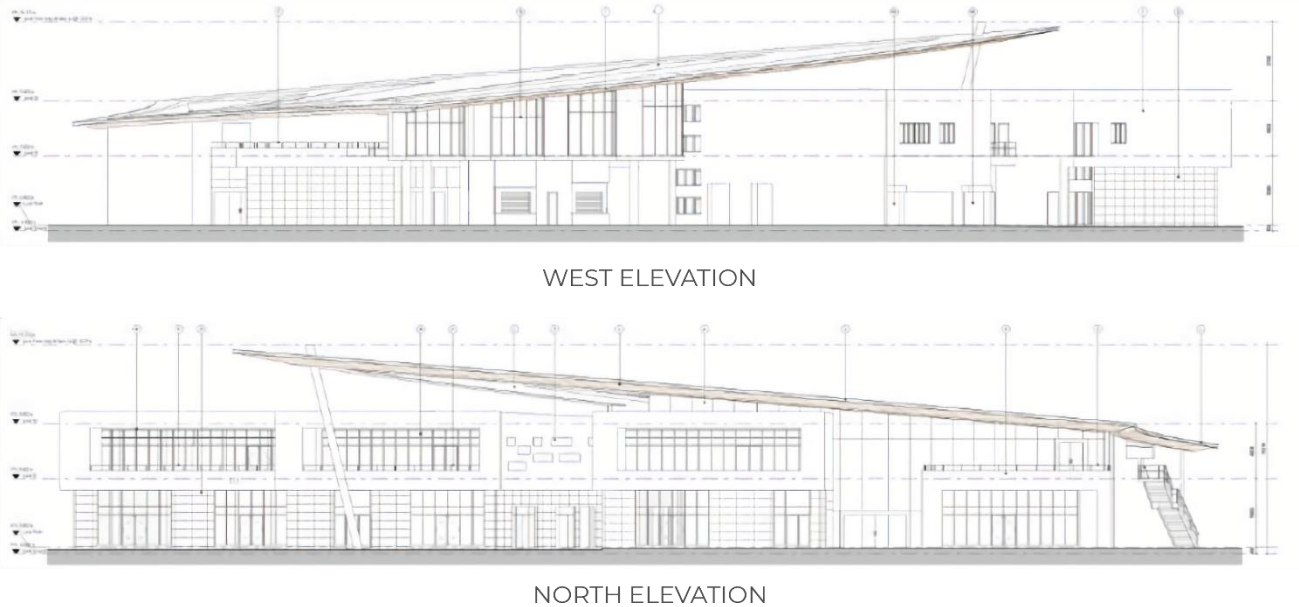


Figure 4.36: Building Elevations (Source: BDP Architects)

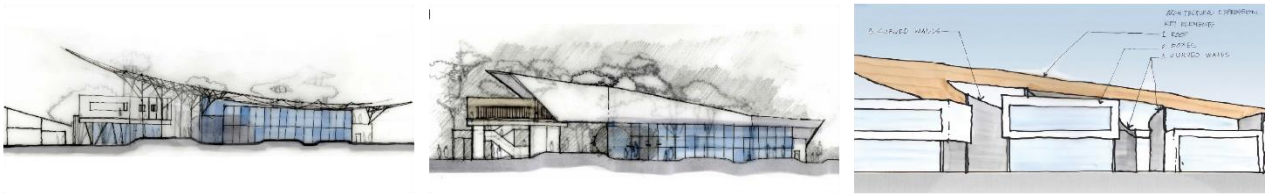


Figure 4.37: Concept Sketches (Source: BDP Architects)

Figure 4.38: Rendered View of the Front Facade (Source: BDP Architects)

Food Court: In terms of the layout and space planning, the design enables both indoor spaces and sheltered outdoor spaces for the food court. All the main restaurants get full visibility from the highway and also incorporate outdoor terrace spaces on the first floor. Internally, the restaurant on the first floor opens out to the double-height spaces within the food court which is, in turn, visually linked to the outdoor landscaped areas featuring an OAT. Skylights in the roof allow the space to feel light and airy.

Retail Outlets: Retail areas have been included and are visible from the main entrance and food court areas. They are planned in a way so as to benefit from the footfall in the F&B areas of the food court.

Figure 4.39: 3D Rendered View (Source: BDP Architects)

Rest Pods: These have been provided on the first floor and overlook the landscaped areas with views of the plantation to the west of the site. Other facilities such as a VIP lounge and a business center has also been planned adjacent to the pods.

Driver Facilities: These include washrooms and a dining area. The facilities have been planned to the west of the site and there is no overlooking into the customer areas such as the food court, outdoor landscape spaces and retail shops. Thus, they are positioned strategically.

4.5 Comparative Analysis

4.5.1 Inferences

A specific set of parameters act as a backboard of the qualitative study on which obtained data and observations are reflected to substantiate the implications drawn from them, in order to compare the Wayside Amenity Centres with fuel stations and their overall design schemes, services, circulation patters, functional and technical aspects.

A detailed analysis of the key design strategies and idea behind the organization of spaces for each facility helped infer key takeaways and fallacies for each case.

J Plaza

The J Plaza exhibits a straightforward and uncomplicated design with a convenient circulation pattern for its visitors. The incorporation of services in the basement such as the loading/unloading bay, electrical panel room, storage and packaging units, dining area for restaurant staff members and administration area allows no overlooking into the customer areas. The idea of having extensive glass facades on the exteriors make the interiors spaces well-lit, presenting sweeping views of the surroundings. The restaurants have an open design and wide expansive spaces offering sufficient seating capacity with ambient, elegant interiors. All major machinery such as the transformers, STP and generator sets have been strategically positioned on site, away from the sight of visitors.

However, the project presents a considerable number of fallacies also. The evident scarcity of space on site has resulted in insufficient parking for guests, with no parking facility in the basement level either. The facility has a common entry and exit route. Ramp leading to the basement has no exit. Washrooms, planned separately as an independent block, are misused by customers and inhabitants of neighbouring villages.

Key Takeaways:

- Straightforward and uncomplicated design.
- Convenient circulation patterns for visitors.
- Services incorporated in the basement including facilities for restaurant and administration staff allows no overlooking into the customer areas.
- Well-lit interiors owing to extensive glass facades.
- Glazing’s on the exterior offer sweeping views of the surroundings.
- Each restaurant with a wide, expansive spaces and sufficient seating capacity.
- All major mechanical equipment’s positioned strategically, away from the sight of visitors.

Fallacies:

- Insufficient parking for guests, no parking in the basement either.
- Common entry and exit route of the facility.
- Ramp leading to the basement has no exit.
- Washrooms, planned as an independent block, misused by customers and village inhabitants.
- Kids Play Zone is dysfunctional and planned incorrectly; secluded in the corner of the site.

Foodway

The Foodway exhibits a simple and uncomplicated design with a convenient circulation pattern for its users. The incorporation of anchor shops in the corners ensures that majority footfall crosses the entire facility instead of simply visiting the stores of their choice and leaving. A spacious and well-lit seating area in the centre of the food court make it an ideal space for dining while kiosks arranged along the front facade allow visitors to shop for sundry items especially on their way out. All Quick Serve Restaurants organized linearly provide a panoramic view for visitors just as they enter the food court. Service passages and loading/unloading area has been meticulously planned at the back of the facility for all restaurants along with facilities such as tray room, pantry, locker rooms and admin. area for the workers. A high and wide building roof head at 10.5m provides a welcoming view for all visitors. However, washrooms could be planned in the corners instead. Absence of lifts or escalators on site for vertical circulation prevents users with special needs and the elderly to access the first floor.

Key Takeaways:

- Simple and uncomplicated design.
- Convenient circulation pattern for users.
- Spacious, semi-open and double-height facility.
- Anchor Shops planned in the corners.
- Ventilated and well-lit common dining space.
- Kiosks arranged along the front facade / exit, for visitors to shop on their way out.
- Panoramic view of Quick Serve Restaurants from the arched entrance.
- Loading / Unloading Area and service passages organized in rear of the facility.
- Ample facilities for restaurant staff and workers.
- Thermally insulated, lightweight, high and wide roof offering a welcoming view.

Fallacies:

- Washrooms could be planned in the corners.
- Absence of vertical circulation mediums.
- Insufficient car parking at peak hours.
- No drop off points, visitors must cross rows of parking to access the facility.

Highway Star

Highway Star exhibits an eccentric design with a subtle interplay of open and enclosed spaces. The incorporation of services and drivers' facilities in the west of the site ensures no overlooking into the customer areas. Restaurants enjoy full visibility of the highway and also have outdoor terrace spaces on the first floor. Skylights in the roof allow ample light and ventilation inside the built structure. Retail areas are visible from the main entrance and are planned in a way so as to benefit from the footfall in the F&B areas of the food court. Guest rooms are organized on the first floor offering scenic views of the landscaping and plantation esp. on the west of the site. The sweeping roof of the structure stands out as an eye-catching architectural feature esp. for the travellers on the highway. The structure is equipped with large fenestrations. There is ample surface parking space for both cars and buses. However, the size and number of rooms are small and insufficient to cater to a large number of guests.

Key Takeaways:

- An eccentric design exhibiting a subtle interplay of open and enclosed spaces.
- Roof acts as an eye-catching architectural feature.
- Services and drivers' facilities in the west of the site ensuring no overlooking into the customer areas.
- Food Court amidst indoor and open spaces.
- Restaurants offer visibility of the highway with terraces on the first floor.
- Roof with skylights to allow light and ventilation.
- Retail Outlets visible from the entrance, and near F&B areas to benefit from their footfall.
- Guest Rooms on the first floor offer scenic views along with landscaping, west of the site.
- Subtle contrast in overall building appearance due to variation in materials on the ground and first floor.
- Structure equipped with large fenestrations.

Fallacies:

- Size and number of rooms small and insufficient to cater to a large number of guests.

4.5.2 Area Calculation

S. No.	Space	Foodway	Floor | Type	J Plaza	Floor | Type	Highway Star	Floor | Type	Standards	Proposed Areas
		Area (sq.m.)		Area (sq.m.)		Area (sq.m.)		Area (sq.m.)	Area (sq.m.)
1	**Site**								
	Plot Area	46,500	-	11,310	-	9,575	-	-	22,123
	Permissible G.C.	30%	-	30%	-	30%	-	-	30%
	Permissible FAR	1	-	1.5	-	1	-	-	1.5
									Minimum per Floor
2	**Food Outlets**							Per Person	
	Food Stall 01	48	GF [QSR A2 A]			45.6	GF	0.48	45
	Food Stall 02	82	GF [QSR A2 B]			45.4	GF	0.48	
	Food Stall 03	31 [Total=280]	GF [QSR]			45.4	GF	0.48	
	Food Stall 04	120.5	GF [McD]					0.48	
	Food Stall 05	120.5	GF [QSR B8]			48.9	GF	0.48	
	Restaurant 01	164	GF [Starbucks]	426 [320 Dining+106 Kitchen]	GF [Bikanerwala]	254	GF, FF, Terrace [Veg.]	1.35	150
	Restaurant 02	100	GF [Veg.]	263	GF [KFC]	277.2	GF, FF, Terrace [KFC]	1.35	
	Restaurant 03	255.6 [207 Dining + 48.6 Kitchen]	FF	120	GF [Subway]	343	GF, FF, Terrace [McD]	1.35	
	Restaurant 04	184.3 [135.6 Dining + 48.7 Kitchen]	FF					1.35	
	Restaurant 05	100.5 [44.2 Dining + 56.3 Kitchen]	FF					1.35	
	Kiosks	7.6 [Total=152 (76+76)]	GF	24	GF [CCD]			0.4	15
	Food Court / Common	2116.4 [1785+331.4]	GF, FF			400	GF	1	300
	Ice Cream Stall					17.7	GF	0.4	15
	Tea Shop					17.6	GF	0.4	15
	Coffee Shop					46.5	GF	0.4	30
	Admin. Area			13.7	Basement-1			0.3	10
	Staff Dining			19.8	Basement-1			0.18	20
	Tray Station	55.5	FF					0.1	50
	Packaging Unit			12	Basement-1			0.1	10
	Raw Material Storage	73	FF	82.4 [Bikanerwala], 118 [KFC]	Basement-1			0.09	75
	Cold Storage			23	Basement-1			0.06	25
	Changing Rooms	24.1	FF	3.21	Basement-1			0.15	20
3	**Retail Stores**							Per Person	
	Retail Shop 01					34.1	GF	1.4-7	50-75
	Retail Shop 02					21.2	GF	1.4-7	
	Retail Shop 03					21	GF	1.4-7	
	Retail Shop 04					67.3	GF [Enfield]	1.4-7	
	Convenience			33	GF	47.7	GF	1.4-7	35
	Pharmacy					34.2	GF	4.6-9	30
4	**Services**							Per Person	
	Toilets [Males+Females]	246 [23+123], 174.6 [91.5+83.1]	GF, FF	54.3 [32+22.3]	GF	124.2	GF, FF	0.4	60
	BoH Area	430	GF, FF					0.8	200
	Electrical Room	180		24	GF	34.9	GF		25
	Mechanic Shop					33.7	GF		25
	DG Room	283.6 [66+217.6]	GF	64.5	GF	43.4	GF	0.09	40
	Dry Garbage					12.2	GF	0.06	15
	Control / Panel Room			12	Basement-1	3.7	GF		10
	STP	130		24.2	GF	74	GF		50
	Loading/Unloading Bay	48.2	GF	132.85	Basement-1			0.13	75
5	**Amenities**							Per Person	
	Admin. Area	26.2	FF			35.1	GF	0.3	30
	Offices					126.3	FF [Buses]	1.5	750
	Rest Area	28	FF						20
	Lobby			26.4	GF			0.8	150
	ATM					3.7	GF	1.4	5
6	**Hotels**							Per Room	
	Guest Rooms					18.5	FF	35-45 (Motel)	35
	Toilets							0.4	5
	Common Room							0.5	100
	Reception							0.4	100
	Office / Admin. Area							0.3	50
	Meeting Rooms							1.1	200
	Café							1.1	150
	Kitchen							2.5	50
	Store							0.9	25
	Reading Room							0.3	150
	Lobby							0.8	100
	Lounge Area					112.82	FF	0.5	100
	Business Centre					25.7	FF	0.5	25
7	**Drivers' Facilities**							Per Person	
	Dining Space					38.5	FF	1.35	35
	Kitchen	1500	GF, FF			67.6	FF	0.58	50
	Toilets					43.4	FF	0.03	30
8	**Parking (No.)**								
	Cars	125	GF	40	GF	45	GF	3 ECS / 100 sq. m.	
	Buses / Trucks	10 Bus, 125 Truck	GF			10	GF		

Figure 4.40: Preliminary Area Calculations (Source: Author)

5 CONCEPT DEVELOPMENT

1. **Visibility and Perceptibility**
    - The shape of the built profile makes the structure easily visible and perceptible from a distance by fast moving travellers along the highway.
    - Visitors and ongoing commuters get a panoramic view of all the proposed facilities on site as they approach the site access to ensure an ultimate visual experience.
2. **Seamless Connectivity and Circulation**
    - Flowing and uninterrupted connectedness between the hotel, eateries and retail outlets ensures a smooth transition between spaces and ease of accessibility to a host of amenities.
    - The vehicular circulation has been organized efficiently to maintain a free-flow of traffic within the site premises considering a huge influx of floating population.
    - An overall legibility of the site and all its spaces is important to create a 'sense of place' in the minds of the users, given the wide variety of functions provided at the multipurpose facility. The same has been achieved by largely organizing spaces with similar functions together, intended to guide the visitors through various spaces with ease.
3. **Grand Entrances**
    - Double-heighted entrances at both the hotel and wayside amenity centre give a feeling of grandeur to the visitors as they enter the respective facilities.
4. **Concealed Services Cores**
    - All major services and back of the house operations have been organized strategically for the hotel and wayside amenity centre ensuring no overlooking into the customer areas.
5. **Supporting Charging Infrastructure**
    - Incorporation of a full-fledged charging infrastructure at the facility while leveraging the prime chunk of real estate effectively by allowing customers to avail a range of products and services at the stopover while their vehicles are being charged.
6. **Revival of Fuel Stations**
    - The project with a wide range of offerings is envisaged to provide new products and service opportunities to the fuel station, designed to be a part of the Wayside Amenity Centre, in lieu of changing trends in the fuel retail and automobile industry placing additional pressure on the probability and relevance of fuel stations altogether.
    - The fuel station is planned to be able to do much more in addition to fulfilling its basic utilitarian purpose.

Figure 5.1: Evolution of the Built Form and overall Design Scheme. (Source: Author)

Conceptual Views (Source: Author):

Figure 5.2: Interior Atrium of the Wayside Amenity Centre.

Figure 5.3: Hotel Façade and Porch Area

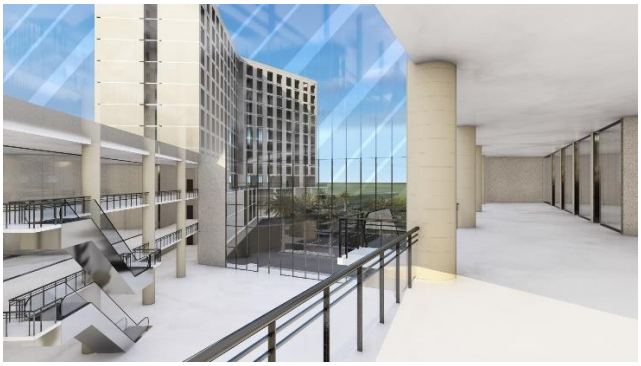


Figure 5.4: View of the Atrium and Hotel from the Retail Wing.

Figure 5.5: Double-heighted Hotel Lobby Entrance

Efficient space planning is imperative wherein the guests are free to move between the different spaces of the facility with ease to guarantee them a comfortable yet thrilling user experience.

The design proposal comprises of an RCC framed structure with veneer stone cladding and plaster finish on the exterior with extensive glass facades to offer scenic views of the lush green surroundings.

The complex primarily consists of enclosed, air-conditioned spaces given the tropical steppe, semi-arid and hot climate of Manesar.

6 DESIGN PROPOSAL

Based on the extensive study of the building typology and its spatial and functional requirements, the following aspects needed to be resolved in order to achieve a functional and aesthetically pleasing design:

- Site Context
- Climatic Conditions
- Connectivity and Accessibility
- Circulation and Management Patterns
- Relationship between Open and Built Spaces
- Incorporation of Building Services
- Construction Type and Building Materials

6.1 Relationship between Built Spaces

These aspects shape every element and space in the design and planning of the Wayside Amenity Centre. Considering the aforementioned aspects, the following relationship has been derived between the built spaces:

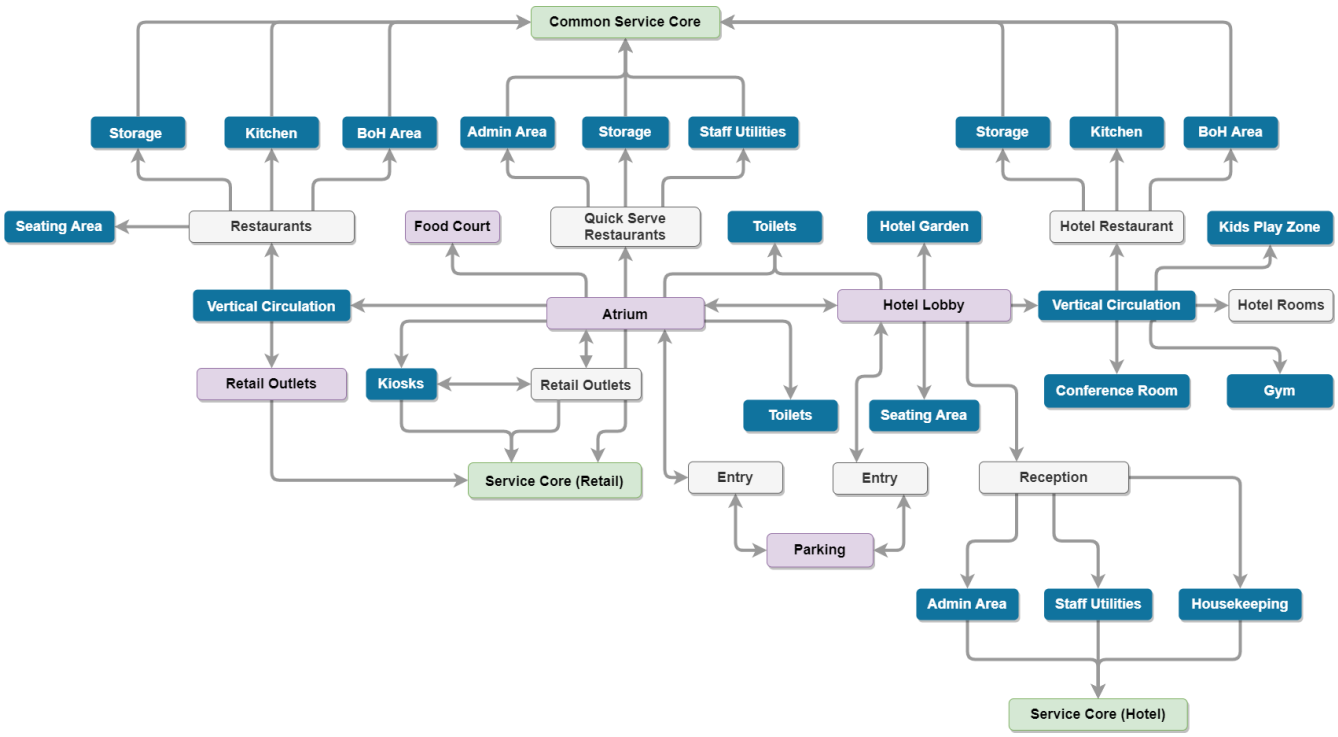


Figure 6.1: Relationship Diagram (Source: Author)

6.2 Proposed Functional Provisions

1. **Food Court**
   - Situated on the ground floor with a seating capacity of 320 persons.
   - 7 Quick Serve Restaurants abutting the Food Court with separate Preparation and Service areas.
2. **Retail Outlets**
   - Situated on every floor of the Wayside Amenity Centre of different sizes with carpet areas ranging from 25 to 110 sqm.

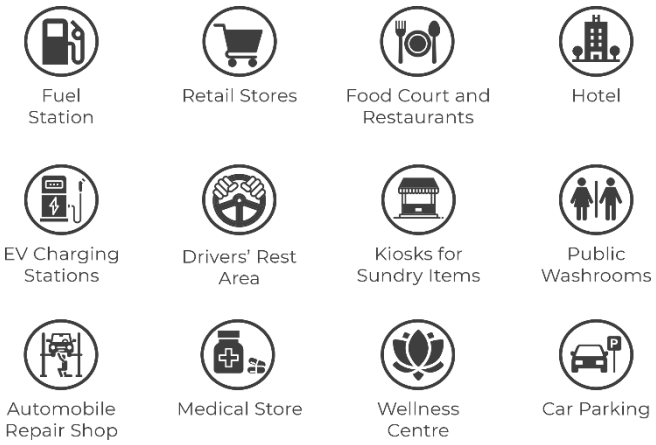


Figure 6.2: Proposed Functional Provisions (Source: Author)

   - Anchor shops organized in the corners of the Retail Wing to ensure consumers visit the facility in an end to end fashion.
   - 5 Kiosks arranged on the ground floor along with a Medical Store and a Wellness Centre.
3. **Restaurants**
   - 6 Restaurants accommodated as part of the Wayside Amenity Centre.
   - 3 Restaurants each situated on the first and second floor.
   - Each restaurant with a seating capacity of 180 persons each.
   - Commercial kitchens with an Assembly Line Layout.
4. **Hotel**
   - Hotel accommodation with a total of 240 guest rooms arranged on 8 floors.
   - Each typical hotel floor with 30 guest rooms.
   - Hotel Restaurant, Gym, Conference Room and a Kids Play Zone planned on the first floor of the Hotel Wing.
5. **Fuel Station**
   - Spanning nearly 1.37 acres, the fuel station houses a total of 18 fuel dispensing machines.
   - Automobile Repair Shop and Pollution Check Centre situated on the premise.
6. **Drivers' Rest Area**
   - The two-floor Rest Area has a dining capacity of 50 persons on the ground floor.
   - Dormitory is situated on the first floor with a capacity of 28 persons along with a provision of bunk beds for occupants.

7. Parking

- 76 surface car parking available on site with 8 bus parking spots near the drop-off and 9 as part of the Drivers' Rest Area.
- 435 basement car parking available including 167 stack and 101 standard car parks.
- EV Charging Stations situated strategically adjacent to a few surface car parking bays.

6.3 Area Statement

AREA CALCULATIONS			
TOTAL PLOT AREA	22123.75		
DESCRIPTION (SQM.)	COMMERCIAL PREMISE	FUEL STATION PREMISE	
AREA	16564.84 (4.09 ACRES)	5558.4 (1.37 ACRES)	
GROUND COVERAGE	30%	20%	
FAR	1.5	2	
PERMISSIBLE BUILADBLE AREA	4969.452	1111.68	
BUILT-UP AREA AVAILABLE	24847.452	11116.8	
SETBACKS	6M ON ALL SIDES	6M FRONT	
HEIGHT RESTRICTIONS	50M INCLUDING PARAPET	EQUIVALENT TO PERMISSIBLE GROUND COVERAGE WITHIN SETBACK LINE	
BUILT - UP AREA CALCULATIONS (SQM.)			
	WAYSIDE AMENITY CENTRE	HOTEL	DRIVERS REST AREA
BASEMENT	12720.24		-
GROUND FLOOR	3105.38	1713.87	148.08
FIRST FLOOR	2774.92	1360.82	148.08
SECOND FLOOR	2774.92	1713.87	-
THIRD FLOOR	-	1316.3	-
FOURTH FLOOR	-	1316.3	-
FIFTH FLOOR	-	1316.3	-
SIXTH FLOOR	-	1316.3	-
SEVENTH FLOOR	-	1316.3	-
EIGHTH FLOOR	-	1316.3	-
NINETH FLOOR	-	1316.3	-
TENTH FLOOR	-	1316.3	-
TOTAL GROUND COVERAGE ACHIEVED:	4967.33		
TOTAL BUILT-UP AREA ACHIEVED (EXCLUDING BASEMENT, ETC.)	24270.34		

Figure 6.3: Final Area Statement (Source: Author)

6.4 Project Drawings

(continued)

6.4.1 Site Plan

Figure 6.4: Site Plan (Units: M, Scale: NTS)

6.4.2 Ground Floor Plan

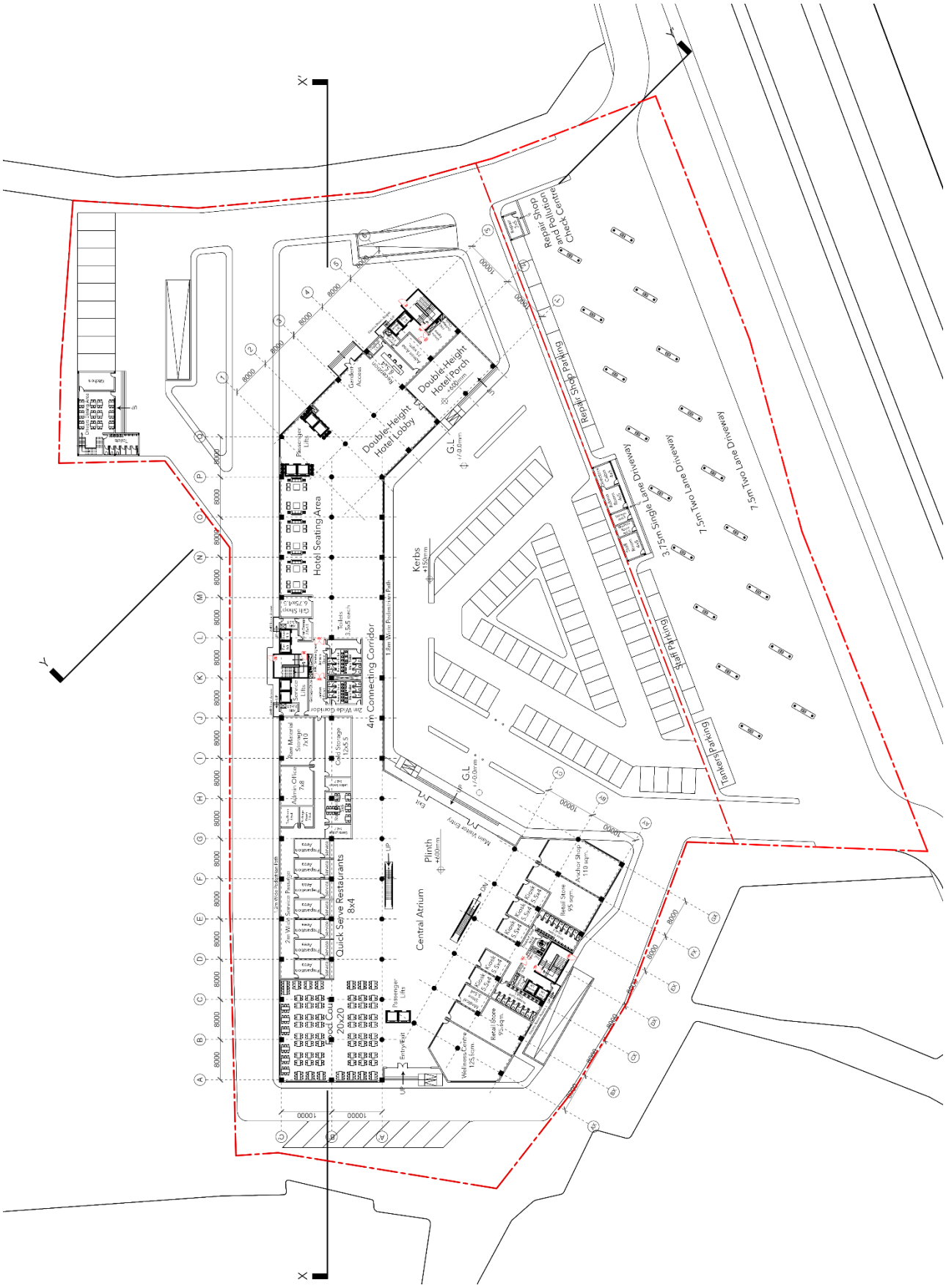


Figure 6.5: Ground Floor Plan (Units: M, Scale: NTS)

6.4.3 First Floor Plan

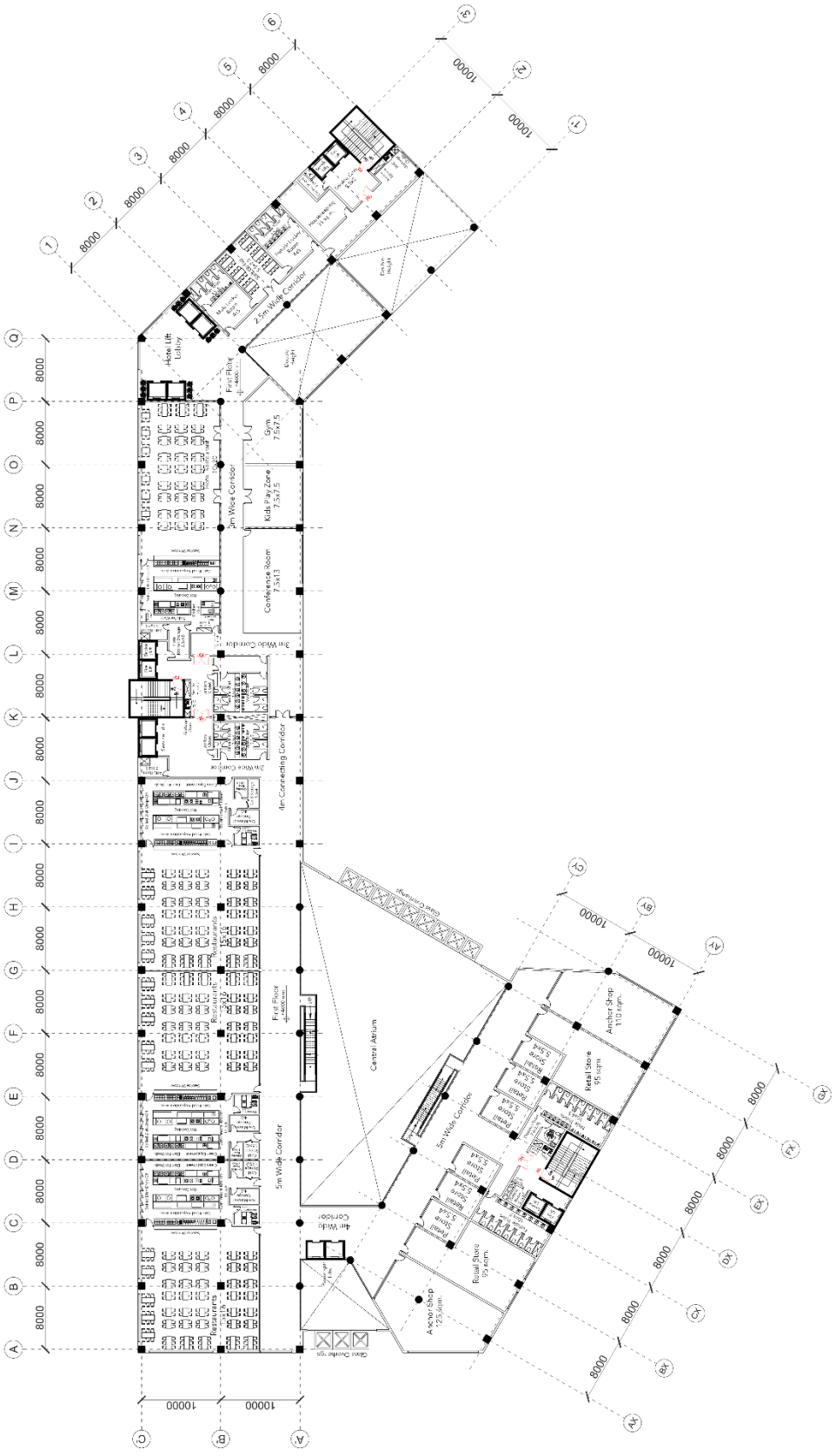


Figure 6.6: First Floor Plan (Units: M, Scale: NTS)

6.4.4 Second Floor Plan

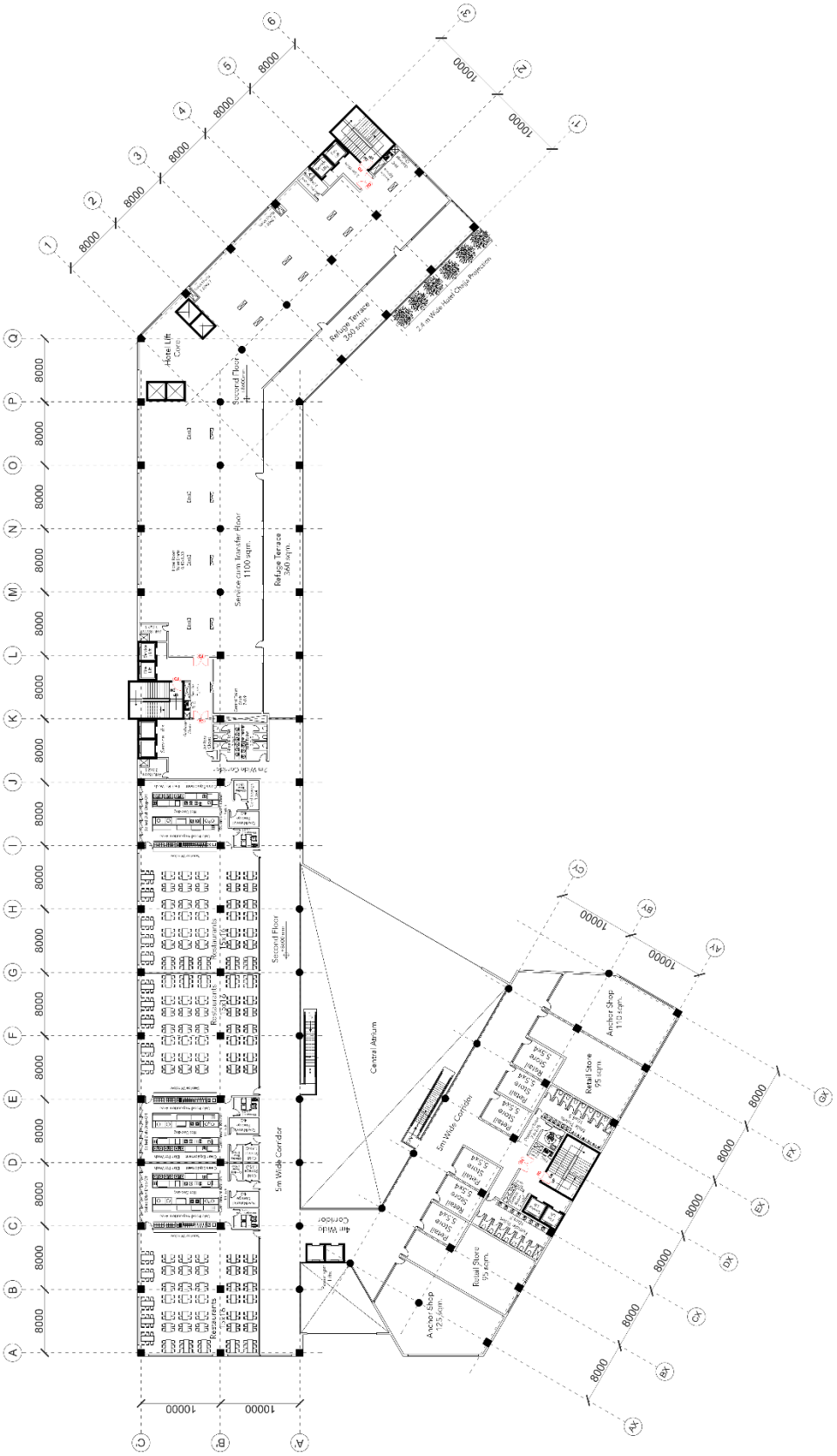


Figure 6.7: Second Floor Plan (Units: M, Scale: NTS)

6.4.5 Third Floor Plan

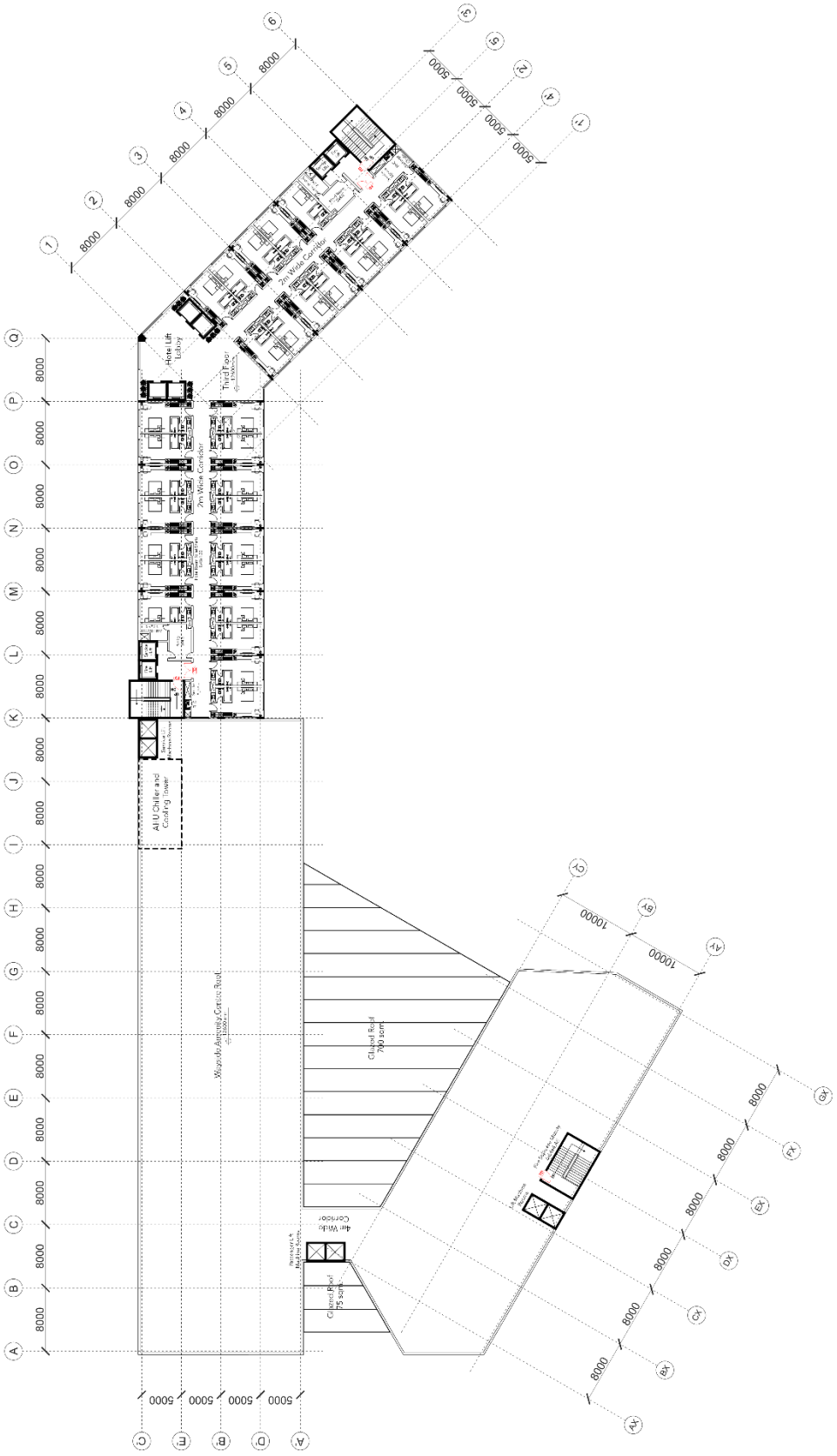


Figure 6.8: Third Floor Plan (Units: M, Scale: NTS)

6.4.6 Basement Floor Plan

Figure 6.9: Basement Floor Plan (Units: M, Scale: NTS)

6.4.7 Front Elevation

Figure 6.10: Front Elevation (Units: MM, Scale: NTS)

6.4.8 Rear Elevation

Figure 6.11: Rear Elevation (Units: MM, Scale: NTS)

6.4.9 Section XX’

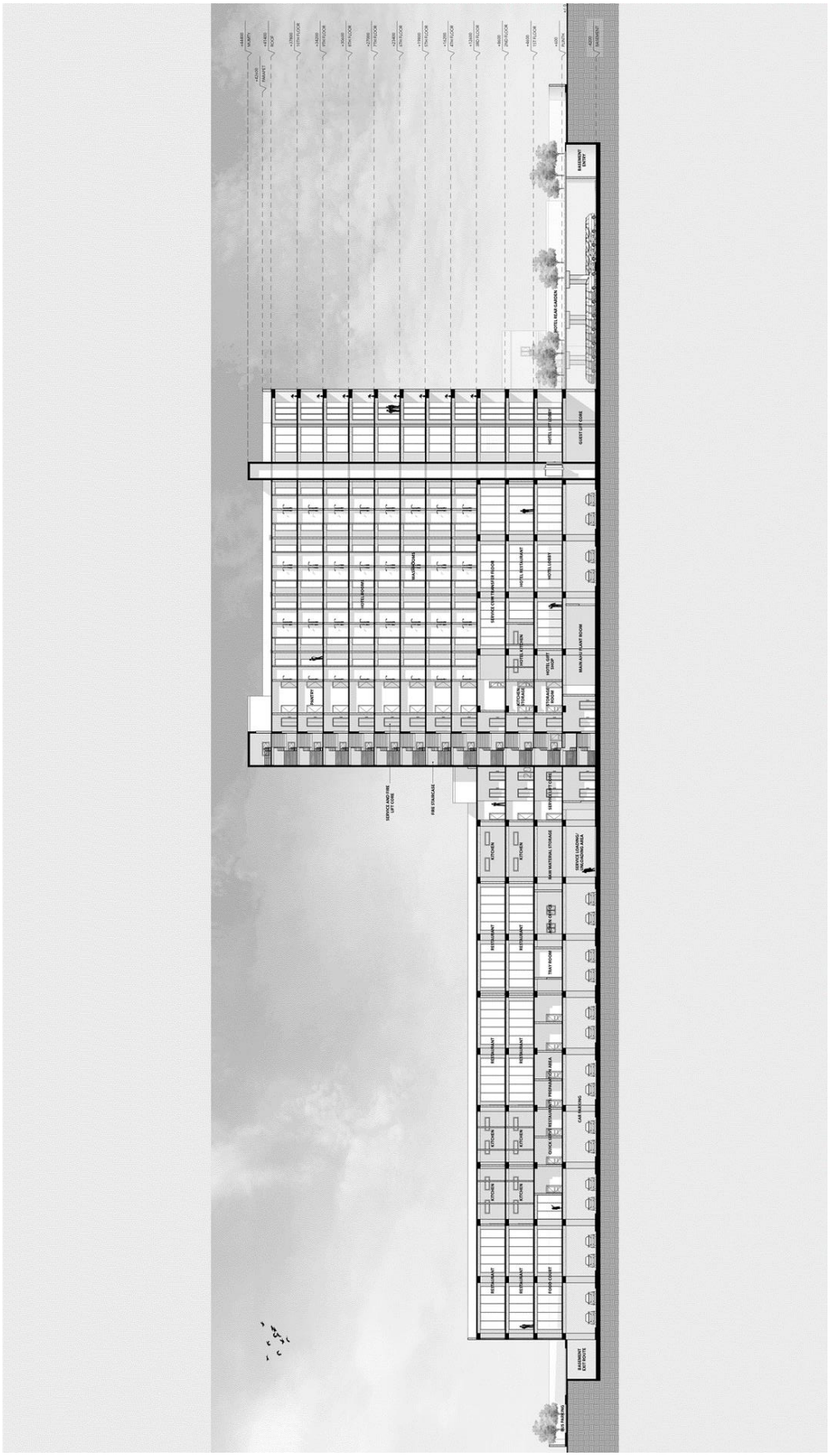


Figure 6.12: Section XX' (Units: MM, Scale: NTS)

6.4.10 Section YY'

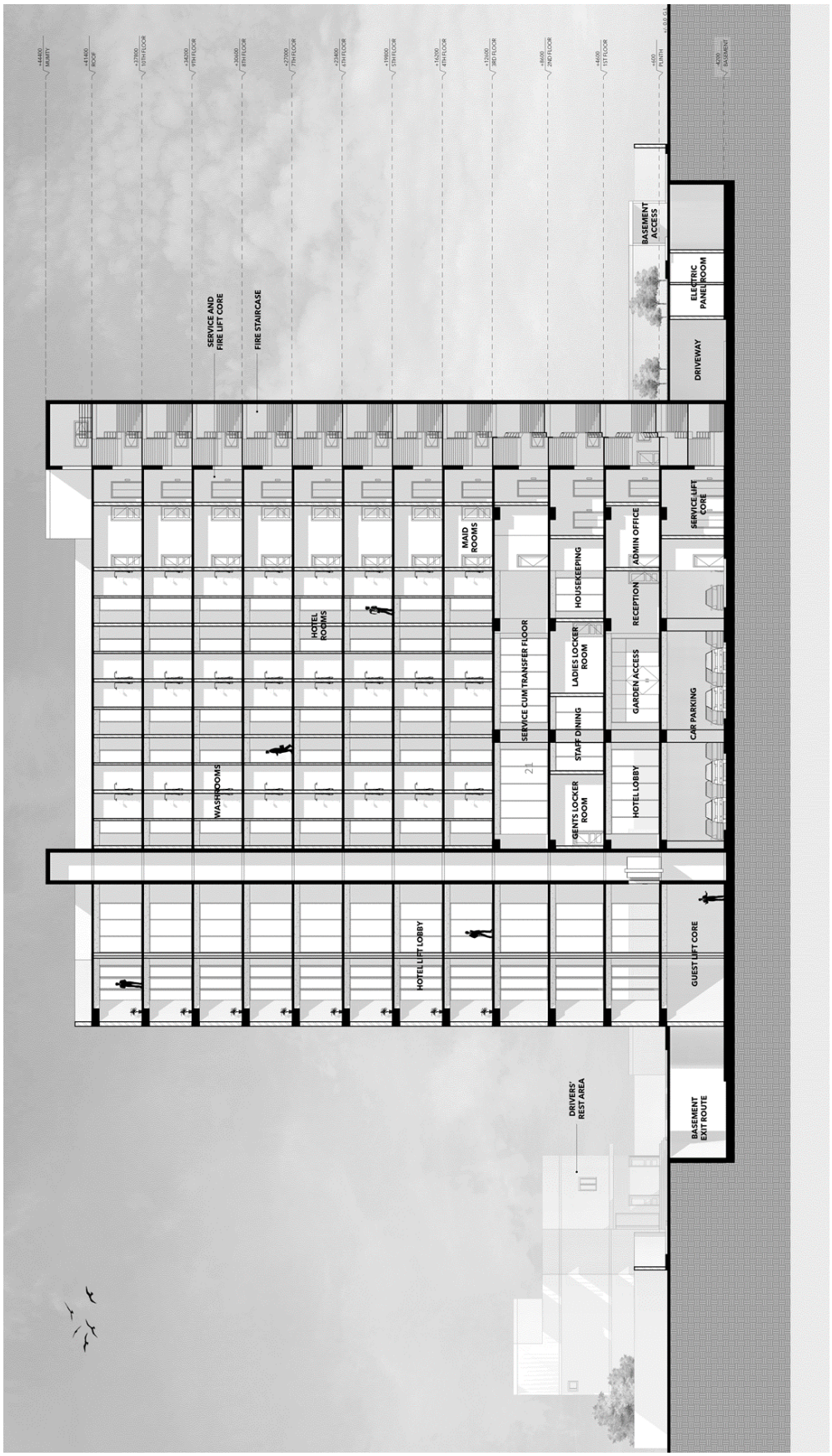


Figure 6.13: Section YY' (Units: MM, Scale: NTS)

6.4.11 Sectional Perspective

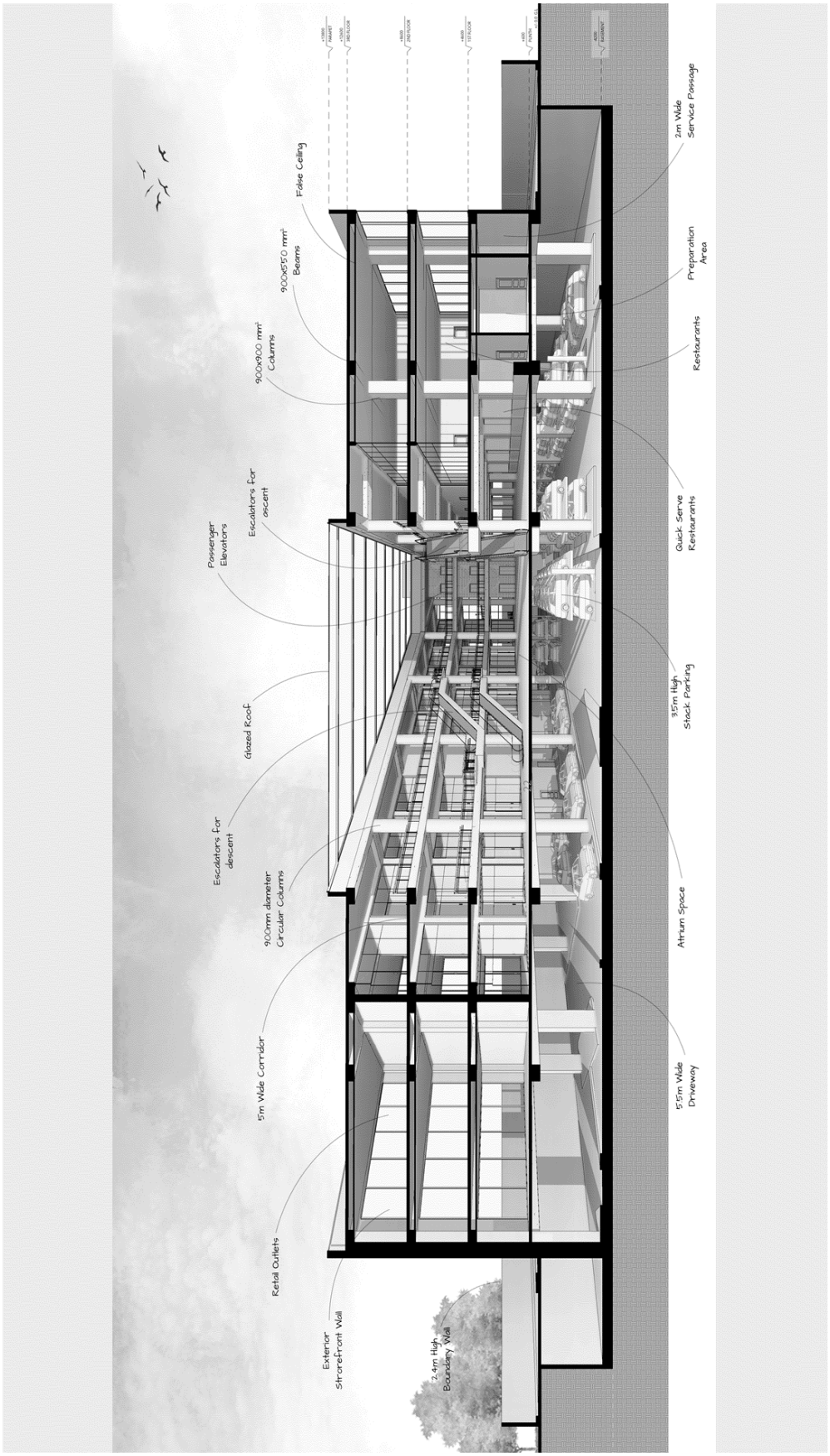


Figure 6.14: Sectional Perspective (Units: MM, Scale: NTS)

6.4.12 Drivers' Rest Area

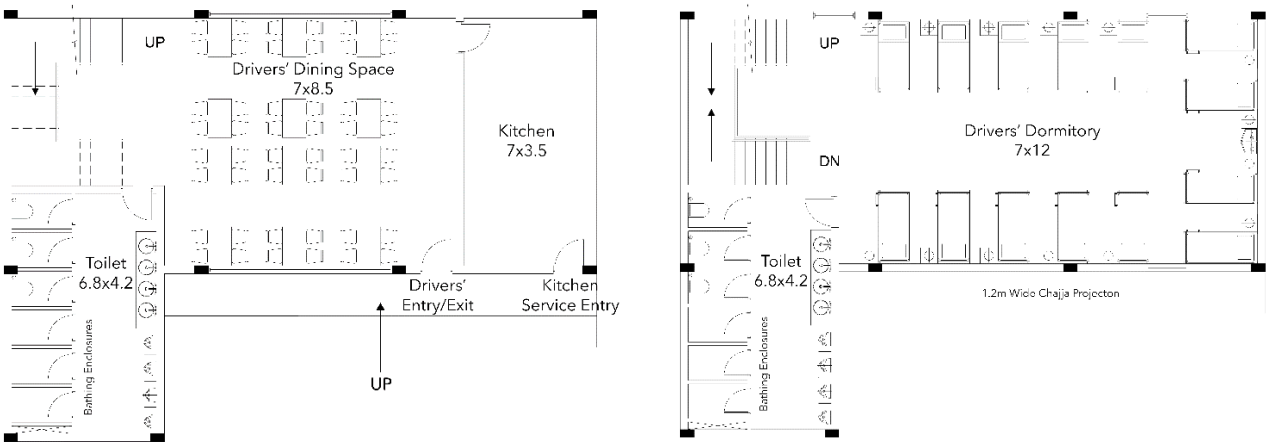


Figure 6.15 (left): Rest Area Ground Floor (Units: MM, Scale: NTS)
Figure 6.16: Rest Area First Floor (Units: MM, Scale: NTS)

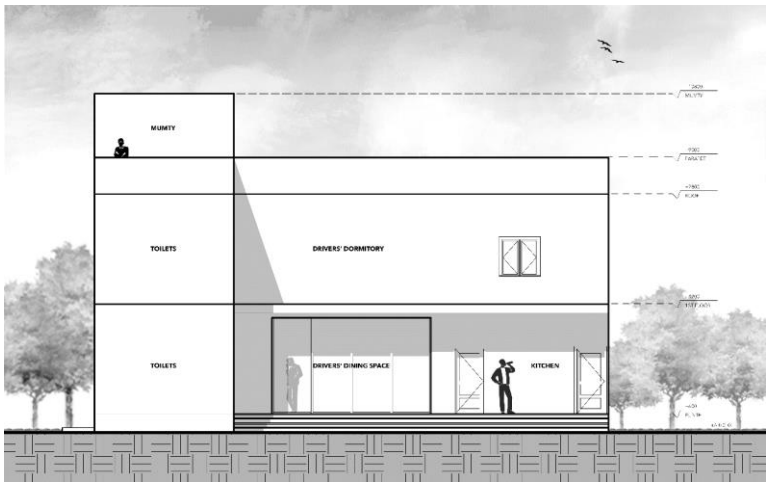


Figure 6.17: Rest Area Front Elevation (Units: MM, Scale: NTS)

6.4.13 Hotel Guest Room

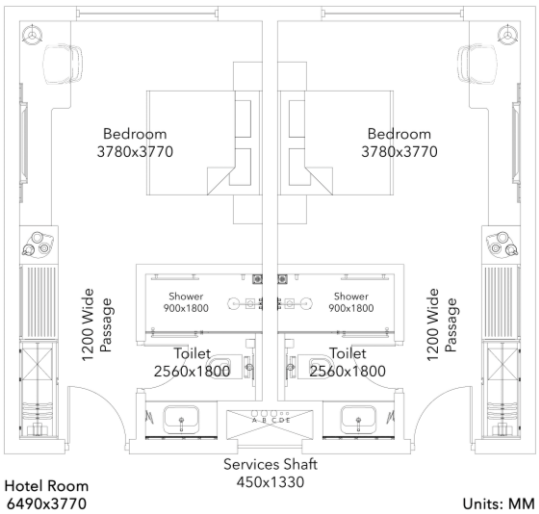


Figure 6.18: Hotel Guest Room Layout (Units: MM, Scale: NTS)

6.4.14 Building Services Layout

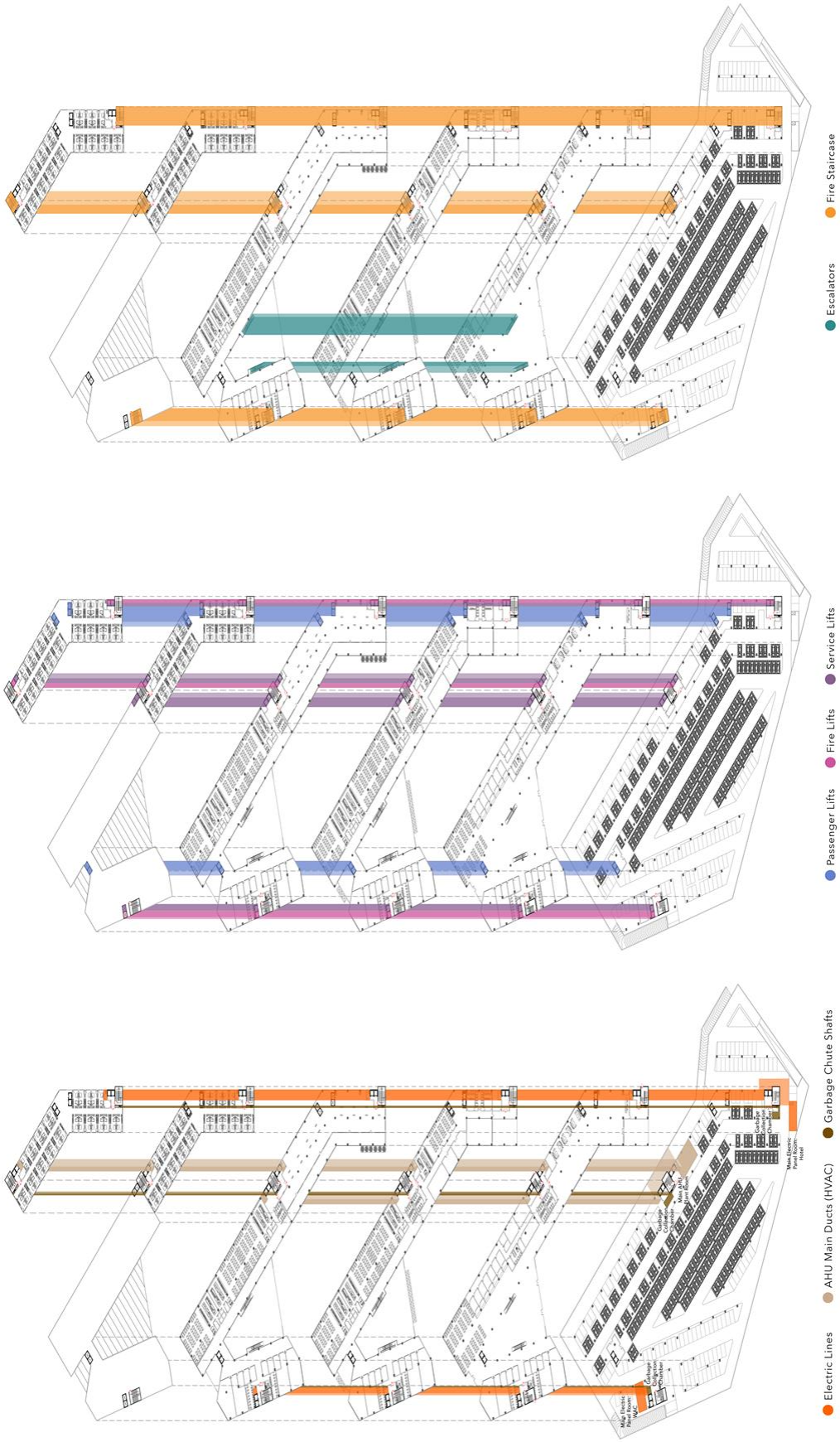


Figure 6.19: Building Services Layout

6.4.15 Views

Figure 6.20: Panoramic View of the Multipurpose Facility from the Site Entrance.

Figure 6.21: Porch of the Wayside Amenity Centre for Car Passengers.

Figure 6.22: Porch for Bus Passengers at the rear of the Wayside Amenity Wing.

Figure 6.23: View of the Drivers' Rest Area Facility with Bus Parking Bays abutting the Built Structure.

Figure 6.24: Hotel Porch and Building Facade.

Figure 6.25: Garden space at the back of the Hotel Wing.

6.5 Services Calculations

- **Electricity Load Calculations:**
  - Average Connected Load/ Consumer: **3 KW (Commercial)**
  - Maximum Population of the Facility at a time: 530 Hotel (480 Guests + 50 Staff) + 850 Retail (750 Visitors + 100 Staff) + 1080 Restaurants (Visitors) + 320 Food Court (Visitors) + 220 Staff
  - Total Population = 3000
  - Total Electricity Load Consumption in a day = 9000KW

- **Transformer**

1. Diversity Factor = 80%,
   9000 (80%) = 7200KW
2. Power Factor =0.85,
   7200/0.85 = 8470KVA
3. 10% Future Requirement,
   8470 + 10% = 9317KVA

3 Distribution Transformers of 3200kva required.

- **DG Set**

1. Diversity Factor = 80%,
   9000 (80%) = 7200 KW
2. 10% Future Requirement,
   7200 + 10% = 7920KVA

3 DG Sets Of 2750KVA required.

Power Factor: Power Factor is an expression of Energy Efficiency. It is expressed as a percentage. Power Factor (PF) is the ratio of Working Power, measured in kilowatts (KW), to Apparent Power, measured in Kilovolt Amperes (KVA).

Diversity Factor: Diversity Factor is defined as the ratio of the sum of the maximum demands of the various part of a system to the coincident maximum demand of the whole system. The maximum demands of the individual consumers of a group do not occur simultaneously. Thus, there is a diversity in the occurrence of the load. Due to this diverse nature of the load, full load power supply to all the consumers at the same time is not required.

- **Water Demand Calculations:**

1. **Average Water Consumption:** (As Per CGWA, Govt. Of India (Authority, 2016))
    - Hotel (Upto 3-Star): 180 LPCD (Excluding Laundry, Kitchen and Staff)
    - Laundry: No. of Rooms x 5kgs x 60 L/Kg/Wash
    - Restaurants: 70 LPCD
    - Food Court: 35 LPCD
    - Retail: 45 LPCD (Staff) And 15 LPCD (Visitor)
    - Staff: 45 LPCD
    - Visitors: 15 LPCD

2. **Total Water Consumption by all consumers (L):**
    - Hotel: 2,42,450 (86400 Guests + 2250 Staff + 9800 Restaurant + 144000 Laundry + 300 Conference Room)
    - Restaurants: 75600
    - Food Court: 11200
    - Retail Outlets: 15750

    Total: 345300 L

3. Since, 1 Cubic Meter =1000 L

Therefore, space required to store the water = 345.3 Cum.

66.6% For UGT and 33.3% For OHT: 228 Cum. (UGT) + 117.3 Cum. (OHT).

Based on the requirement and distribution of population density, provision of more than one water storage tank will be a more feasible option.

- **Fire Safety Requirements: (As Per NBC Norms (Standards, 2016))**

1. Hotel (Residential A-5 Category Building Type):

- Tank = 200000l UGT + 20000l OHT
- Pump: 1 Diesel And 1 Electric Pump of capacity 2280 L/min. with min. pressure 2 kg/cm^2 for UGT.
- 1 Electric Pump of capacity 180 L/min for OHT.

2. Wayside Amenity Centre (Assembly D-6 Building Type):

- Tank = 200000l UGT + 20000l OHT
- Pump = 1 Diesel And 1 Electric Pump of capacity 2850 L/min. with min. pressure 2 kg/cm^2 for UGT.
- 1 Electric Pump of capacity 180 L/min for OHT.

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ANNEXURE I

Building Design Norms

Minimum Area, Size, Height and Light and Ventilation of Different Components of Residential Premises:

Minimum area for a habitable room, kitchen and water closet shall be followed in accordance to table:

Sl. No.	Component of Building	Min. requirement for plots upto 50 sq m.	Min. requirement for plots above 50 sq m.
1	Habitable Room	Area 7.50 sq m. Width 2.10 m. Height 2.75 m.	Area 9.50 sq m. Width 2.40 m. Height 2.75 m.
2	Kitchen	Area 3.30 sq m. Width 1.50 m. Height 2.75 m.	Area 4.50 sq m. Width 1.50 m. Height 2.75 m.
3	Pantry	Area Not applicable Width Not applicable Height Not applicable	Area 3.00 sq m. Width 1.40 m. Height 2.75 m.
4	Bathroom	Area 1.20 sq m. Width 1.00 m. Height 2.20 m.	Area 1.80 sq m. Width 1.20 m. Height 2.20 m.
5	W.C.	Area 1.00 sq m. Width 0.90 m. Height 2.20 m.	Area 1.10 sq m. Height 0.90 m. Height 2.20 m.
6	Combined Bath & W.C. (Toilet)	Area 1.80 sq m. Width 1.00 m. Height 2.20 m.	Area 2.80 sq m. Width 1.20 m. Height 2.20 m.
7	Store	Area No restriction Width No restriction Height 2.20 m.	Area No restriction Width No restriction Height 2.2 m.
8	Projections	Permitted within the setbacks upto 0.75 m. width	Permitted within the setbacks upto 0.75 m. width
10	Garage	--	Area 14.85 sq m. Width 2.75 m. Length 5.40 m. Height 2.40 m.
11	Passage	--	Width 1.00 m.
12	Doorways Habitable rooms For kitchen bath, W.C. etc.	Width 0.80 m. Height 2.00 m. Width 0.75 m. Height 2.00 m.	Width 0.90 m Height 2.20 m. Width 0.75 m. Height 2.00 m
14	Staircase	Width 0.75 m. No restriction for internal ladder	Width 0.90 m.

Habitable Room:

- In case of air-conditioned rooms, the height shall not be less than 2.4 m. measured from the surface of the floor to the lowest point of air conditioning duct or false ceiling; and
- All doors and windows shall open directly or through a veranda or to a permanent open space or an open space abutting the building not less than m. in width.
- No portion of a room shall be assumed to be lighted, if it is more than 3 m. or as stated in National Building Code 2005, away from the opening provided for lighting that portion.

Kitchen:

- In case there is a separate store, the floor area of the kitchen shall be reduced to 4.5 square m.
- In case of houses constructed on plots up to 100 square m., the size of the kitchen shall be reduced to 3.8 square m.
- The kitchen which is intended for use as a dining space also shall have a floor area of not less than 9.5 square m. with a minimum width of 2.45 m.
- For the purpose of this regulation, a kitchen shall be deemed to be a habitable room and all the aforementioned requirements regarding ventilation shall apply to it provided that the minimum area of the kitchen shall not be less than 5.5 square m. with a minimum width of 1.8 m.
- Kitchen planning requires four stages of development:
  - Determine a process plan covering all major areas.
  - Check maximum and minimum personnel need per area.
  - Determine the equipment needed for each area.
  - Space allocation.
- Space allotment for the main kitchen:
  - 6 sq. ft. per restaurant seat.
  - 1 sq. ft. per guest room.
- Service lanes should not be less than 900 – 1350 mm.
- Net kitchen 15 to 30% to the restaurants.
- Kitchen and wash to be preferred at the same level as the restaurant.
- Dining Area: People must be able to eat comfortably. One person requires a table area of around 60cm wide by 40cm. deep. This provides sufficient clearance between adjacent diners. Although an additional 20cm of space in the center for dishes and tureens is sometimes desirable, an overall width of 80-85cm for a dining table. Round table, or table with six or eight sides, with a diameter of 90-120cm are ideal for four people and can also take one or two more diners.
- Restaurants should be planned so that variety of seating arrangement can be achieved.
- Large regular spaces should be broken up in small more intimate areas.
- Changes of level not usually favoured by caterers but acceptable providing, they may positive contribution to design. No more than 2 or 3 steps and main restaurant should be same level as kitchen.

Bathroom and Water Closet (W.C):

- Every bathroom and water closet shall:
  - Preferably be so situated that at least one of its walls shall have opening for circulation of external air, with provision of exhaust fan.
  - Not be directly over any room other than another W.C, washing place, bath or terrace unless it has a water-tight floor;
  - Have a platform or seat made of water tight non-absorbent materials;
  - Preferably be enclosed by walls and partitions and the surface of every such walls or partition, shall be finished with a smooth impervious material to a height not less than 1.5 m. above the floor of such room; and
  - Be provided with impervious floor covering sloping towards the drain with a suitable gradient and not towards veranda or any other room.
- Where the water-closet room in a building is not connected to exterior, it shall be ventilated by mechanical means or through a vertical shaft open to sky of a minimum size of 1.25 m. X 1.50 m. for ventilation to toilet, bath and water closet, but it shall be counted towards covered area.
- No room containing water-closet shall be used for any other purposes except as lavatory and no such room shall open directly into any kitchen or cooking space by a door/ window or another opening. Every room containing WC shall have a door completely closing the entrance to it.
- Soil or ventilating pipes shall not be allowed on the exterior face of any building, provided these shall either be embedded in the walls or pipe ducts to be provided to accommodate them.

Parking:

- In Integrated/ Multi Storey Commercial Building, Big Box Retail Stores and Shopping Mall 1 ECS for every 50 square m. of covered area shall be required.
- In shopping area and designated shopping markets being developed by competent authority, 65% of total site area shall be kept for parking purpose.
- For restaurant, parking shall be provided as 1 ECS for every 2 seats and for multiplex/ cinema/ theatre 1 ECS for every 4 seats.
- 3 Star Hotel will comprise of 1 ECS for every four guest rooms (Employees and Visitors).
- The covered parking in the basement or in the form of multi-level parking above ground level or stilt shall not be counted towards Floor Area Ratio (FAR).

- However, the footprint of separate parking building blocks shall be counted towards ground coverage.
- In case of provision of mechanical parking in the basement floor/ upper stories, the floor to ceiling clear height of the basement/ floor may be maximum of 4.75 m.
- No storage and commercial activities shall be permitted in the covered parking areas.
- The misuse of the covered parking space shall immediately attract levy of three times the penalty of the composition fee prescribed for the excess covered area in the respective category.
- For sites other than residential plots, 1 ECS = 23 square m. for open parking, 28 square m. for parking on stilts and 32 square m. for basement parking.
- The public entrance and the movement of staff and goods should be segregated.
- The parking pattern that will be most satisfactory fully warrants a careful thought. it depends upon many factors including the possible locations of access drives. At right angle turn off the driveway should be 25 feet wide and the curb should have a 30 feet radius.
- Slope of 1:8 to 1:12 is customary for ramps.
- Central driveway with 2 rows of cars and 90 parking gives the best economical layout.
- Diagonal parking is easier for drivers, reduces the necessary width, but requires more total space.

Courtyard:

- The courtyard shall have a minimum area, throughout its height, of not less than the square of one-fifth the height of the highest wall abutting the courtyard.
- Provided that when any room (excluding staircase bay, bathroom and water closet) is dependent for its light and ventilation on an inner courtyard, the dimension shall be such as is required for each wing of the building.
- Provided that such courtyard shall not be less than 12.0 square m. in area and the minimum width of every such courtyard in any direction shall not be less than 3.0 m. In determining the said aggregate, floor area of the rooms and veranda abutting on the courtyard, following shall be considered:
    - Only one half of the floor area of such rooms and verandas as abut on another courtyard or an open space or road not less than 6 m. in width shall be taken in account;
    - The area of the courtyard for the purposes of this code shall be the area open to sky, clear of all projections.

Plinth:

- The plinth of the main building shall be so located with respect to surrounding ground level that proper drainage of the site is assured. The height of the plinth shall not be less than 450 mm and more than 1.5 m.
- The plinth of court-yard shall be at least 150 mm above the level of the street from where entry to plot has been taken and shall be satisfactorily drained.
- In no case, any part of the ramp/ steps connecting building plinth to street/ road shall lie on street/ road and obstruct traffic movement.

Basic Room Layout:

- Hotel offer different types of accommodation, including bedrooms, suites.
- The size and number of beds largely dictates dimensions and layout of rooms, e.g. twin 100/200cm, double 150/200cm, queen-size 165/200cm, or king size 200/200cm.
- Rooms may include a sitting area with chairs, a desk, T.V., self-services drinks refrigerator and suitcase stand. Corridor space should be about $6m^2$/ room, and normally at least 1.5-1.8m wide. Separate route should be provided for guest, staff and goods.

Boundary Wall, Fence, Gate and Porch:

- Maximum permissible height of front side boundary wall shall be not more than 1.2 m. from the mean level of abutting street in front of the plot from where entry to the plot has been taken. The owner/ applicant if desires, is permitted to not construct boundary wall in front of plot, so that the said area can be utilized for parking.
- Maximum height of boundary wall at rear and side of plot shall not be more than 1.8 m. from the mean level of abutting street in front of the plot from where entry to the plot has been taken. In case of plots above 2000 square m., maximum height of boundary wall at the rear and side of plot shall not be more than 1.8 m. from the abutting ground level.
- A railing/ grill with or without poly carbonate/ fibre glass sheet covering of 0.75 m. height shall be permitted over and above the maximum height of boundary wall at all sides.
- Boundary wall upto the height of 2.4 m. may be permitted by the Competent Authority in industrial buildings, electric sub-stations, transformer stations, institutional buildings like hospitals, industrial buildings like workshops, factories and educational buildings like schools, colleges, including hostels and other uses of public utility undertakings and strategically sensitive buildings.

Staircase:

- Every building intended to be used as multiple residential building or commercial or educational and institutional or industrial building shall be provided with required number of staircase (accessible from a maximum distance of 30 m. (45 m., if building has automatic sprinklers for firefighting) from any part of the building, extending from ground floor level to the highest floor, having following specifications:

  Residential and Commercial Plots above 51 sqm. Area:

  - Minimum permissible clear width of staircase: 1.2m.
  - Minimum permissible width of tread: 0.3m (without nosing).
  - Maximum permissible height of riser: 0.15m.

  Assembly Building:

  - Minimum permissible clear width of staircase: 2m.
  - Minimum permissible width of tread: 0.3m (without nosing).
  - Maximum permissible height of riser: 0.15m.
- The minimum head-room in a passage under the landing of a staircase shall be 2.1 m. The minimum clear head-room in any staircase shall be 2.1 m. The maximum numbers of risers in single flight are limited to 14.
- If a service or a spiral staircase is provided, its width shall not be less than 1.0 m. and its average tread width shall not be less than as mentioned.
- Notwithstanding anything contained in sub-code, the staircases in the private portion of a public building and industrial building not open to the general public, may be of the sizes mentioned for residential building.
- For residential plot sizes upto 100 square m., there is no restriction for maximum permissible height of riser, subject to the condition that it shall not cause inconvenience to user.

Ramps:

- Every building having more than 15 m. height shall be provided with a lift or a ramp with an inclination of 1:10 in addition to the staircases. In all residential buildings having more than 15 m. height, lift is mandatory to install in numbers depending on the occupancy of building.
- In case of public building with only ground floor, ramp shall be provided for reaching its plinth level. Further, in case of public building being more than one storey, lift or ramp shall be provided.

- The ramp to basement and parking floors shall not be less than 7.2 m. wide for two-way traffic and 4 m. wide for one-way traffic, provided with minimum gradient of 1:10.
- Ramps may also be provided in the setbacks which can be sloped considering unhindered movement of fire engine and in no case the gradient shall be less than 1:10. (to be read with basement).
- All structural design/ safety aspects as per latest Bureau of Indian Standards Codes and National Building Code, 2005 (as amended from time to time) shall be complied along with consideration of weight of Fire Engine and its manoeuvring.
- A ramp shall have handrail on at least one side, and preferably two sides with minimum height of 0.90 m., measured from the surface of the ramp. The handrails shall be smooth and extend to 0.30 m. beyond the top and bottom of the ramp. Where major traffic is predominantly children, the extra handrail shall be placed 0.76 m. height.
- Where ramps with gradients are necessary or desired, they shall conform to the requirement that a ramp when provided shall not have a slope greater than 1:20 or maximum of 1:12 for short distance up to 9 m.

Lifts:

- Every building having more than 15 m. height shall be provided with a lift or a ramp with an inclination of 1:10 in addition to the staircases. In all residential buildings having more than 15 m. height, lift is mandatory to install in numbers depending on the occupancy of building.
- Wherever lift is required as per Code, provision of at least one lift shall be made for the wheel chair users, with the following cage dimensions, recommended for passenger lift of 13 persons capacity by the Bureau of Indian Standards:
  - Clear internal depth 1.1 m.
  - Clear internal width 2.0 m.
  - Entrance door width 0.9 m.
- A handrail not less than 0.6-m.-long and 1 m. above floor level shall be fixed adjacent to the control panel.
- The minimum size of lift lobby shall be 1.8 m. x 2.0 m. or more.
- The interior of the cage shall be provided with Braille symbols and auditor signage that audibly indicates the floor. When the cage reached on floor, it shall indicate that the door of the cage for entrance/ exit is either open or closed.

Passages and Corridors:

- The minimum width of corridors and passages in a residential building shall be at least 1.25 m. and these shall be of fire-resistant material.
- Minimum width of any corridor and passage in case of residential building with multiple dwelling units and for other type of building, shall be as given below:

  Residential and Commercial Buildings:

  - Minimum permissible width of passage and corridor: 1.25m.

  Assembly Building:

  - Minimum permissible width of passage and corridor: 2m.
- The clear headroom height of passage and corridors shall, in no case, be less than 2.15 m.
- All surfaces including ceiling shall be of fire resistance materials.
- All the passages and corridors shall be naturally lighted and ventilated and if not possible, provision for artificial lighting and mechanical ventilation shall be made.

Exit:

- The requisite number and size of various exits shall be provided, based on the occupants in each room and floor based on the occupant load, capacity of exits, travel distance and height of buildings as per provisions of Part 4 Fire and Life Safety, National Building Code as amended with time.
- At least one primary entrance and exit to each building shall be usable by individuals in wheelchairs, indicated by a sign and on a level that would make the elevators accessible.
- Exits shall be so located so that the travel distance on the floor shall not exceed 22.50 m. for residential, educational, institutional and hazardous occupancies and 30.0 m. for assembly, business, mercantile, industrial and storage occupancies. Whenever more than one exit is required for a floor of a building they shall be placed as remote from each other as possible. All the exits shall be accessible from the entire floor area at all floor levels.
- The travel distance to an exit from the remote point shall not exceed half the distance as stated above. Provided for fully sprinklered building, the travel distance may be increased by 50 percent of the values specified.
- No exit doorways shall be less than 1 m. in width except assembly and institutional buildings where it shall not be less than 2 m.

- Exit doors shall open outwards, that is away from the room but shall not obstruct the travel along any exit. No door when opened shall reduce the required width of stairway or landing to less than 0.90 m. Overhead door shall not be installed.

Means of Access:

- No Building shall be erected as to deprive any other building of its means of access.
- If there are any bends or curves in the approach road, sufficient width shall be permitted at the curve to enable the fire tenders to turn, the turning circle shall be at least of 9.0 m. radius.
- Other provisions of means of access for buildings other than plotted residential and commercial:
    - The approach to the building and open spaces on its all sides upto 6.0 m. width, shall have composition of hard surface capable of taking the weight of fire tender, weighing upto 22 tonnes for low rise building and 45 tonnes for building 15 m. and above in height. The said open space shall be kept free of obstructions and shall be motor-able.
    - Main entrance to the premises shall be of adequate width to allow easy access to the fire tender and in no case, it shall measure less than 6.0 m. The entrance gate shall fold/ slide back against the compound wall of the premises, thus leaving the exterior access way within the plot free for movement of the fire service vehicles. If archway is provided over the main entrance, the height of the archway shall not be of height less than 5.0 m.
    - In case of basement extending beyond the building line, it shall be capable of taking load of 45 tonnes for a building of height 15.0 m. and above and 22 tonnes for building height less than 15.0 m.
- Every person who applies for permission for erection or re-erection of building shall also submit NOC for accessing the road (whether National Highway, State Highway) if applicable from the concerned authority.
- In no case, development on plots shall be permitted unless it is accessible by a public street of width not less than 6 m.
- For all assembly buildings like, theatres, cinema houses, assembly halls, stadia; educational buildings; markets, hospitals; industrial buildings and other buildings which attract large crowd, the means of access shall not be less than the following:

Width of Means of Access (m)	Length of Means of Access (m)
12.0	200
15.0	400
18.0	600
24.0	Above 600

- Further, in no case shall the means of access be lesser in width than the internal accessways in layouts and subdivision.

Light and Ventilation of Building:

- Every room that is intended for human habitation shall abut on an interior or exterior open space or on to a veranda open to such interior or exterior open space.
- The setback area can be sunk for light, ventilation and access to basement, provided fire tender movement is not hindered.
- The whole or part of one side of one or more rooms intended for human habitation and not abutting on either the front, rear or side open spaces shall abut on an interior open space whose minimum width in all directions shall be 3.0 m. in case of buildings not more than 15 m. in height, and in case of buildings above 15 m., the provision of code shall apply accordingly.
- Sunken courtyard up to the lowest floor of basement(s) shall be allowed as 'light well' within building envelop for light and ventilation for basement area.
- Other provisions of light and ventilation for buildings other than plotted residential and commercial:
- If exterior open-air space is intended to be used for the benefit of more than one building on same plot/ site, then the width of such open-air space shall be the one specified for the tallest building abutting on such open-air space, shall be as given below:

Height of Building (m)	Exterior Open Spaces to be left on all sides of Building Blocks (front, rear and sides in each plot) (m)
15.0	5
18.0	6
45	13
50	14

- For ventilating the spaces for water closets and bathrooms, if not opening on the front side, rear and interior open spaces, shall open on the ventilation shaft, the size of which shall not be less than the values given below:

Height of Building (m)	Minimum size of Ventilation Shaft (sqm.)	Minimum Width of Shaft (m.)
Upto 18.0	4.0	1.5
Above 30.0	9.0	3.0

- For buildings above 30.0 m. height, mechanical ventilation system shall be installed on ventilation shaft.
- For fully air-conditioned buildings the ventilation shaft shall not be required, provided the air-conditioning system works on uninterrupted source of power supply.
- Horizontal ducting for ventilation may be installed in building with exhaust fan of appropriate capacity for discharging used air to external face of building.

Cantilevered and Chajja Projections:

- No building veranda, chajja or other projections from the face of the building shall be allowed to be erected or re-erected on or over a road or beyond the boundaries of the applicants' own land/ plot.
- Balcony of a width of maximum 1.80 m. in front and rear sides of a plot can be permitted within the plot, provided the width of balcony do not exceed half of the width of setback.
- On plots of the size of 300 square m. or above, where side setback has been provided, a balcony of maximum width of 1.5 m., in side set back shall be permitted (not included in FAR).
- Sun-shades over opening shall be allowed subject to the following:
    - Sun-shade of 0.23 m. width is permitted over any road/ over any park/ public place.
    - Sun-shade if provided, shall be at a height of 2.3 m. from the ground level shall be permitted to project up to a maximum of 0.45 m. within the applicants' own land, provided it does not exceed half of the width of setback/open space.

Mezzanine Floor:

- A mezzanine floor or internal balcony shall not be permitted unless the height of the room is at least 5.0 m. and such mezzanine floor or balcony do not cover more than 0.5 of the room areas. The area of such mezzanine floor shall be counted towards FAR.
- The clear height of such mezzanine floor or internal balcony shall not be less than 2.3 m. from the floor level to the soffit of ceiling.

Motor Garage and Repair Shops:

- The minimum size of a private motor garage shall be 2.75 m. x 5.0 m. The clear height of the garage shall not be less than 2.40 m. The plinth of the motor garage shall not be less than 150 mm above the average ground level.
- A garage shall be permitted within zoned area and shall be counted towards covered area.
- Garage shall not be used for habitable purposes.

Basement:

- The construction of the basement shall be allowed by the Competent Authority in accordance with the provisions of Zoning Plan.
- The basement shall be constructed within the zoned area and may be put to following uses:
    - Storage of household or other goods of ordinarily non-combustible material;
    - Strong rooms, bank cellars, etc.;
    - Air-conditioning equipment and other machines used for services and utilities of the building.
- Modern automated laundry shall be allowed only in the basement of Hotel and Hospital/ Nursing Home sites, group housing, service apartment, as an ancillary services for the purpose for which permission is granted by Competent Authority and meant for in-house services only subject to the condition that the effluent of the laundry shall be properly pumped up to ground floor inspection chambers and discharged to the main sewer;
- Car wash, security room, ticketing booth, driver waiting room, toilets, loading/ unloading activities, lift/ escalator lobbies and parking.
- The basement may be used for habitable purpose subject to fulfilment of fire safety, light & ventilation and exit provisions on opposite directions. However, in case basement is used for

habitable purpose, the area utilized will be counted towards total covered area of building i.e. FAR. The basement is used for uses other than specified above, shall be considered for habitable use and shall be counted towards FAR, subject to fulfilment of fire safety, light and ventilation and exit provisions on opposite directions.

- An open area of a minimum width of 1.8 m. shall be provided across the full length and/ or width of the basement storey. This area shall be within the limits of the site and shall be paved with impervious material above a concrete bed. It shall be completely unobstructed except that in this area steps may be allowed for access to it, if considered necessary.
- In the case of buildings governed by the zoning, basement storeys shall be lighted and ventilated by means of windows of the minimum area within 1/10th to 1/25th of the total floor area, at least half of which must open subject to the condition that the deficit of light and ventilation shall be made up by providing artificial lighting and mechanical ventilation as per provision of National Building Code of India.
- Adequate ventilation shall be provided for the basement. The ventilation requirements shall be the same as required by the particular occupancy according to code. Any deficiency may be met by providing adequate mechanical ventilation in the form of blowers, exhaust fans, air-conditioning systems, etc.
- The walls of the basement story shall be properly damp proofed and if in contact with the soil, they must be effectively secured against dampness from the soil with the approved vertical and horizontal damp proof course.
- The minimum clear height of the basement shall be 2.4 m. and maximum clear height of the basement shall be up to 4.75 m. from floor to the underside of the roof slab or ceiling subject to structural stability to be certified.
- The minimum height of the roof of basement shall be 0.9 m. and maximum 1.5 m. above the average surrounding ground level for plots upto 1000 sqm.
- For plots above 1000 sqm., the roof of basement shall be either flushed with ground or the maximum height shall be 1.5 m. above the average surrounding ground level.
- Open area adjoining a basement story, if any, shall be effectively drained.
- The access to the basement shall be separate from the main and alternative staircase providing access and exit from higher floors.
- Where the staircase is continuous in the case of buildings served by more than one staircase, the same shall be of enclosed type serving as a fire separation from the basement floor and higher floors. Open ramps shall be permitted if they are constructed within the building line.

- The ‘Exit’ requirements in basements shall comply with the provisions of Part 4 ‘Fire and Life Safety’ of National Building Code of India.
- Basement shall not be constructed beyond the zoned area or in case existing adjacent building, setback of 2.4 m. shall be taken from the existing adjacent building.

Fire:

- Fire protection measures provided in Part IV of National Building Code of India, dealing with the fire protection measures as amended from time to time, have been followed.

No construction of any kind shall be permitted beyond the Building Envelope (on setbacks) except:

- A Chajja (projection) of maximum width of 0.75 m. at lintel or roof level. No construction of any type or any material shall be permitted over projections other than mentioned herewith.
- Underground water tanks with top flush with the adjoining ground level.
- Watchman Shelters and Watch Towers with due provisions. No projection of watchman shelters and watch towers shall be allowed outside the plot line.
- Maximum height of watchman shelter shall be 4 m. and for watch towers 15 m.
- The following features shall be permitted after leaving minimum 6 m. open corridor for fire tenders.
    - Meter Room as per norms of Electricity Authority.
    - Open transformers without any permanent enclosure keeping in view the necessary safety requirements.
    - Rockery, well and well structures, water pool, swimming pool (if uncovered), uncovered platform around tree, tank, fountain, bench, chabutra with open top and unenclosed by side walls, compound wall, gate, slide swing, culverts on drains.
    - Open generator set, filtration plant, Electrical distribution equipment, feeder pillars, telephone distribution equipment may be permitted in open setback as a service utility provided after leaving clear space for fire tender.

Floor Area Ratio Inclusions:

- Mezzanine.
- The shafts provided for lifts shall be taken for covered area calculations only on one floor and included in ground coverage.
- Pergola, shall be counted towards Floor Area Ratio if closed from three or more than three sides.
- Meter room as per Electricity Authority.

Floor Area Ratio Exemptions:

- A cantilever projection at any level (in setbacks) of a width of 0.75 m. No construction of any type or any material shall be permitted over projections.
- Basement(s) shall be permissible within the setback line on each floor. However maximum permissible area under basement shall be limited up to:
    - Basement area, if used for services, storage etc. then maximum area under such facilities shall be equivalent to maximum permissible ground coverage.
    - Basement area/ Podium parking as defined in parking table, if used for parking, then area equivalent to parking requirement shall be permitted.
    - In plots bigger than 10000 sqm. The basement shall be allowed in setback area after leaving a minimum setback of 6.0 m.
- Basement, if put to any use other than mentioned above, shall be included in the FAR of the building.
- Stilt area of non-habitable height 2.40 m. from bottom of beam proposed to be used for parking, landscaping etc.
- Balconies (upto 1.5 m. width) free from FAR may be projected in open setbacks provided 6 m. clear space is available for fire tender movement.
- Rockery, well and well structures, water pool, swimming pool (if uncovered), uncovered platform around tree, tank, fountain, bench, chabutra with open top and unenclosed by side walls, compound wall, gate, slide, swing, uncovered staircase (unenclosed and uncovered on three sides except for 0.9 m. high railing /wall and open to sky), overhead tanks on top of buildings, open shafts, culverts on drains.
- Open ramps with no area enclosed below it of usable height. If used for approach to the entrance of the building, then the height as per requirement may be considered. The space under the ramp

shall not be used for any commercial purpose, however it can be landscaped with approval of the Chief Executive Officer on case to case basis.

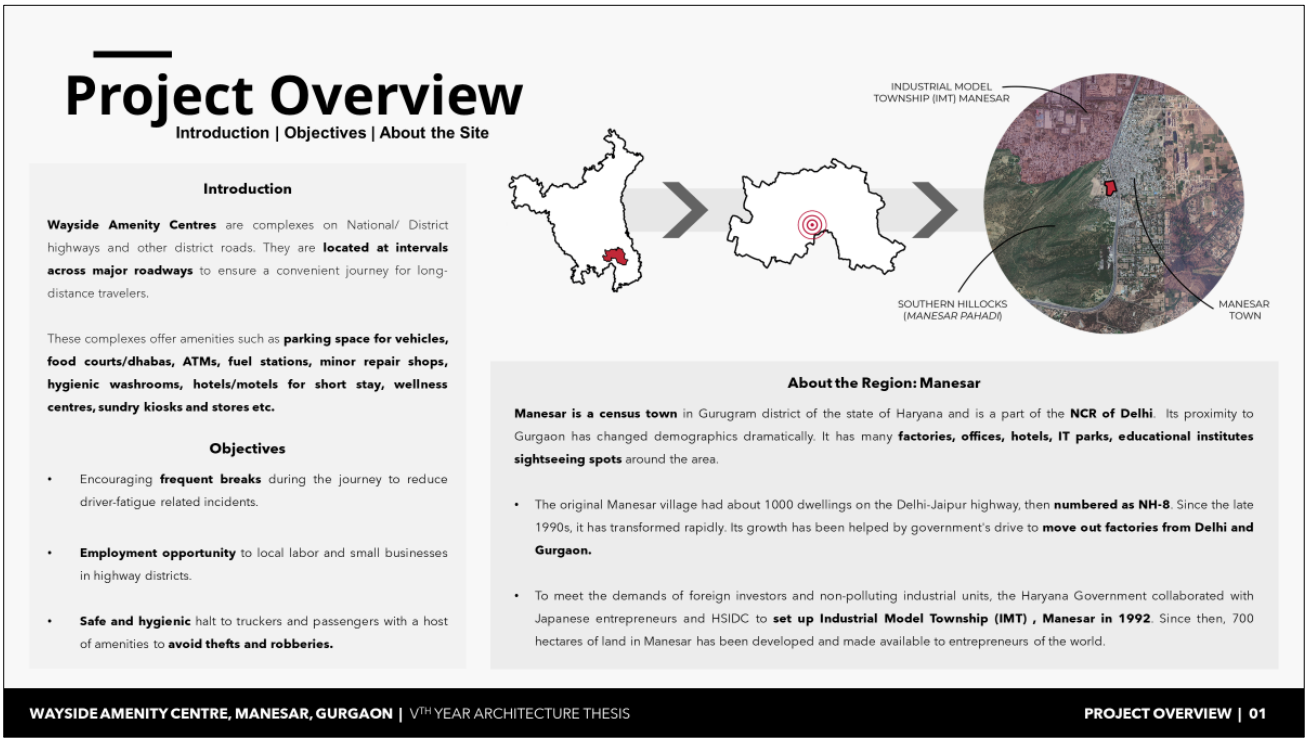
- Atrium shall be kept free from FAR and ground coverage. In case any commercial activity is proposed in Atrium or any saleable area or any other structure which is counted in FAR and ground coverage, its respective area shall be added in total FAR and ground coverage.
- Any other feature purely ornamental in nature and not enclosing or covering space of commercial use may be permitted by the Chief Executive Officer on case to case basis.
- Additional 5% of the plot area as ground coverage will be allowed for dedicated multi-level parking in plots bigger than 10000 sqm. (excluding green areas).
- In multi-storey buildings service floor, may be allowed after 4 floors. Maximum of 3 service floors may be allowed in a building. Service floor shall not be counted in FAR and maximum height of service floor shall be 2.40 m. from floor to bottom of the beam.

15% of Prescribed FAR shall be added towards Common Areas, which shall include the following Built Structures:

- Canopy projections of area as mentioned, no construction of any type shall be permitted over the canopy. Canopy, if cantilevered and no structure on it having a size of 2.4m x 4.5m shall not be counted in ground coverage.
- Loft up to maximum height of 1.5 m.
- Air-Conditioning Plant, Electrical Installation, Generator Room, Water Works, Water Tank etc.
- Watchmen, Security Shelters and Watch Towers.
- Garbage Shafts, Lift Shafts and 10 sqm. lobby in front of each lift (excluding area of corridor beyond the lift).
- Fire Escape Staircases.
- Toilet Blocks for visitors, drivers, guards etc on ground floor only.
- Mumty, Machine Room for lifts.
- Cupboards upto a depth of 0.60 m. and 1.80 m.in length.
- Refuge Area as per definition for fire evacuation in National Building Code.
- Sewage Treatment Plant, Water Treatment Plant, Garbage Collection Centre, Electric Sub-Station and Service Ducts.
- Covered walkways and pathways.

ANNEXURE II

- **Thesis Final Review Presentation**

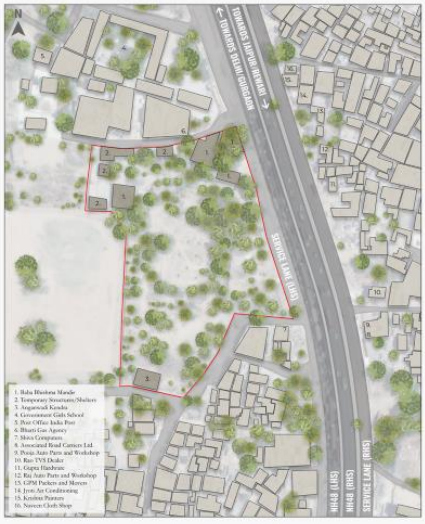


Government Proposal

- **National Highway Authority Of India (NHAI), Ministry of Road Transport and Highways** has planned to develop wayside amenities across highways of India.
- These stopovers will provide stop and rest facilities at **intervals of 50kms** along National Highways.
- Developed on **Public Private Partnership (PPP)** model.
- Facilities of more than 5 acres will be under the brand name **'Highway Village'** and under 5 acres will be named **'Highway Nest'.**
- A convergence of **alternative fuel types (especially electric vehicles),** advanced mobility models, changing technology, increased regulatory and competitive pressures, disruptive market dynamics, and emerging consumer trends will bring **dramatic change to the fuel retail industry** over the next decade.
- **Highway locations** are likely to be more resilient and enjoy a **longer residual economic life** than other locations, for two main reasons. First, the **electrification of heavy-duty vehicles will probably take longer** than that of light-duty vehicles. Consequently, heavy-duty vehicles will continue to make fuel stops at highway locations for the foreseeable future. Second, **consumers who drive EVs may afford to stop at highway fuel stations for longer durations**, for recharging and non-fuel purchases, in comparison to fuel stations located in cities.

Site Description

Site Details | Provisional Functions | Site Justification



Nearest Airport: Indira Gandhi International Airport - 32 kms

Nearest Toll Plaza: Kherki Daula - 7 kms

Nearest Fuel Station: IOC Pump, IMT, NH48 - 2 kms

Nearest Police Station: Opp. Heritage Village Resort, Sector 2, IMT - 4.2 kms

Nearest Railway Station: Ghari Harsaru - 12 kms

Nearest Hospital: Kalawati Hospital - 4.5 kms

Nearest Electric Substation: Sector 1, IMT - 2 kms

Nearest Municipal Boundary: GMDA, crossing Sector 83, Gurgaon - 6 kms

Site Details

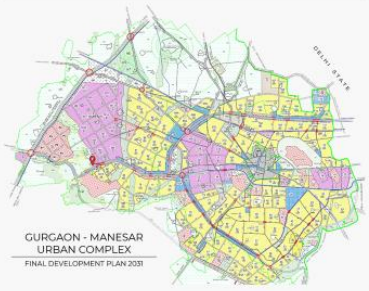
Location: Delhi-Jaipur Expressway, NH-48, Manesar (Latitude: 28°21'2.58"N, Longitude:76°56'17.13"E)

Area: 22123.75 sq. m (5.46 acres)

Perimeter: 675.10m

Ground Coverage: 30% only (for the WAC only)

FAR: 1.5 (for the WAC only)

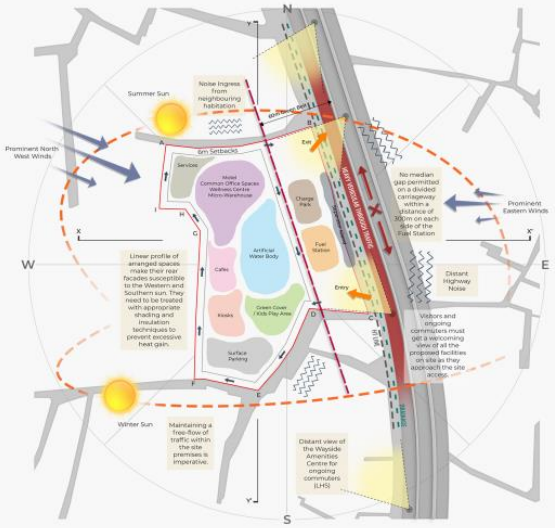


Site Justification

- **NH-48 is part of the 'Golden Quadrilateral'** connecting key metropolitan cities namely Delhi, Mumbai, Chennai and Kolkata. The **'Golden Triangle' (Tourist Circuit)** connecting Delhi, Jaipur and Agra.
- The site is located on the Delhi-Jaipur Expressway (LHS) and the completion of the **Kundli-Manesar-Palwal Expressway** (Western Peripheral Expressway for Delhi) has **increased volumes of traffic** from the Jaipur/Rewari route exponentially. Total daily traffic along the stretch of NH-48 now accounts for 3.8 lakh PCUs.
- There is **no wayside amenity centre present in the 65 kms stretch** from Pachgaon, Manesar to Delhi.

Site Analysis

Climate | Site Dimensions



Climate

The climate of Manesar can be classified as tropical steppe, semi-arid and hot which entails extremely dry air except during high humidity monsoon months. The monsoon season lasts from June-September, winters last from January to March followed by scorching summers.

Site Dimensions

AB: 112.62m **CD:** 47.9 m **EF:** 52.27m **GH:** 21.54m **IA:** 59.39m
BC: 159.94m **DE:** 79.39 m **FG:** 121.04m **HI:** 21.1m

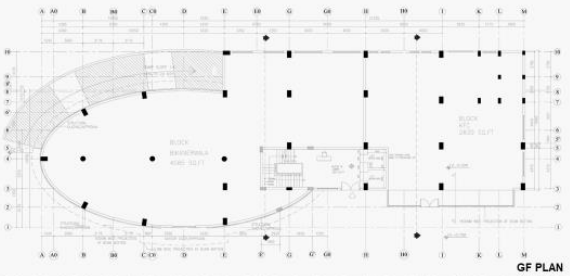
Area of Commercial Premise: 16564.84 m^2
Ground Coverage: 30%
Buildable Area: 4969.452 m^2
FAR: 1.5
Built-Up Area Available: 24847.26 m^2
Number of Floors Available: G+4 (End to end)
Setbacks: 6m (on all sides for Fire Tender)
Height Restrictions: 50m including parapet
Basement: Twin level permitted

Area of Fuel Station Premise: 5558.44 m^2
Ground Coverage: 20%
Buildable Area: 11116.88 m^2
FAR: 2
Built-Up Area Available: 11116.88 m^2
Front Setback: 6m (minimum)
Canopy: Equivalent to permissible ground coverage with setback line

Case Study 1: J Plaza, Manesar

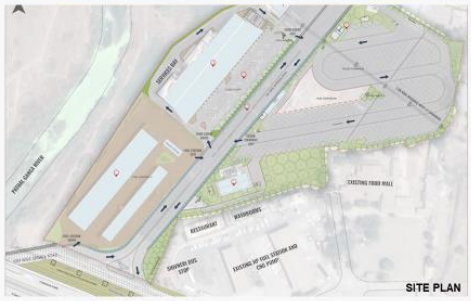
Location: Kukrola, Manesar on Delhi-Jaipur Expressway
Site Area: 2.79 Acres (11310.84 sq. m.)
Architects: Di Arq, Gurgaon
Client: Jamnagar Filling Station
Land Ownership: Jamnagar Filling Station
Functional Provisions: Restaurants, Fuel Station
Status: Under Construction

Concept: The J Plaza exhibits a **straightforward and uncomplicated design** with a **convenient circulation pattern** for its visitors. The idea of having extensive **glass facades on the exteriors** make the interiors spaces well-lit, presenting sweeping views of the surroundings. The restaurants have an open design and **wide expansive spaces** offering sufficient seating capacity.


GF PLAN


ELEVATION FRONT

Case Study 2: Foodway, Mumbai



Location: Sarsan, Khalapur on Mumbai Pune Expressway

Site Area: 4.65 Hectares (11.49 Acres)

Architects: StudioBoxx, Mumbai

PMC: StudioBoxx, Mumbai

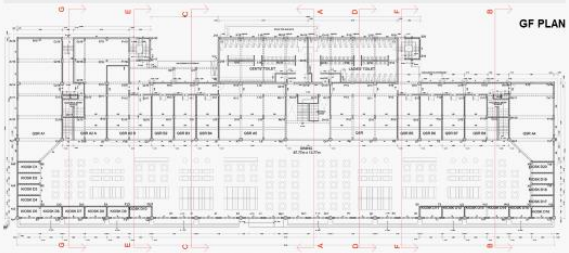
Client: Expressway Truck Terminus and MSRDC

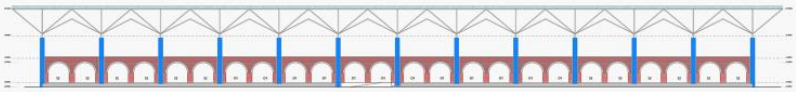
Land Ownership: Maharashtra State Road Development Corporation Ltd. (MSRDC) Functional

Provisions: Food Court, Fuel Station and Truck Terminus

Status: Completed in 2018

Concept: The facility possesses a **lightweight roofing structure** covered with thermally insulated double roofing. Front facade of the structure comprises of a **uniform archade** ensuring **multiple accesses for visitors**. The whole structure is essentially a double-height, semi-open space to facilitate a **naturally lit and ventilated dining area.** The **semi-openness** of the structure is conducive for the facility **considering the tropical climate of Mumbai-Pune**. The food court possesses a linear building profile with washrooms in the centre and kiosks for the sale of sundry items along the front facade.





Case Study 3: Highway Star, Bangalore

Location: Kolar, Vadagur on Bangalore-Tirupati

Highway Site Area: 2.36 Acres (9,575 sq. m.)

Architects: BDP Architects, Delhi

PMC: Potential PMC

Client: Highway Star Rest & Recreation Pvt. Ltd.

Land Ownership: Highway Star Rest & Recreation Pvt. Ltd.

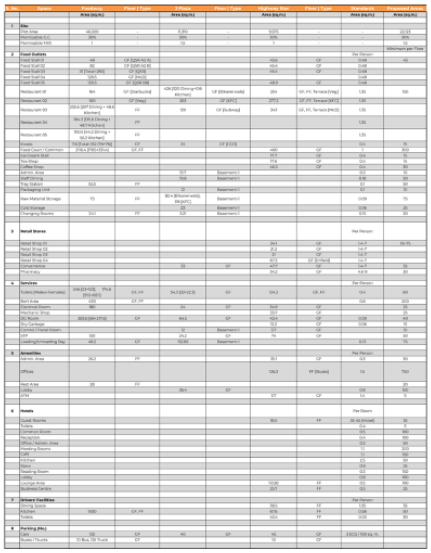
Functional Provisions: Food Court, Fuel Station, Retail

Outlets and Guest Rooms Status: Completed in 2015

Concept: The program includes a food court, retail outlets, rest pods and driver facilities. The varied functions are held together under an **overarching floating roof** which acts as a prominent design feature creating a **landmark presence.**

The initial chosen concept was derived from sweeps along the ground which emanate from a point and provide a **dynamic form with cantilevered boxes** at the end of the sweep. Similar lines are also manifested in the landscape. The **pebble-like forms of the pods** within the landscaped areas resemble the rock formations found on the way to the site from Bangalore.

Comparative Analysis



Foodway, Mumbai

Key Takeaways

- Spacious, semi-open and double-height facility.
- Anchor Shops planned in the corners.
- Ventilated and well-lit common dining space.
- Panoramic view of Quick Serve Restaurants from the arched entrance.
- Loading / Unloading Area and service passages organized in rear of the facility.
- Ample facilities for restaurant staff and workers.

Fallacies

- Washrooms could be planned in the corners.
- Absence of vertical circulation mediums.
- Insufficient car parking at peak hours.
- No drop off points, visitors must cross rows of parking to access the facility.

Highway Star, Bangalore

Key Takeaways

- An eccentric design exhibiting a subtle interplay of open and enclosed spaces.
- Roof acts as an eye-catching architectural feature.
- Services and drivers' facilities in the west of the site ensuring no overlooking the customer areas.
- Food Court amidst indoor and open spaces.
- Restaurants offer visibility of the highway with terraces on the first floor.
- Retail Outlets visible from the entrance and F&B areas
- Guest Rooms on the first floor offer scenic views
- Structure equipped with large fenestrations.

Fallacies

- Size and number of rooms small and insufficient to cater to large number of guests.

J Plaza, Manesar

Key Takeaways

- Straightforward and uncomplicated design.
- Convenient circulation patterns for visitors.
- Well-lit interiors owing to extensive glass facades.
- Glazing's on the exterior offer sweeping views of the surroundings.
- Each restaurant with a wide, expansive spaces and sufficient seating capacity.
- All major mechanical equipment's positioned strategically, away from the sight of visitors.

Fallacies

- Insufficient parking for guests, no parking in the basement.
- Common entry and exit route of the facility.
- Washrooms, planned as an independent block, misused by customers and village inhabitants.

Concept Development

Visibility and Perceptibility

- The shape of the built profile makes the structure easily visible and perceptible from a distance by fast moving travellers along the highway.
- Visitors and ongoing commuters get a panoramic view of all the proposed facilities on site as they approach the site access to ensure an ultimate visual experience.

Seamless Connectivity and Circulation

- Flowing and uninterrupted connectedness between the hotel, eateries and retail outlets ensures a smooth transition between spaces and ease of accessibility to a host of amenities.
- The vehicular circulation has been organized efficiently to maintain a free-flow of traffic within the site premises considering a huge influx of floating population.

Grand Entrances

- Double-heighted entrances at both the hotel and wayside amenity centre give a feeling of grandeur to the visitors as they enter the respective facilities.

Concealed Services Cores

- All major services and back of the house operations have been organized strategically for the hotel and wayside amenity centre ensuring no overlooking into the customer areas.

Supporting Charging Infrastructure

- Incorporation of a full-fledged charging infrastructure at the facility while leveraging the prime chunk of real estate effectively by allowing customers to avail a range of products and services at the stopover while their vehicles are being charged.

Revival of Fuel Stations

- The project with a wide range of offerings is envisaged to provide new products and service opportunities to the fuel station, designed to be a part of the Wayside Amenity Centre, in lieu of changing trends in the fuel retail and automobile industry placing additional pressure on the probability and relevance of fuel stations altogether.

EVOLUTION OF BUILT FORM AND THE OVERALL DESIGN SCHEME

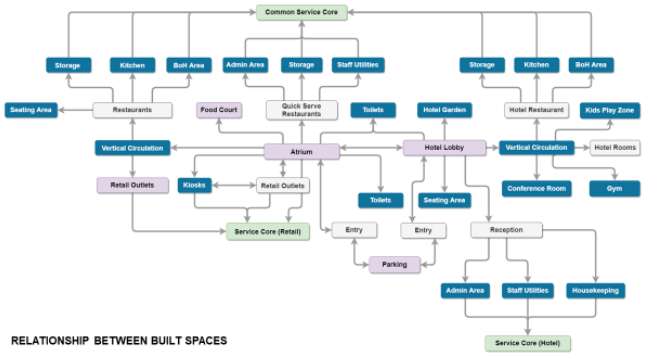
CONCEPTUAL VIEWS

Design Proposal

- **Efficient space planning** is imperative wherein the guests are free to move between the different spaces of the facility with ease to guarantee them a comfortable yet thrilling user experience.
- The design proposal comprises of an **RCC framed structure** with **veneer stone cladding and plaster finish** on the exterior with extensive **glass facades** to offer scenic views of the lush green surroundings.
- The complex primarily consists of **enclosed, air-conditioned spaces** given the **tropical steppe, semi-arid and hot climate** of Manesar.

Proposed Functional Provisions

Fuel Station | Retail Stores | Food Court and Restaurants | Hotel
EV Charging Stations | Drivers' Rest Area | Kiosks for Sundry Items | Public Washrooms
Automobile Repair Shop | Medical Store | Wellness Centre | Car Parking



RELATIONSHIP BETWEEN BUILT SPACES

AREA CALCULATIONS			
TOTAL PLOT AREA	22123.75		
DESCRIPTION (SQM.)	COMMERCIAL PREMISE	FUEL STATION PREMISE	
AREA	16564.84 (4.09 ACRES)	5558.4 (1.37 ACRES)	
GROUND COVERAGE	30%	20%	
FAR	1.5	2	
PERMISSIBLE BUILADBLE AREA	4969.452	1111.68	
BUILT-UP AREA AVAILABLE	24847.452	11116.8	
SETBACKS	6M ON ALL SIDES	6M FRONT	
HEIGHT RESTRICTIONS	50M INCLUDING PARAPET	EQUIVALENT TO PERMISSIBLE GROUND COVERAGE WITHIN SETBACK LINE	
BUILT - UP AREA CALCULATIONS (SQM.)			
	WAYSIDE AMENITY CENTRE	HOTEL	DRIVERS REST AREA
BASEMENT	12720.24		
GROUND FLOOR	3105.38	1713.87	148.08
FIRST FLOOR	2774.92	1360.82	148.08
SECOND FLOOR	2774.92	1713.87	-
THIRD FLOOR	-	1316.3	-
FOURTH FLOOR	-	1316.3	-
FIFTH FLOOR	-	1316.3	-
SIXTH FLOOR	-	1316.3	-
SEVENTH FLOOR	-	1316.3	-
EIGHTH FLOOR	-	1316.3	-
NINETH FLOOR	-	1316.3	-
TENTH FLOOR	-	1316.3	-
TOTAL GROUND COVERAGE ACHIEVED:	4967.33		
TOTAL BUILT-UP AREA ACHIEVED (EXCLUDING BASEMENT, ETC.)	24270.34		

Site Plan

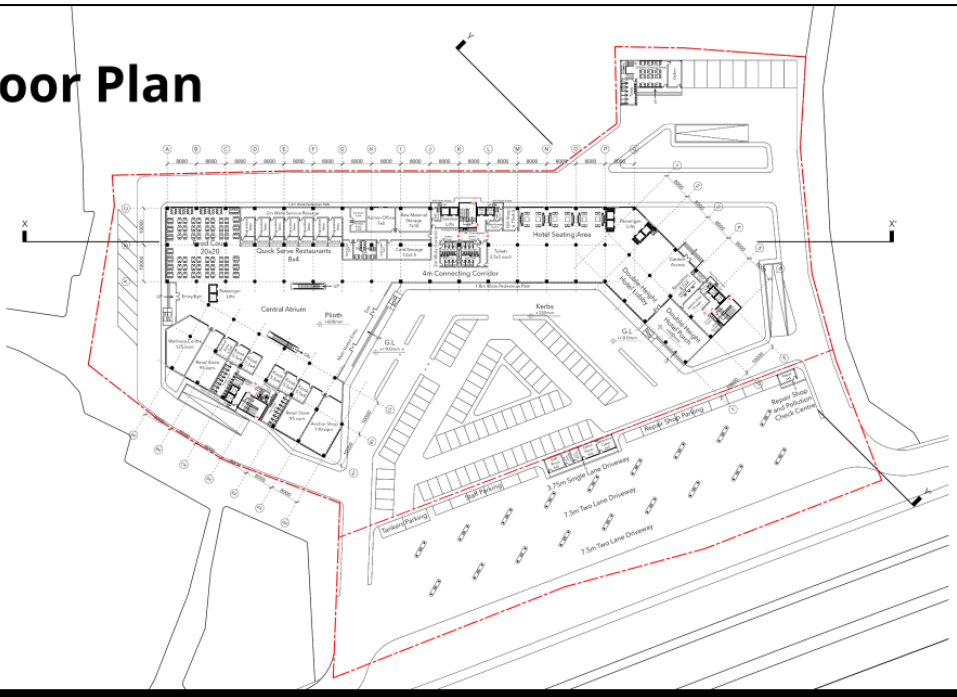
NOTES

- Units: Meters
- Car Parking Size: 5000 x 2750 sq.mm.
- Bus Parking Size: 7000 x 4000 sq.mm.
- Bus Parking Spots: 8 (+9 Drivers Rest Area)
- Width of Single Lane Driveway: 3.5m.
- Surface Car Parks: 76
- Width of Pedestrian Pathway (Complex Front): 1.8m
- Width of Pedestrian Pathway (Complex Rear): 1.2m
- Width of Kerbs: 1m.
- EV Charging Stations situated strategically on the Kerbs adjacent to Surface Car Parks.

Ground Floor Plan

NOTES

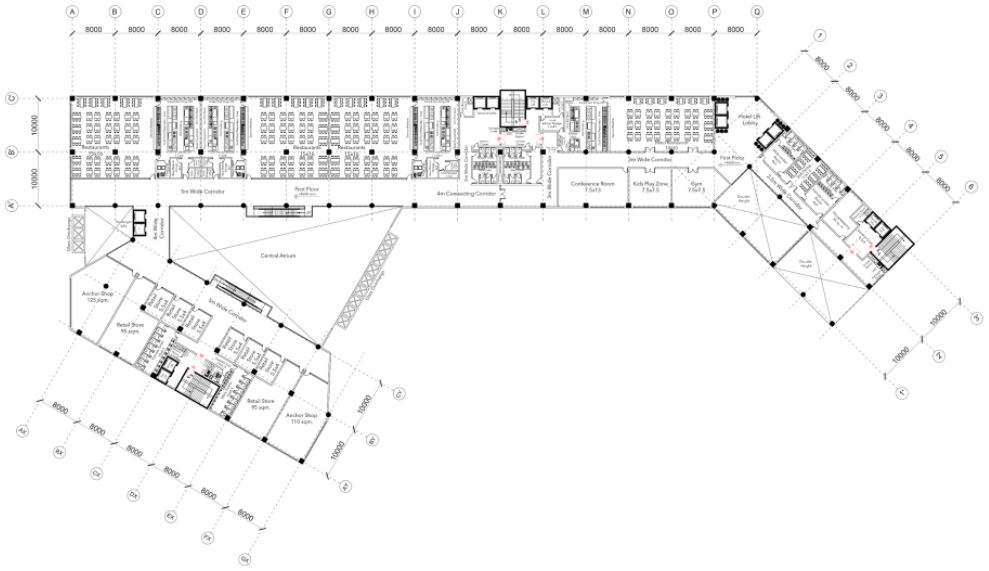
- Units: Meters
- Food Court with Seating Capacity : 320 persons.
- 7 Quick Serve Restaurants.
- Admin. Area, Staff Utilities, and Storage Space for the Food Court on the GF.
- Service Passage Width: 2m.
- Fire Escape Corridor: 2m.
- Double-Height Hotel Lobby.
- Admin. Area for the Hotel behind the Reception .
- Anchor Shops located in the corners of the Retail Wing.
- In addition to Retail Outlets, 5 Kiosks, 1 Medical Store and 1 Wellness Centre on the GF.
- Automobile Repair Shop and Pollution Check Centre on the Fuel Station Premise.
- 18 Fuel Dispensing Machines.
- 9 Repair Shop Car Parking, 6 Staff Parking and 2 Fuel Tanker Parking.



First Floor Plan

NOTES

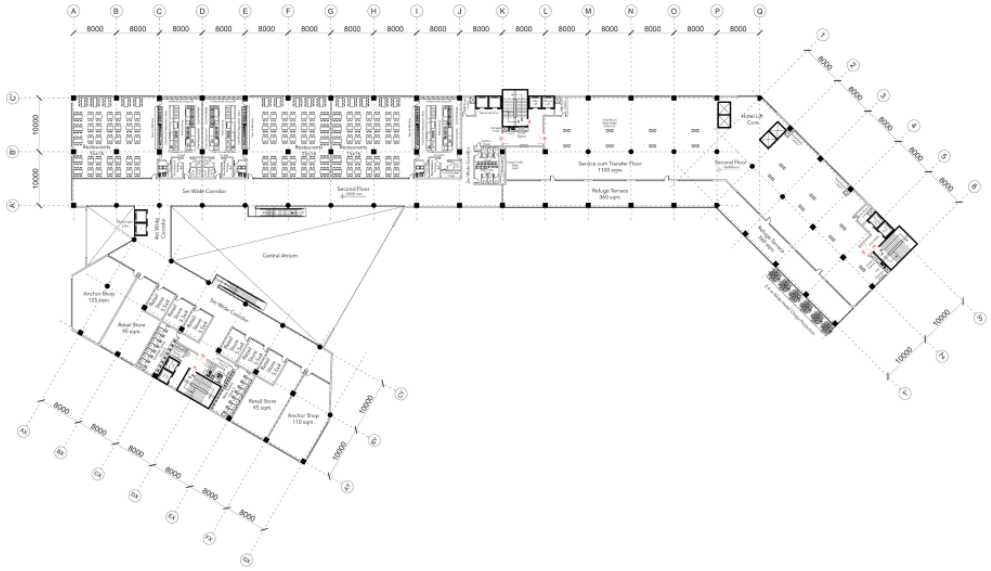
- Units: Meters
- 3 Restaurant Spaces situated on the FF.
- Each Restaurant with Seating Capacity of 180 persons.
- Commercial Kitchens with an Assembly Line Layout.
- Storage Space within the Kitchen with Managers Office.
- Kitchen Aisle Width: 1.2m.
- Restaurant Dining Aisle Width: 1.2m.
- 4m wide Connecting Corridor between Restaurants-Hotel and Restaurants-Retail Wing.
- Hotel Restaurant with Seating Capacity of 140 persons.
- Staff Utilities and Housekeeping for the Hotel on the FF.
- Conference Room, Kids Play Zone and Gym for the Hotel Guests on FF.



Second Floor Plan

NOTES

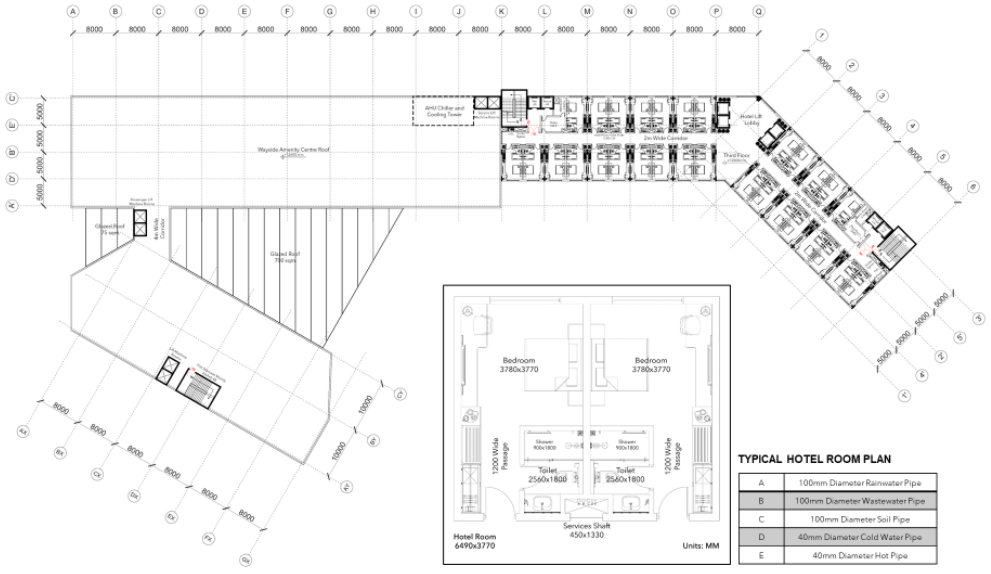
- Units: Meters
- 3 Restaurant Spaces situated on the SF.
- Service cum Transfer Floor for the Hotel on SF.
- 360 sqm. Refuge Terrace accessed from Service Floor.
- Service Core: Fire Staircase, Fire Lifts, Service Lifts, FHC, Smoke Egress Chamber, Garbage Chute, Electric / AHU Rooms.
- Services Pipelines from the Hotel Rooms assemble on the Service Floor through shafts and directed to the GF through larger shafts, in turn leading to the STP and Sewer.
- Garbage Chute Shaft Size: 900x800 sq.mm.
- Elevator Car Size: 2150x2050 sq.mm.
- G to G+2 Floors with Two-way slab and Column Size: 900x900sq.mm.



Third Floor Plan

NOTES

- Units: Meters
- Hotel Typical Floor Area: 1225 sqm. (No. of Floors: 8)
- Typical Floor with 30 Hotel Rooms each. (Total: 240)
- Hotel Room Size: 3780x3770 sq.mm.
- Hotel Room Toilet Size: 2560x1800 sq.mm.
- Hotel Room Services Shaft Size: 1330x450 sq.mm.
- 2m wide Corridors between Hotel Rooms.
- Maid Room and Pantry accommodated with Service Cores on Typical Hotel Floor.
- Typical Hotel Floor Column Size: 900x230 sq.mm.
- One-Way Slab for Typical Hotel Floor.
- Mumty, Lift Machine Rooms, OHT, AHU Cooling Tower and Chiller Room on the Terraces of respective Built Wings.



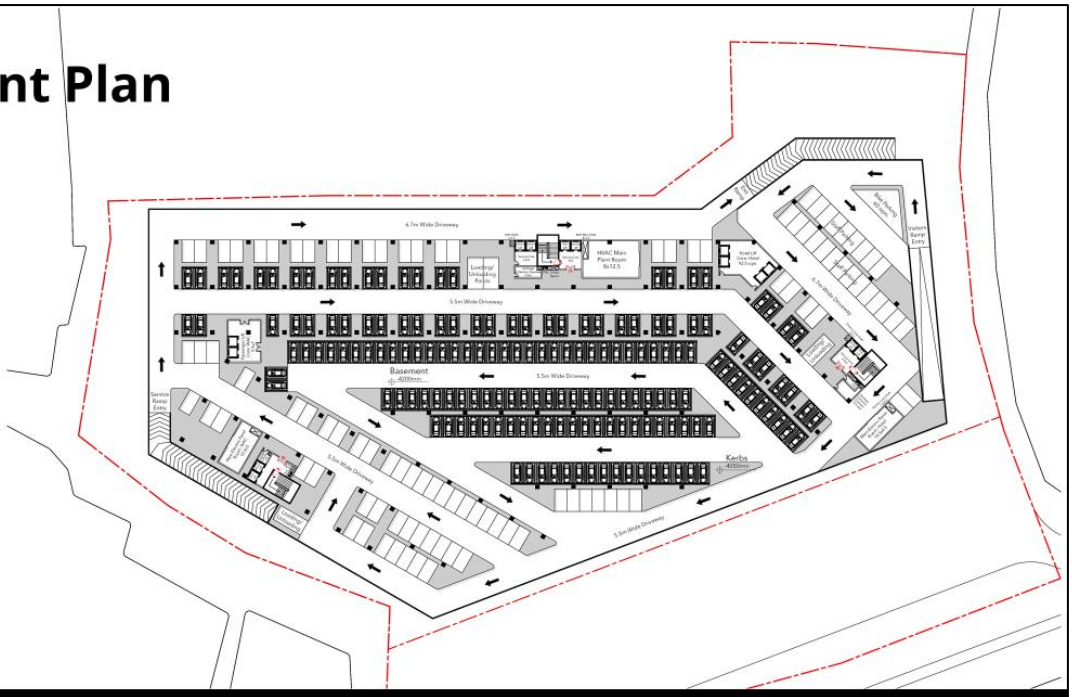
TYPICAL HOTEL ROOM PLAN

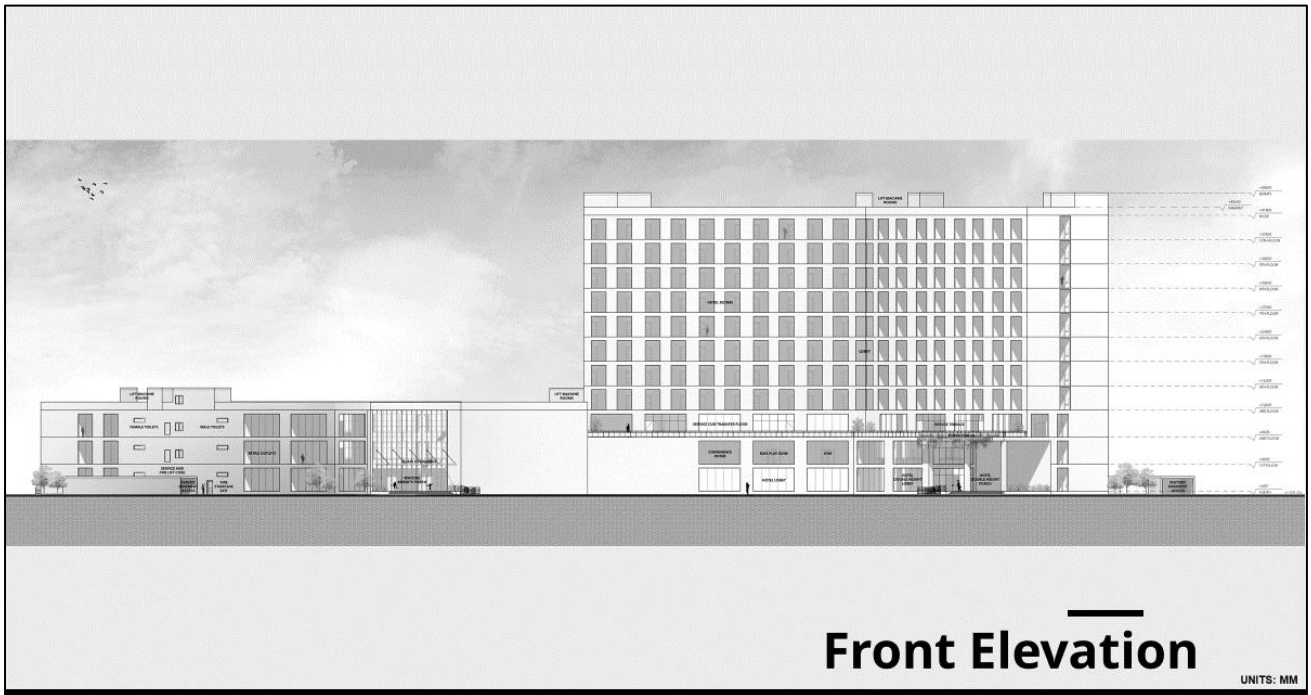
A	100mm Diameter Rainwater Pipe
B	100mm Diameter Wastewater Pipe
C	100mm Diameter Soil Pipe
D	40mm Diameter Cold Water Pipe
E	40mm Diameter Hot Pipe

Basement Plan

NOTES

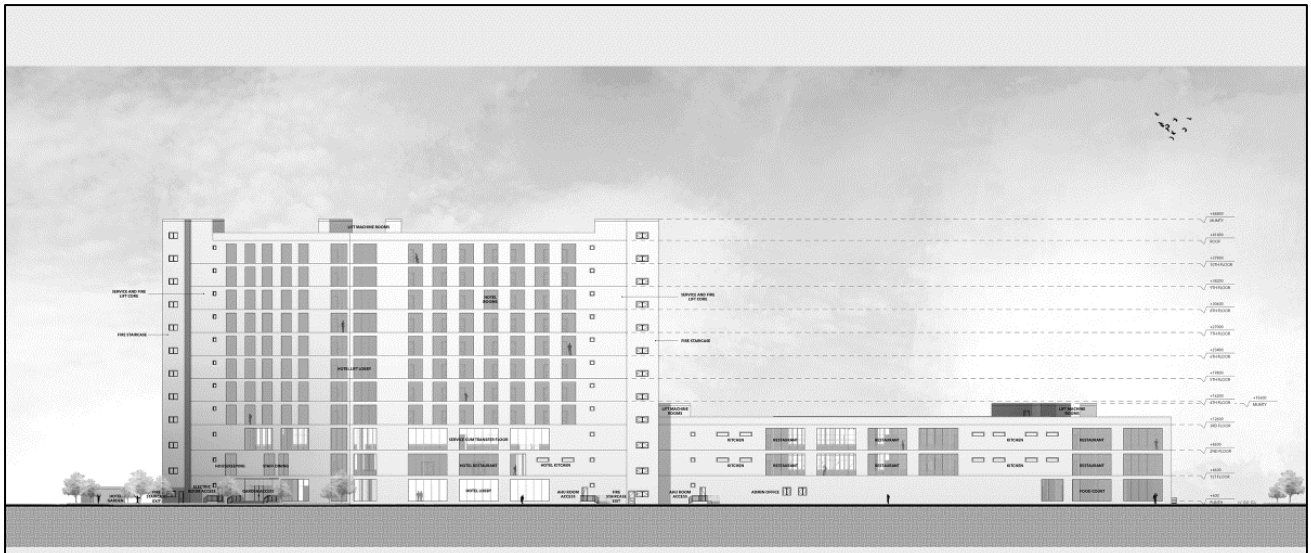
- Units: Meters
- Total 435 Basement Car Parking.
- 167 Stack Parking.
- 101 Standard Parking.
- Provisions for Bike Parking.
- Min. width of Driveway: 5.5m.
- Entry/Exit Ramp Width: 5m.
- Ramp Slope: 1:8
- Separate Electric Panel Rooms for the Wayside Amenity and Hotel Wing in the Basement.
- Common HVAC Main Plant Room for both the Wings in the Basement.
- AHU Shaft Size: 60x40 inches.
- Separate Garbage Collection Chambers for the Hotel, Eateries and Retail Wings.
- Service Loading / Unloading Bays planned for each Wing.
- Basement Clear Height: 4.5m. (3.5m for Stack Parking).





Front Elevation

UNITS: MM

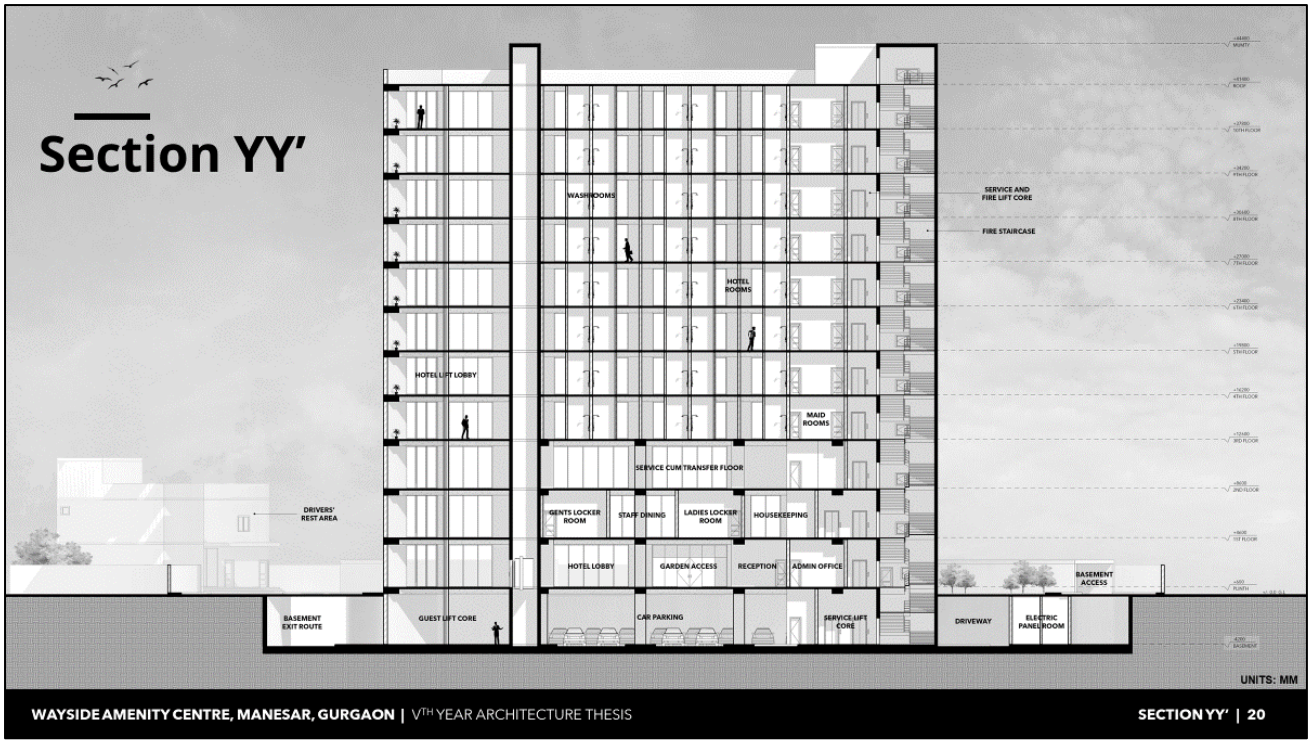


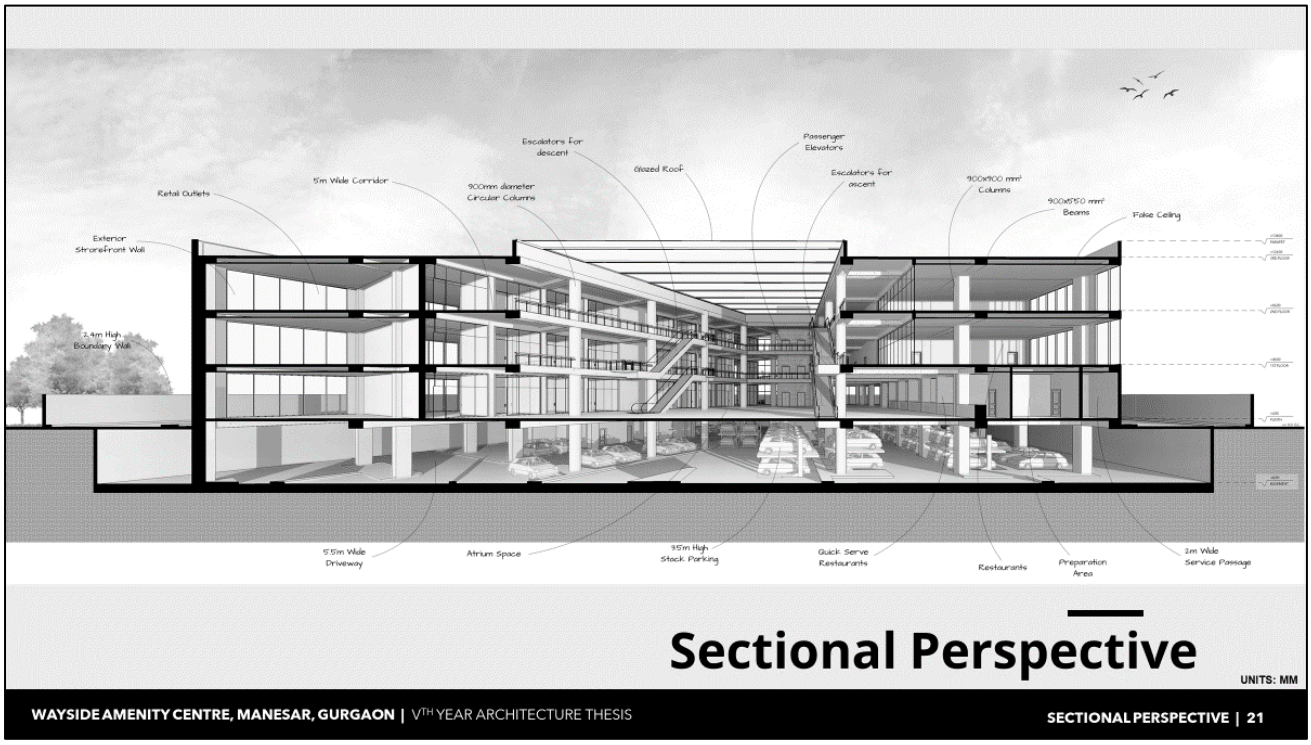
Rear Elevation

UNITS: MM

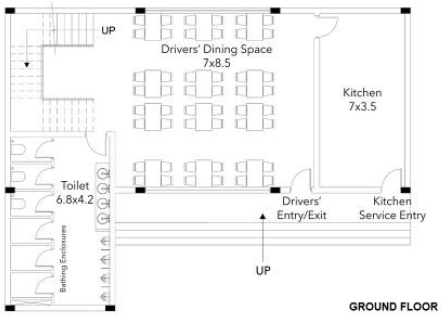
Section XX'

UNITS: MM

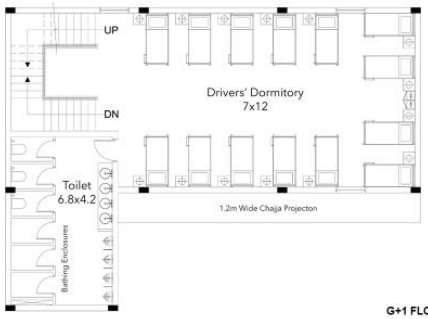

Section YY'
WASHROOMS
HOTEL ROOMS
SERVICE AND FIRE LIFT CORE
FIRE STAIRCASE
HOTEL LIFT LOBBY
MAID ROOMS
SERVICE CUM TRANSFER FLOOR
DRIVERS' REST AREA
GENTS LOCKER ROOM
STAFF DINING
LADIES LOCKER ROOM
HOUSEKEEPING
HOTEL LOBBY
GARDEN ACCESS
RECEPTION
ADMIN OFFICE
BASEMENT ACCESS
BASEMENT EXIT ROUTE
GUEST LIFT CORE
CAR PARKING
SERVICE LIFT CORE
DRIVEWAY
ELECTRIC PANEL ROOM
UNITS: MM
WAYSIDE AMENITY CENTRE, MANESAR, GURGAON | VTH YEAR ARCHITECTURE THESIS
SECTION YY' | 20


Escalators for descent
Glazed Roof
Passenger Elevators
Escalators for ascent
900x900 mm² Columns
900x950 mm² Beams
False Ceiling
Retail Outlets
5m Wide Corridor
900mm diameter Circular Columns
Exterior Storefront Wall
2.4m High Boundary Wall
5.5m Wide Driveway
Atrium Space
9.5m High Stack Parking
Quick Serve Restaurants
Restaurants
Preparation Area
2m Wide Service Passage
Sectional Perspective
UNITS: MM
WAYSIDE AMENITY CENTRE, MANESAR, GURGAON | VTH YEAR ARCHITECTURE THESIS
SECTIONAL PERSPECTIVE | 21

Drivers' Rest Area



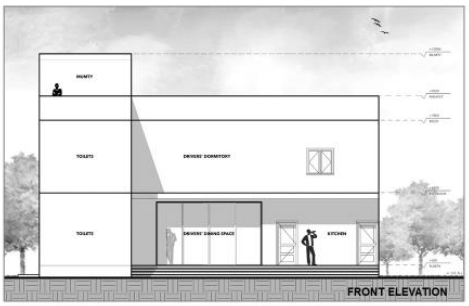
GROUND FLOOR



G+1 FLOOR

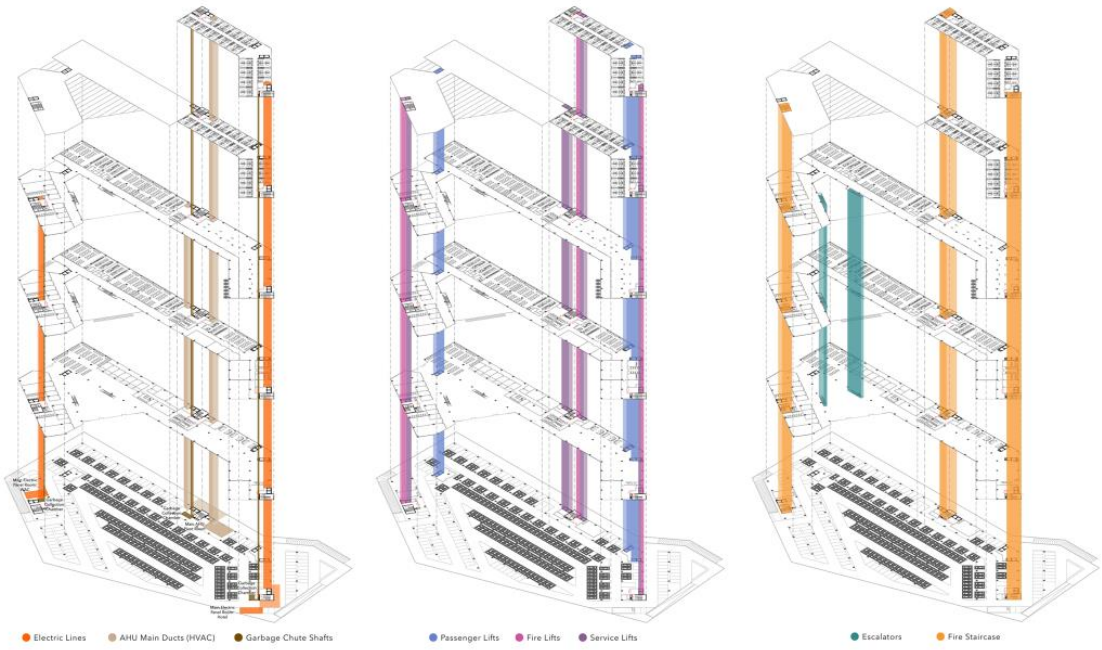
NOTES

- Units: Millimeters
- Two-Floor Facility.
- Dining Capacity of 50 persons on GF.
- Dormitory Capacity of 28 persons on the FF.
- Provision of Bunk Beds for Occupants.
- Bus Parking Bays abutting the Built Structure.


FRONT ELEVATION


PERSPECTIVE VEW

Building Services Layout



Views


HOTEL PORCH AND BUILDING FACADE


WAC PORCH FOR CAR PASSENGERS


WAC REAR PORCH FOR BUS PASSENGERS


HOTEL GARDEN

Services Calculations

ELECTRICITY LOAD CALCULATIONS

- AVERAGE CONNECTED LOAD/ CONSUMER – **3 KW (COMMERCIAL)**
- MAXIMUM POPULATION OF THE FACILITY AT A TIME = 530 HOTEL (480 GUESTS + 50 STAFF) + 850 RETAIL (750 VISITORS + 100 STAFF) + 1080 RESTAURANTS (VISITORS) + 320 FOOD COURT (VISITORS) + 220 STAFF

✓ **TOTAL POPULATION (approx.) = 3000**
✓ **TOTAL ELECTRICITY LOAD CONSUMPTION IN A DAY = 9000KW**

❑ **TRANSFORMER**

- DIVERSITY FACTOR – 80%: 9000 (80%) – 7200KW
- POWER FACTOR = 0.85: 7200/0.85 – 8470KVA
- 10% FUTURE REQUIREMENT: 8470 + 10% = 9317KVA

✓ **3 DISTRIBUTION TRANSFORMERS OF 3200KVA REQUIRED.**

❑ **DG SET**

- DIVERSITY FACTOR – 80%: 9000 (80%) = 7200 KW
- 10% FUTURE REQUIREMENT: 7200 + 10% – 7920 KVA

✓ **3 DG SETS OF 2750KVA REQUIRED**

WATER DEMAND CALCULATIONS

❑ **AVERAGE WATER CONSUMPTION (AS PER CGWA, GOVT. OF INDIA):**

- HOTEL (UPTO 3-STAR): 180 LPCD (EXCLUDING LAUNDRY, KITCHEN AND STAFF)
- LAUNDRY: NO. OF ROOMS X 5KGS X 60 L/KG/WASH
- RESTAURANTS: 70 LPCD
- FOOD COURT: 35 LPCD
- RETAIL: 45 LPCD (STAFF) AND 15 LPCD (VISITOR)
- STAFF: 45 LPCD
- VISITORS: 15 LPCD

❑ **TOTAL WATER CONSUMPTION BY ALL CONSUMERS (L):**

- HOTEL: 2,42,450 (86400 GUESTS + 2250 STAFF + 9800 RESTURANT + 144000 LAUNDRY + 300 CONFERENCE ROOM)
- RESTAURANTS: 75600
- FOOD COURT: 11200
- RETAIL OUTLETS: 15750

✓ **TOTAL: 345300 L**

- 1 CUBIC METER =1000 L
- THEREFORE, SPACE REQUIRED TO STORE THE WATER = 345.3 CUM

✓ **66.6% FOR UGT AND 33.3% FOR OHT: 228 CUM (UGT) + 117.3 (OHT)**

FIRE SAFETY CALCULATIONS

❑ **HOTEL (RESIDENTIAL A-5 CATEGORY BUILDING TYPE)**

- TANK = 200000L UGT + 20000L OHT.
- PUMP – 1 DIESEL AND 1 ELECTRIC PUMP OF CAPACITY 2280 L/MIN. WITH MIN. PRESSURE 2 KG/CM2 FOR UGT.
- 1 ELECTRIC PUMP OF CAPACITY 180 L/MIN FOR OHT.

❑ **WAYSIDE AMENITY CENTRE (ASSEMBLY D-6 BUILDING TYPE)**

- TANK = 200000L UGT + 20000L OHT.
- PUMP – 1 DIESEL AND 1 ELECTRIC PUMP OF CAPACITY 2850 L/MIN. WITH MIN. PRESSURE 2 KG/CM2 FOR UGT.
- 1 ELECTRIC PUMP OF CAPACITY 180 L/MIN FOR OHT.

ANNEXURE III

- **Similarity Report**

Mohak Anand

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