

An Overview of Bicycle Parking System

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Abstract- Bicycle being the transporting means for modern society due to increase of pollution and many more things. But in modern days the problem fold down to parking systems, there are many bicycle parking system available which are affordable, easy to handle and easy to use. Early models tends to offer a means of securing one wheel, these can be grooved piece of concrete in the ground, a forked piece of metal into which a wheel of the bicycle is pushed, or a horizontal "ladder" providing positions for the front wheel of many bicycles. These are not very effective, since a thief need only detach the wheel to free the rest of the bicycle. They also do not offer much support and a row of bicycles in this type of stand susceptible to all being toppled in a Domino effect. These types of stands are known as wheel benders among cyclists. This paper include studies done on various types of bicycle parking system available which are more effective than wheel benders known as vertical parking system.

Keywords- bicycle parking, Rack design, bicycle cages, bicycle lockers etc.

I. INTRODUCTION

Vertical cycle parking is the newest concept coming out nowadays. Today most of the countries of the world move toward the more use of cycle due to more consumption of fuel and also the environmental pollution. Although the use of cycle is not more but after some years it is definitely sure that the use of cycle become increasing rapidly. Due to the more use there will arising a problem off the bicycle parking. So, some countries try to face the problem of this, hence they design the new type, conventional and more durable bike racks. There are various countries in the world who design their own bicycle stand. Such a rack type, wave type, decorative type and innovative type.

To contribute the idea of the vertical bicycle parking system comes in picture. This is one of the most convenient and suitable system for bicycle parking. This system required less space and also can be fixed to the wall. The installation and maintenance is also easy. This allowed saving almost 40% of the total space required before. This is generally used allow space constraint is take place such as School having less space, offices, buildings such as flats. This can also use for the decorative purpose in houses.

A. Classes of parking system

Various types of classes are depending upon the space available and environment to environment. It also depend upon the durability such as long time and short time parking classes such as

- Class 1
- Class 2

In class 1 type when bicycle parked for hours at a time.

Examples of these spaces include offices, library, and elementary school. In this weather protection for racks is also being provided. Whereas in case of class 2, this is the most common and widely used in public places. These racks are needed when cyclist placed their cycle for less than 2 hours. Weather protection is not so important for this class. It can be implemented near the restaurant, picnic areas and parks.

II. TYPES OF BICYCLE PARKING SYSTEM

There are two categories of bicycle parking:

- A. Long-term bicycle parking
 1. Also known as "bicycle parking space occupant or type 1 bicycle parking".
 2. Includes bicycle racks in an enclosed secured area with controlled access.
 3. Individual, secure and closes like bicycle lockers.
- B. Short-term bicycle parking
 1. Also known as "bicycle parking space visitor or type 2 bicycle parking".
 2. Includes bicycle rides in an easily accessible location.
 3. Available for public use.
 4. Sheltered or unsheltered.
 5. Does not protect bicycles from vandalism for theft attempts.

III. CRITERIA FOR GOOD QUALITY BICYCLE PARKING

Although there are a wide variety of designs strategies that can be used to implement good quality bicycle parking. There are three main criteria that must be satisfied:

- A. Accessibility
1. Close to building entrances.
 2. At ground level are accessible from ground level (i.e. by ramps, elevators).
 3. No obstacles like stairs or steep slopes.
 4. Separate, dedicated bicycle ramps into parking areas and desirable.
 5. Way-finding signage.

B. Installation

All bicycle racks should be firmly secured to the ground or floor by bolting them to a hard surface or fixing them in concrete. Concrete is the preferred surface for maximum security although other surfaces may also be appropriate.

C. Spacing

Required minimum spacing between bicycles parked in a horizontal position is 0.6 meters by 1.8 meters with a vertical dimension of 1.9 meters. For bicycles parked in a vertical position the required spacing is 0.6 meters by 1.2 meters with a vertical dimension of 1.9 meters.

IV. VARIOUS TYPES OF DESIGN

A. Rack design: - There are several types of bicycle parking rack designs available for bicycle parking on property outside of the public right of way. The key features of rack design determine their quality and suitability.



Figure 1: - Rack design (U-rack)

B. Covered Bicycle Parking: - Sheltered racks provide an even higher quality of short term parking. Shelters offer weather protection and can help protect bicycles from accidental damage by providing greater separation from a

sidewalk or parking area. Installing parking underneath awnings, overhangs or stairways can also provide good shelter and may avoid extra construction costs. An enclosed structure provides the best shelter however a simple covering will still help to protect bicycles and cyclist from rain and snow



Figure 2:- Covered Bicycle Parking

C. Bicycle Lockers: - Bicycle lockers are individual storage units. They are weather protected, enclosed and operated by a controlled access system that may use keys, swipe cards (key fob) or electronic key pad located on a locker door. Some locker systems are set up for multiple users.



Figure 3:- Bicycle Lockers

D. Bicycle cages: - Bicycle cages restrict access to bicycle parking racks through electronic keypad, security pass card or a similar type of system. Good quality racks are installed inside the cage and bicycles are locked to these racks. See section 2.3.3 for details on rack installation and spacing. Once inside the cage, an individual has access to all bicycles so it is important to closely monitor and enforce proper use of the cage.

E. Indoor bicycle parking (parking garage):- Underground parking facilities offer many good options to accommodate high quality, long term bicycle parking. This can only qualify as long term parking if access to the parking garage is controlled or if the bicycle racks are otherwise secured (i.e. a bike cage, separate locked room or bicycle lockers). Providing more than one Level of security (i.e. controlled access to garage + bicycle cages or lockers) will further improve the quality of the parking.

F. Vertical bicycle parking system: - This is an innovative and a very new concept which uses the implication of mechanical knowledge to make it simple to operate and easy for parking. The system can be used in household, by garages, apartments etc.

Vertical Park	—————	In this cycle is generally directly stood on the wall in a vertical position. This is best to reduce the parking space.
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OTHER AVAILABLE PARKING SYSTEM

V. CONCLUSION

NAME	OTHER NAME	DESCRIPTION
U – Rack	Staple, Sheffield rack	Bike rack that is used in urban area because it can be placed along sidewalks without taking too much space away from pedestrians.
Wave	Serpentine	The wave is an extension of the u rack, that accommodate more bicycle then the single U rack, but only support a bicycle from at 1 Point resulting in a greater chance of the bicycle falling over when pranced in rack.
Bollard Style	Post and Ring	Bollards are short vertical post most commonly used as traffic or parking barriers. Bollards style bike racks add 1 or 2 arms to which bikes maybe secured.
Innovative	—————	These are used for both utility and style. It is small alternative, improves functionality and Appearance.
Decorative	—————	For unique natural commercial areas, some environment required more decorative bike rack.
Double Rack	—————	Two tier bike racks can be used to increase bicycle storage capacity in a fixed space. In order to easily maneuver a bicycle onto the top tire, some double deck bike racks incorporate hydraulics Pistons to lift the bike into the rack after the user has locked it.

Thus definition of bicycle parking with various aspects of bicycle parking design and various available parking systems like, U-rack, V-rack, parking lockers etc. has been overviewed. By learning and studying about the various bicycle parking system it is been found that although there are various innovative, decorative or types of parking system the Rack design dominates them by larger margin because of various qualities it has like simple design, easy to manufacture and maintain. The only disadvantage of this system is found to be that it is not appropriate for housings and apartments as it requires to be fitted on the ground which cannot be moved. One of the best alternatives of this system can be vertical parking system which uses mechanical knowledge to lift and store bicycle in means so as to space about 30% of the total space but it comes with cost and slightly high maintenance.

REFERENCES

- [1] Analysis and recommendations for improved bicycle parking in Copenhagen, Denmark, Christian Banker, Christine Keches, Megan Murphy, May 7, 2006
- [2] College of Charleston: Assessment of campus bike Parking, Aaron Holly, spring 2015
- [3] Cycle Parking Guide for New Residential Developments Produced by Transport Initiatives LLP and Cambridge City Council Feb. 2010.
- [4] Singh H, Mutyala K C, Evans R D and Doll G L 2015 Surf. & Coat. Tech. 284 281–289
- [5] Seo J W, Jun H K, Kwon S J and Lee D H 2016 I. J. Fat. 83 184–194
- [6] Bicycle parking facilities, Queensland Transport’s state cycle unit, Queensland.
- [7] Australian standards for bicycle parking facilities (AS2890.3)