

Need For Sustainable Parking Spaces - A Survey study at a Built Environment

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ABSTRACT

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Modern Multistoried complexes need to be constructed with sustainable parking spaces as these regions in a Building are health Hazard to the occupants. Health issues in built environment can be broadly classified under the social sustainability.

Most of the high-rise building either for domestic, commercial or mixed occupancy have three to five Decks allotted for vehicle parking. These spaces are ill ventilated fin with dead space corners. The vehicle emission contains CO, c02, HCHO and TVOC and air pollutants are a source of health hazard to the occupants. The air entrapped in building spaces can be potential health hazard. Hence monitoring and controlling e of exhaust fume and greenhouse gas become a paramount importance for the social sustainability.

In this paper the need to introduce a monitoring and control system for exhaust ac fume in parking basement has been highlighted for social sustainability of built environment.

Keywords: sustainability, parking, modern.

1. INTRODUCTION

Emission of Gases and health hazards cars, trucks and buses produce air pollutants in the course of their lifestyles cycle, including pollutants emitted all through car operation and fuel manufacturing extra emissions are related to refining and distribution of fuels and to a lesser extent, manufacturing and disposal of the vehicle.

Air pollution from cars, vehicles and buses is cut up into number one and secondary pollutants. Primary pollution is emitted without delay into the ecosystem; secondary pollutants result from chemical reactions among pollutants inside the ecosystem. Fetuses, new child youngsters, and those with continual illnesses are in particular susceptible to the effects of air pollutants. The subsequent are the important pollutants from motor automobiles:

Particulate depend (PM): One kind of particulate rely is the soot seen in vehicle exhaust. Fine debris much less than one-10th the diameter of a human hair pose a critical risk to human health, as they can penetrate deep into the lungs. PM can be a number one pollutant or a secondary pollutant from hydrocarbons, nitrogen

oxides, and sulfur dioxides. Diesel exhaust is a major contributor to PM pollution.

Volatile organic compound (VOC): These are organic chemicals that easily evaporate at room temperature and can enter the atmosphere as gases. VOCs are commonly found in many household and industrial products, such as paints, cleaning agents, adhesives, fuels, and solvents.

VOCs can have both short-term and long-term effects on human health and the environment. Short-term exposure to high levels of VOCs Can purpose eye, nose, and throat infection, headaches, dizziness, and nausea. Long-time period publicity to decrease ranges of VOCs may additionally make a contribution to respiratory problems, allergies, and even positive types of most cancers.

Nitrogen Oxides (NOx): Those pollutants form ground degree ozone and particulate count (secondary). Additionally dangerous as a primary pollutant, NOx can reason lung inflammation and weaken the frame's defenses towards respiration infections together with pneumonia and influenza.

Carbon Monoxide (CO): This odorless, colorless, and toxic gas is fashioned by the combustion of fossil fuels

such as gasoline and is emitted often from motors and vehicles. When inhaled, CO blocks oxygen from the mind, coronary heart, and other crucial organs.

Sulfur Dioxide (SO₂): Electricity plants and motor vehicles create this pollutant by means of burning sulfur-containing fuels, mainly diesel and coal. Sulfur dioxide can react in the environment to form great particles and, as different air pollution, poses the largest fitness hazard to young children and asthmatics.

HCHO: If you suspect the presence of formaldehyde (HCHO) in a parking space, it is important to prioritize your safety and take appropriate measures. Formaldehyde is a colorless and pungent-smelling gas that can cause irritation and health issues when present in high concentrations.

TVOC: TVOC stands for Total Volatile Organic Compounds, which are a group of chemicals that can be emitted as gases from various sources such as building materials, furnishings, cleaning products, and vehicle exhaust.

GREENHOUSE GASES: Motor automobiles additionally emit pollution, predominantly carbon dioxide that contributes to global climate alternate. In truth, tailpipe emissions from automobiles, trucks and buses international warming pollutants: Transportation, which includes airplanes, trains and ships accounting for around thirty percent of all heat-trapping fuel emissions.

The safety and properly-being of the human beings should be a count of utmost significance for all. Vehicle parking spaces are usually underground and are closed from all ends, that's why proper air flow is critical for the elimination of exhaust gases produced and to provide fresh air within the vehicle parking area before someone gets suffocated. Poor indoor air great can affect the health of individuals who are in-charge of dealing with the car parking space as well as folks that come to go to the mall or building and feature parked their automobile. As in step with CSE analysis, the emission and energy consumption in few cities of India is shown in Fig. 1.

It's miles vital to put in force a effective ventilation gadget to do away with all of the ability contaminants from the air within the Parking areas. Carbon monoxide tracking equipment is needed for detecting the level of CO in air.

There are broadly strategies of complying with the building rules concerning air flow

1. Natural ventilation
2. Mechanical ventilation

Natural ventilation: Natural ventilation in parking spaces refers to the process of using natural air movement to provide fresh air and remove pollutants within an enclosed or semi-enclosed parking area. It involves utilizing openings, such as windows, doors, vents, or other openings, to allow the flow of air into and out of the parking space

Emissions and Energy Consumption in India

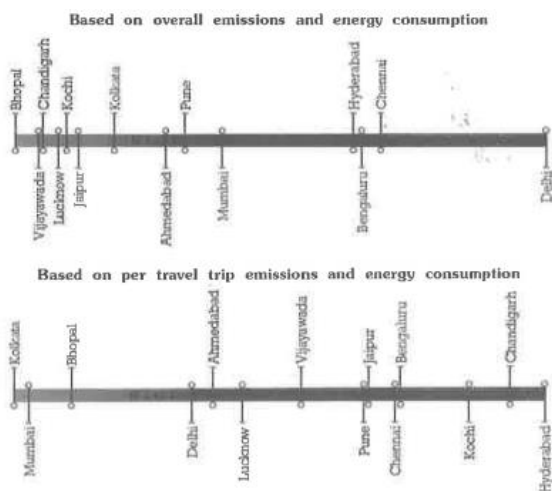


Fig: 1 CSE Analysis



Fig:2 Natural Ventilated Parking

Mechanical ventilation: This approach is adopted while parking is designed in underground. This technique to manipulate of fumes a machine which is able to limiting the attention of CO within the car park to beneath 30 parts in step with million averaged over an 8th hours period ought to be supplied.

For smoke clearance 10 air modifications per hour ought to be extracted. Regulation of air go with the flow is to be controlled to ensure that the quantity of exhaust gases which might be radiated, an equal amount of clean air is changed as nicely.

2. SYSTEMS PREVALENT/MONITORING AND CONTROL OF EXHAUST GASES IN PARKING SPACES

2.1 SMOG CONTROL SYSTEM

This system is very simple and most common to use as the setup of chimneys requires very simple material. The purpose of system is to send fresh air from an inlet and collecting smog to discharge in the atmosphere as shown in Fig.3.

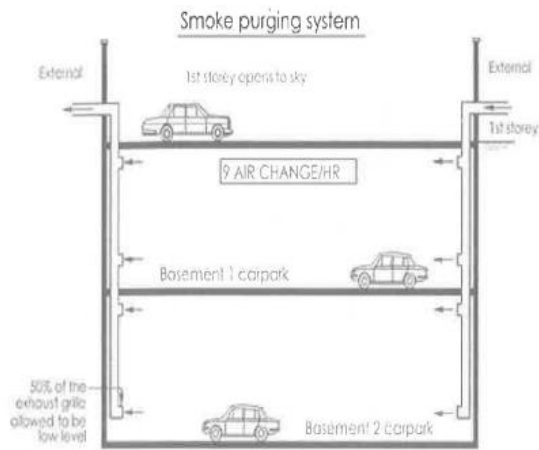


Fig: 3

2.2 DUCTED MECHANICAL EXTRACT SYSTEMS

Commonly, we use this kind of extract system. Mechanical extract structures use sheet metal ductwork to move the fumes or smoke being extracted to the external atmosphere. The ducts must be evenly dispensed around the car park and additionally drop to low degree to cover the low-level extract factors. The gadget has to be able to running at temperatures of up to three hundred for 60 minutes, and ductwork and fixings should be crafted from substances that have a melting factor above 800°C.

The Ducted mechanical extract systems are accredited via regulations but are not often used these days due to the following motives:

- The ductwork runs below the ceiling. Lowering the already confined height typically to be had.
- Down stand beams require the ducting to be set down underneath them, thus diminishing the height even in addition
- Low degree extract factors are required, frequently desiring defensive barriers to surround them, and these take up treasured floor space.
- excessive initial and going for walks cost for preservation

2.3 DUCT LESS VENTILATION SYSTEM

Enforcing ductless air flow systems in place of ducted one, in order that it does now not soak up plenty of indoor space, designed with advanced technologies, desirable overall performance, price efficiency and less

intake of power. It mechanically controls the airflow and makes positive that the exhaust gases are constantly replaced with clean air from the out of doors and the CO stage is maintained as properly. If the CO degree is better, it speedy detects and takes right movement.

Because the ductless systems are strength efficient, it reduces carbon footprint and promotes toward sustainable increase and improvement. In comparison to the cumbersome ducted air flow structures, ductless ones function a swish layout this is electricity-filled with the features making sure excessive productivity. W hooked up in underground Carnot take up useless space.

Jet fan, jet thrust, jet vent, or induction systems are of various names for the same ductless air flow gadget and feature grow to be more and more famous as they can triumph over a number of the troubles related to sheet metal ductwork.

Jet fanatics were evolved for ventilating tunnels a small jet of air at extraordinarily high pace which causes surrounding air to be entrained and in a constrained area like a tunnel or car park can be used to move a large quantity of gasoline. Impulse ventilation systems push the air via the auto park closer to a single extract point, in place of pulling it to a couple of extract points as a ducted mechanical extract device would.

The wide variety and place of fanatics are cautiously chosen to fit the machine layout requirements and to make certain that there are not any lifeless spots (where there is no airflow) for fumes and smoke to stagnate and acquire. Similarly, to the space saving as well as useless spots are avoided jet fan systems have other benefits over conventional ducted structures.



Fig: 4 Ductless Ventilation System



Fig: 5 placing of Ductless Ventilation

Strength saving Jet fan structures are frequently combined with CO detection to provoke them for CO control. The primary extract enthusiasts are quite smaller and for CO manipulate run at decrease speeds than a traditional system consequently the noise generated is drastically lower. Low-cost Jet fan systems cost much less than a comparable ducted device. The device of ductless ventilation device is furnished as shown in Fig. 4 & five.

3. DESIGNING A PARKING GARAGE VENTILATION SYSTEM DESIGN AND IMPLEMENT THE SYSTEM

The following steps are enough to create a preliminary induction ventilation device layout. Computational Fluid Dynamics (CFD) analysis is regularly required to prove and similarly refine the design. Fanatics may also want to be reoriented, introduced, or removed.

An induction ventilation machine may be tailor-made to suit sincerely any storage. Earlier than thinking about fan locations, the device layout needs to be diagnosed.

Step 1: examine Parking storage Geometry

Investigate the first-rate stream pattern for the garage, and become aware of the supply and exhaust points, if viable, select a layout that complements the herbal airflow. Airflow with wide circulation patterns that promote mixing will offer the most effective ventilation.

Step 2: Fan selection and Spacing select Fan version:

Vertical top regulations may additionally dictate which version to use. Check this first. If peak regulations do not drive fan choice, the use of fewer, higher-rated Jet-Vent fanatics commonly make the machine extra value-powerful than the use of extra, lower-rated lovers. However, to ventilate garages which might be irregularly fashioned, selecting more enthusiasts with smaller thrust ratings can be greater powerful.

Decide the most and encouraged spacings among Jet-Vent lovers for exclusive tiers of fan thrust. These spacing distances are tips for fans located in series. While the recommended. Fan spacing is used, airspeed in most of the ventilated regions have to be greater than 200 toes/ min. CFD analysis will determine whether or not this is carried out in a selected storage design. Working lovers at encouraged pace or under will make sure applicable sound stages see sound level statistics on merchandise page for additional statistics.

Step 3: choose Sensor alternatives

CO Sensor: A Carbon Monoxide sensor should be located so that no part of the garage is greater than 50 toes from a sampling factor. A one hundred feet diameter circle around a CO sensor will show the coverage area, and typically equates to 1 CO sensor in keeping with fan. Extra CO sensors ought to be located to offer extra coverage in areas wherein humans

NO2 Sensor: NO2 sensors discover Nitrogen Dioxide (NO2). This gasoline is associated with diesel exhaust usually discovered in transportation terminals, vehicle upkeep, and restore centers. These sensors need to be furnished anyplace an excessive degree of diesel car visitors is predicted.

Temperature Sensor: Temperature sensors are used in areas where there are high relative temperatures and expanded, local ventilation is suited. Examples encompass byproduct heat from mechanical equipment, electronic/laptop. Equipment, and areas which could otherwise stagnate and gather warmth.

Step 4: pick manage alternative

Jet-Vent enthusiasts controlled through jet vent manage middle
(Includes optional BAS tracking)

Jet-Vent enthusiasts: The Jet-Vent manipulate gadget is an effortlessly customized answer, designed to efficiently manipulate the garage ventilation device. It allows keep right air first-class whilst storage site visitors is high and conserve strength while it is low. The Jet- Vent manage middle works together with the optional CO and NO, sensors, supply and exhaust fans as proven in Fig. 6. Jet-Vent Controls can operate independently and can be monitored by means of a constructing Automation device (BAS). The Jet-Vent control middle facilitates growth the power efficiency of a garage by using presenting localized, variable speed, demand-pushed ventilation to keep safe air nice. While the CO or NO, pollutant tiers within the storage reach a preset degree, the air flow enthusiasts boom speed. As pollutant degrees increase and decrease, the speed of the fanatics and the related fee of ventilation

also boom and decrease accordingly.

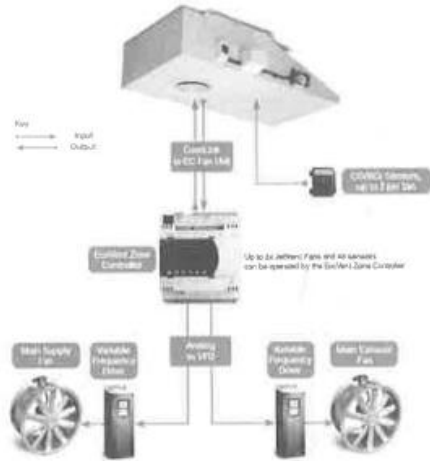


Fig: 6

4. JET VENT FANS MANAGED BY A BUILDING AUTOMATION SYSTEM:

- Analog, without extra, included sensors or detectors.
- digital, with or without additional, integrated sensors or detectors.

Jet-Vent enthusiasts EC motor's included controller allows for either Analog or virtual inputs. Digital input permits -way verbal exchange via MODBUS with the Jet Vent fanatics, sensors and detectors as shown in Fig.7. Other BAS verbal exchange protocols, along with BACnet, may also be supported with non-compulsory configuration. Fans can send fan velocity, electrical popularity and blunders codes, and obtain on/off/speed instructions. Jet Vent enthusiasts' sensors and detectors may be monitored for ongoing protection stages.

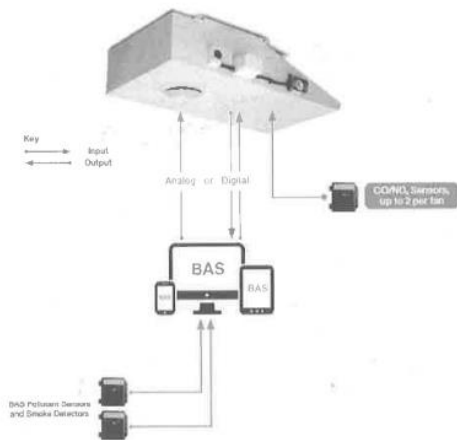


Fig: 7

4.1 JET VENT CONTROLS WITH A TRADITIONAL DUCTED SYSTEM

As defined in option 1, above, the Jet-Vent manage middle gives appealing abilities for included storage air flow management. It can be used to decorate electricity savings and operational efficiencies with conventional ducted structures.

4.2 INSTALLATION

Jet-Vent enthusiasts are commonly hard-established to the concrete ceiling of the storage the use of 8mm fixing bolts. In a few instances, fans may be activate the ceiling thru the use of brackets and anti- vibration mounts. This may be the case if there are unavoidable obstructions close to the discharge air circulation. To preserve the constructing's structural integrity, methods of affixing fans may need to be authorized by using a structural engineer. In preferred, vibration isolation is not required whilst installing Jet-Vent fans in retail or industrial office garages. However, anti-vibration mounts may be required for installations below residential buildings, or floor systems which might be bendy or vibration touchy. An isolation performance of 90%, or as otherwise targeted through the design consultant. Is suggested.

4.3 PLACEMENT OF CO SENSORS:

- No part of the enclosure will be greater than 25 meters from a sampling point.
- extra detectors will be installed in areas in which humans may additionally congregate within the automobile park and are not within one-by-one ventilated regions.
- The most sensible mounting role for a CO sensor inside a automobile park is the aid columns.
- CO sensors will be extra powerful if positioned in
- regions in which CO levels are probably to be excessive.

5. COMPUTATIONAL FLUID DYNAMICS (CFD):

CFD can provide unique prediction of air movement, temperature and smoke density all through the car park, taking into account the frequently-complicated geometry of individual buildings as this level of element cannot be supplied via every other way. A Computational Fluid Dynamics (CFD) analysis is frequently required to show and similarly refine the design as lovers may want to be re-oriented, or in some

instances, added or eliminated. The photograph indicates the velocity vectors produced with the aid of the CFD representation of a Colt Cyclone 100 fan unit

6. TO MINIMIZE THE GASES RELEASED BY VEHICLES IN ATMOSPHERE IT'S BETTER TO USE ELECTRIC CARS/BIKE/TRUCKS

Just as electric powered cars are helping to reduce pollution from passenger cars, electric powered vans and buses ought to take away tailpipe pollution completely, and increase the development of easy, renewable strength and hydrogen.

Further to emitting no harmful tailpipe pollution, electric powered trucks and buses have drastically Lower worldwide warming emissions than motors powered via fossil fuels. A battery-electric bus on contemporary strength grid is the bottom-carbon alternative in each a part of the u. S. A.

A growing wide variety of towns are dedicated to 100 percent 0-emission transit buses of their fleets together with Delhi, Chennai, Bangalore and Hyderabad within the USA.

7. NEED FOR EXHAUST FUMES REGULATION

The issue concerning exhaust gas emission from internal combustion engine in multilevel Parking spaces is not being regulated in Indian context. Though we have plethora of rules under various acts for industries covered by both state and Central pollution control board, there is no single agency keeping a tab on emissions of exhaust gases and fumes in closed parking slots of built environment. With the rising need for developing smart city and green neighborhood, the matter concerning monitoring and control of exhaust gases and fumes in parking region in building needs to be given Importance by introducing appropriate regulatory measures. Probably with introduction of electric vehicle in the market the policy weather monitoring and control of exhaust fumes in the parking lots would be required in for future can be reviewed.

8. PRACTICAL STUDY AT DIFFERENT COMMERCIAL SITES

8.1 SITE 1: AMB MALL HYDERABAD

DATA READING COLLECTION- AMB MALL						
DECK ONE - 1						
AREA	CO READINGS	CO2 READINGS	HCHO READINGS	TVOC READINGS	AQI	REMARKS
AT BIKE PARKING	15ppm	530ppm	0.025	0.3mg/m	2	THERE ARE THREE LEVELS PROVIDED WITH MECHANICAL VENTS AND ARE MAINTAINED WELL FOR RELEASE OF GASES
AT CAR PARKING	13ppm	524ppm	0.022	0.2mg/m	2	
AT COMMON CORNER	14ppm	526ppm	0.024	0.2mg/m	2	
AT DRIVE WAY	16ppm	528ppm	0.027	0.3mg/m	2	
DECK TWO - 2						
AT BIKE PARKING	14ppm	525ppm	0.025	0.3mg/m	2	
AT CAR PARKING	13ppm	523ppm	0.022	0.2mg/m	2	
AT COMMON CORNER	15ppm	526ppm	0.024	0.2mg/m	2	
AT DRIVE WAY	17ppm	528ppm	0.027	0.3mg/m	2	
DECK THREE - 3						
AT BIKE PARKING	15ppm	530ppm	0.025	0.3mg/m	2	
AT CAR PARKING	14ppm	524ppm	0.022	0.2mg/m	2	
AT COMMON CORNER	16ppm	526ppm	0.024	0.2mg/m	2	
AT DRIVE WAY	17ppm	528ppm	0.027	0.3mg/m	2	

Table: 1

Excellent
 Good
 slightly polluted

AMB mall has three levels of parking and is provided with mechanical air vent system which are used for every three hours in peak traffic time.



Fig: 8 parking layout

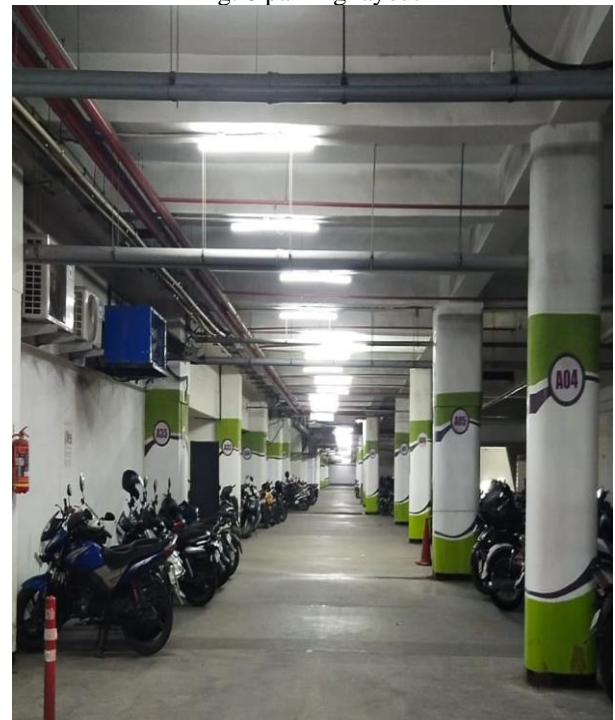


Fig:9 parking space



Fig:10 mechanical vent

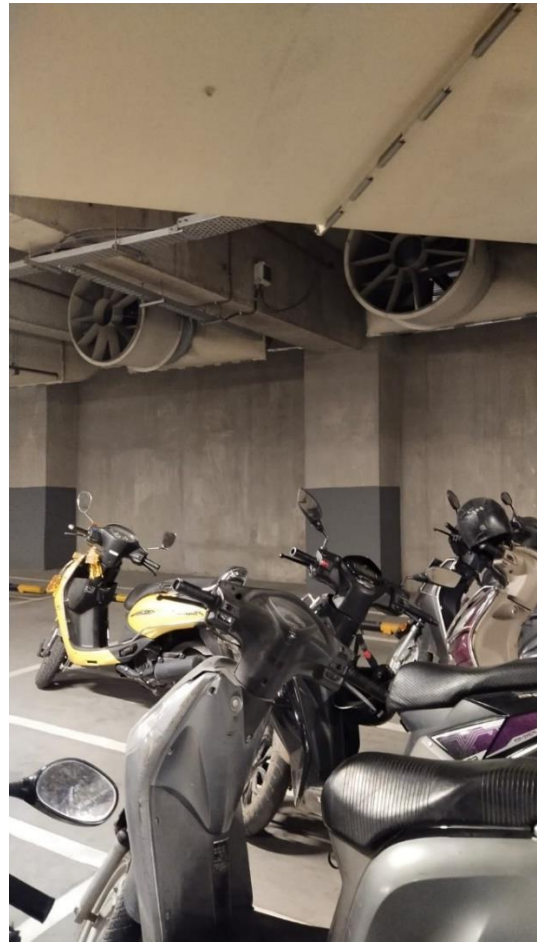


Fig: 11 vents

8.2 SITE 2: IKEA HYDERABAD

DATA READING COLLECTION- IKEA						
DECK ONE -1						
AREA	CO READINGS	CO2 READINGS	HCHO READINGS	TVOC READINGS	AQI	REMARKS
AT BIKE PARKING	10ppm	519ppm	0.019	0.2mg/m	2	THERE IS ONLY ONE DECK WITH MECHANICAL VENTS
AT CAR PARKING	11ppm	521ppm	0.02	0.2mg/m	2	
AT COMMON CORNER	11ppm	518ppm	0.018	0.2mg/m	2	
AT DRIVE WAY	13ppm	522ppm	0.023	0.3mg/m	2	

Table: 2

■ Excellent
 ■ Good
 ■ slightly polluted

IKEA has one level of parking and is provided with mechanical air vent system which are used according to the sensors provided in the parking space.



Fig: 12 car parking space

8.3 SITE 3: ASHOKA CAPITOL, HYDERABAD

DATA READING COLLECTION- ASHOKA CAPITOL						
DECK ONE - 1						
AREA	CO READINGS	CO2 READINGS	HCHO READINGS	TVOC READINGS	AQI	REMARKS
AT BIKE PARKING	15ppm	530ppm	0.025	0.3mg/m	2	HERE WE HAVE 2 DECKS WITH NO MECHANICAL AIR VENTS PROVIDED YET THE CO, CO2 LEVELS ARE MAINTAINED GOOD
AT CAR PARKING	13ppm	528ppm	0.022	0.2mg/m	2	
AT DRIVE WAY	10ppm	519ppm	0.019	0.2mg/m	2	
DECK TWO - 2						
AT BIKE PARKING	14ppm	524ppm	0.022	0.2mg/m	2	YET THE CO, CO2 LEVELS ARE MAINTAINED GOOD
AT CAR PARKING	13ppm	526ppm	0.023	0.2mg/m	2	
AT DRIVE WAY	10ppm	520ppm	0.02	0.2mg/m	2	

Table: 3

Excellent
 Good
 slightly polluted

Ashoka Capital is a commercial office space having two levels of parking that has no mechanical vents provided. There are ducts for air as ventilation.



Fig: 13 parking space

8.4 SITE 4: BUSINESS SQUARE, HYDERABAD

DATA READING COLLECTION- BUSINESS SQUARE						
DECK ONE - 1						
AREA	CO READINGS	CO2 READINGS	HCHO READINGS	TVOC READINGS	AQI	REMARKS
AT BIKE PARKING	25ppm	551ppm	0.036	0.4mg/m	2	HERE WE HAVE 3 DECKS WITH MECHANICAL AIR VENTS PROVIDED YET THE CO, CO2 LEVELS ARE MAINTAINED GOOD
AT CAR PARKING	22ppm	538ppm	0.003	0.3mg/m	2	
AT DRIVE WAY	14ppm	536ppm	0.003	0.2mg/m	2	
DECK TWO - 2						
AT BIKE PARKING	15ppm	530ppm	0.025	0.3mg/m	2	YET THE CO, CO2 LEVELS ARE MAINTAINED GOOD
AT CAR PARKING	13ppm	526ppm	0.023	0.2mg/m	2	
AT DRIVE WAY	13ppm	520ppm	0.02	0.2mg/m	2	
DECK TWO - 3						
AT BIKE PARKING	15ppm	530ppm	0.025	0.3mg/m	2	YET THE CO, CO2 LEVELS ARE MAINTAINED GOOD
AT CAR PARKING	16ppm	530ppm	0.026	0.3mg/m	2	
AT DRIVE WAY	13ppm	524ppm	0.022	0.2mg/m	2	

Table: 4



Fig: 14 parking space

8.5 SITE 5: MY HOME JEWEL, HYDERABAD

DATA READING COLLECTION- MY HOME JEWEL						
DECK ONE - 1						
AREA	CO READINGS	CO2 READINGS	HCHO READINGS	TVOC READINGS	AQI	REMARKS
AT BIKE PARKING	50ppm	486ppm	0.008	0.0mg/m	1	HERE WE HAVE 3 DECKS WITH NATURAL AIR VENTS PROVIDED YET THE CO, CO2 LEVELS ARE MAINTAINED GOOD
AT CAR PARKING	18ppm	522ppm	0.003	0.2mg/m	2	
AT DRIVE WAY	14ppm	526ppm	0.018	0.3mg/m	2	
DECK TWO - 2						
AT BIKE PARKING	10ppm	510ppm	0.018	0.2mg/m	2	YET THE CO, CO2 LEVELS ARE MAINTAINED GOOD
AT CAR PARKING	13ppm	526ppm	0.019	0.2mg/m	2	
AT DRIVE WAY	13ppm	520ppm	0.018	0.2mg/m	2	

Table: 5



Fig: 15 parking space



Fig: 16 natural vents

8.6 SITE 6: DLF, BANGALORE

DATA READING COLLECTION- DLF						
DECK ONE - 1						
AREA	CO READINGS	CO2 READINGS	HCHO READINGS	TVOC READINGS	AQI	REMARKS
AT BIKE PARKING	11ppm	528ppm	0.018	0.2mg/m	2	HERE WE HAVE 2 DECKS WITH MECHANICAL AIR VENTS PROVIDED YET THE CO, CO2 LEVELS ARE MAINTAINED GOOD
AT CAR PARKING	13ppm	522ppm	0.003	0.2mg/m	2	
AT DRIVE WAY	14ppm	526ppm	0.018	0.2mg/m	2	
DECK TWO - 2						
AT BIKE PARKING	12ppm	524ppm	0.018	0.2mg/m	2	YET THE CO, CO2 LEVELS ARE MAINTAINED GOOD
AT CAR PARKING	13ppm	526ppm	0.018	0.2mg/m	2	
AT DRIVE WAY	13ppm	520ppm	0.018	0.2mg/m	2	

Table: 6



Fig: 17 Mechanical vents



Fig: 18 Parking

facility: def. west end heights, AkshayNagar, Begur, Bengaluru 560068

flat c 3085

facility studies: car parking

number of underground basements: 2 numbers

number of blocks in c-segment, 4 section or towers of 18 floors:

approx. 100 car parking per section, total for c1,2,3,4 400 parking lot.

facility services under the basement for car parking:

- exhaust fans with duct work and supply grills
- firefighting hose deluge system
- smoke/ heat detector and water sprinkler system
- water drainage with panel which will collect the wash water and flood drain
- water collect in a sump tank and pump it to outside tank.
- huge mirror reflector for monitoring vehicle moment in turnings.
- adequate ventilation shaft in the 2 level basements for natural ventilation.
- adequate basement lighting.
- a dedicated facility supervisor with team to continuously monitor clean and upkeep of the car basement facility.

9. INSTRUMENT USED:

The instrument used for the study is “AIR QUALITY DETECTOR”

HASTHIP Air Quality Monitor, 5 in 1 Accurate LCD Air Quality Meter for AQI, HCHO, CO₂, CO, TVOC, Rechargeable AQI Quality Monitor.

This instrument gives the readings adequately.



Fig: 19 Instruments

10. CONCLUSION:

Here through the study, I suggest that every modern building being constructed now should have sensor-based equipment to manage the gases released in the parking by achieving both natural and mechanical vent systems and maintain the levels of emissions appropriately.

The prerequisite for development of smart city's and green neighborhood calls for development of sustainable built environment for social sustainability. Regulators, policymakers, builders and project implementers must critically examine all aspects of the built-in environment. With emission levels alarmingly raising in India there is a dire need to look into all aspects of pollution generated both at macro and micro level. The need for monitoring and control of emission at enclosed parking spaces in multilevel parking decks of big multi storied complexes and various methods of exhaust ventilation is of paramount importance. With a voluntary implementation of the emission control system in absence of regulation would contribute considerable benefit to the social fabric promoting to social sustainability.

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