

## Research & application on Residential parking facilities of Stereo garage

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**Abstract:** From the present tension situation of residential parking facilities, based on the comparison of the three-dimensional garage type and analysis to residential quarters type, made the positive significance and necessity of three-dimensional garage into residential areas clear, put forward selection and planning principles of three-dimensional garage for different residential area, In order to ease parking difficulties and stop disorderly in the residential.

### Residential parking facilities status

After investigating several new residential area of Shenyang, the sale of garage in the district is very good. And some garages are sold even more quickly than the residences. So the price of garage is increasing as well. As building sales staff told, some garages sold out in few weeks after Building opening, and many clients have started to inquire the relative information before the opening quotation of the building. All of the garages have electrically operated gate and radiator, and everyone has Certificate of property title. Many owners park any place the like because of the short supply of garages.

To new community which have been considering a heavy demand of the private cars has appeared so nervous situation, for many old residential district had built, the design is more insufficient, so that the parking deficiency, leading to the present common situation that vehicle occupancy road, public activity space and even green space.

In view of the above situation, we need to improve the situation of lack space to parking due to the appropriate. So how do we save space for so many cars in the city where the price of land is high. At present, there are two consensus views: stereoscopic parking building, or stereoscopic parking lot under the ground. The underground parking can be seen everywhere. It is very expensive to improve underground parking lot, however this has solved some problems. And there are many restriction factors to build underground parking garage. Therefore, to build a stereoscopic parking building which cover small area and contain much is an effective way to settle the problems.

### The type of stereoscopic parking

Stereoscopic parking contains self-propelled stereoscopic parking, semi-automatic stereoscopic parking and full-automatic stereoscopic parking. Stereoscopic parking refers to all kinds of parking facility which not on flat. The stereoscopic parking consists of steel framework, revolving platform (embedded type), Monitoring work station, delivery wagon, elevator and accessory equipment (fire control, electronic security mechanism). According to Structure performance, stereoscopic parking can be classified as mechanical, self-propelled and half mechanical. The major types include:

- 1) Lifting transverse kind of parking facilities
- 2) Simple lifting kind of mechanical parking facilities
- 3) Vertical lifting kind of parking facilities
- 4) Stacker kind of parking facilities
- 5) Plane moving kind of parking facilities

## The stereo garage planning of Residential district

### The type Residential area

Influence by the factors that motor vehicle quantities, different standard of supporting construction, residential area of different construction time, parking facilities supply situation have bigger difference. At the same time, Influence by the factors of location conditions and residential environment, parking demand is also different. According to the different construction time here, the present residential area can be divided into two types generally to study.

#### 1) Residential area of construction time earlier

Residential area of construction time earlier (before 2000), under the influence of the ownership of motor vehicle was low, the consciousness of construction supporting construction parking lot is weak, there are many village interior does not have standard parking Spaces, vehicle that can't parked can only excavate available public space fully in Village internal, or take up surrounding roads to park temporary, brought great influence in the living environment and urban road traffic.

#### 2) New residential area

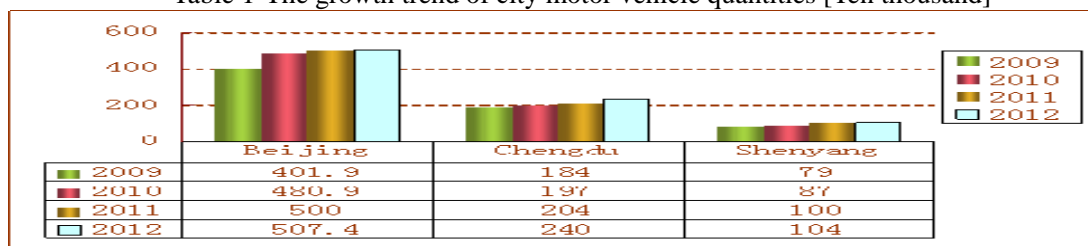
The residential area constructed between 2000 and 2005, although equipped with a certain number of parking berth, but at that time influenced by supporting construction index is not high, it is still difficult to meet the rapid growth of parking demand in recent years.

The residential area constructed after 2005, supporting construction improved, supporting construction parking supply increased, but it can not still meet the practical parking demand, exist a certain number of non-formal parking.

### The necessity and planning of stereo garage place into residential area

According to the latest data show that motor vehicle quantities of Shenyang has made a breakthrough at one million, including small, micro motor vehicle accounted for seventy percent, the growth rate of motor vehicle has already been above 16% two years in succession. Table 1 embodies the development trend of the motor vehicle quantities in Beijing, Chengdu and Shenyang during recent years, facing the increasingly soaring motor vehicle quantities, much residential area not only the parking in the planning is full, both sides roads n the community parked full, even the streets outside the community have parked full, but there are still some cars of the owner have nowhere to park, What should them do?

Table 1-The growth trend of city motor vehicle quantities [Ten thousand]



#### 3.2.1 The Choice of stereo garage facilities in old residential areas

According to the survey to old residential area of Shenyang found that the parking facilities of old village have no management, how to distribution parking space, owners have right to decide. From to Shenyang Building property department understood, that is about to come on 'some opinions on enhancement of the old residential areas management work' specify, whether to allow owner have the final say to the old residential area parking. Free space where can park the car, can take auction, wave number means for distributing parking, income can be used to supplement service fees of property management.

Old residential areas that need to be planned, in strengthening the management and redesign process, it can put into three-dimensional garage to ease difficult problem of parking. Although the old residential area parking is nervous, floor are low generally, resident population is less than new high-rise building relatively, and average income is low relatively, car won't be too much. This situation to built underground or half underground garage costs too much, also does not apply to actual situation. So, in residential space around the building put in some simple three-dimensional garage is primary choice, such as 2 simple carport, it Is not only economy and convenient but also

solving the problem, at the same time offer residents a fresh perspective.

For this kind of old residential areas that space less and irregular, should choose stereo garage which high space utilization and flexible, low cost and suitable for outdoor, for example: The type of lifting transverse parking equipment.

The kind of lifting transverse parking equipment is more, it has better adaptability to site, to civil requirements is lower, can be built in a open, ground and underground, the scale can small or large, combine and arrange arbitrarily according to different terrain and space, The rate space utilization is high, Deposit and remove car fast, use and maintenance is simple, and low cost.

In addition, in the case of don't affecting daylight and ventilation of buildings, we also can choose: multiple cycle kind, stacker kind, vertical lifting kind, vertical circulation class. The place that road is narrow relatively or cannot turn can choose: car rotary disk.

### 3.2.2 The choice of the facilities in stereo garage of new residential district

At present, the ground and underground parking space of the certain scale are built in the new residential areas in Shenyang, but the number of the parking space is fixed and limited while the number of the private cars is growing. For example, there are 226 parking spaces in Bishuimingmen, but it can't satisfy the demand of 700 of the owners. In order to solve the difficult situation of parking, the street parking at night is as a supplement. This way is in the planning and management now, but it is not safe. A considerable solution for the parking difficulty is placing stereo garage.

This kind of new residential quarter including high buildings and garden style houses can't satisfy the rising demand of parking though there are some underground and roadside planning parking spaces. Generally, the demand of this kind of new community is higher, such as the volume ratio, the size of greening, etc. Therefore, the placement of stereo garage should be analyzed and chosen specifically.

First of all, the kind of plane moving parking equipment is suitable for the construction of new residential area. This type can reduce lane area, increase the density of parking, improve the utilization of space. There are some advantages in the equipment, such as safe, reliable, high efficiency and high utilization of space. This kind of stereo garage is used in some situations, such as large garage, outdoors parking garage, the residential area required parking space and green ground, etc. It can be designed into a detached garage building and indoor double garage.

Secondly, some equipments can be chosen in the basements and square basements, such as lifting transverse, horizontal circulation, multilayer cycle, plane moving, stacker, etc.

In addition, some equipments can be chosen in better illumination and ventilation, such as pit lifting (simple lifting), lower lifting transverse, horizontal circulation, plane moving, etc. For the places not affecting illumination and ventilation, we can choose lifting transverse, multilayer cycle, stacker, vertical lifting and vertical circulation.

Table 2 -All kinds of garage take car time schedule

Types of garage	The time of take the car (s)	Note
Lifting transverse	30~160	
Small vertical circulation	$\leq 95$	Storage capacity $\leq 10$
Large vertical circulation	$\leq 170$	Storage capacity for 10 to 50
Vertical lifting	50~200	
Simple lifting	35~100	

From Table 2, we can see that the time of the simple lifting garage in take car exist obvious advantage.

Obviously, two-storey simple three-dimensional garage is the most useful to quickly solve the parking difficult problem in the communities at the beginning. High-rise parking garage often has large volume because of the floors. That will affect taking car time and easily cause the owners cannot take the car when power cut. It makes the car owners unsafe.

The price of the parking spaces in two-storey simple stereo garage is more acceptable for resident than high-story stereo garage. This kind of garage is easier to operate, more convenient to maintain and cheaper to build. Two-storey simple stereo garage can effective use the smaller residential ground space to build, it can also be built in basement even under the lawn. Many

foreign countries especially European countries have already had many mature experience and practice, which we can learn from. In addition, two-story simple stereo garage also has high applicability and practicability for upscale residential area.

For example, Dig.1 show that the situation of parking in the community. It makes the parking space up to twice to add two-story simple lift stereoscopic parking equipment at the both sides of the road.

Diagram.1--A residential area parking situation of Shenyang.



In a word, because of the low cost, flexible configuration, easy installation and removal, coupled with increasingly difficult parking situation in the residential district, make it possible for simple lift stereo garage to be built large scale in the residential area. When it play the role of real and presented in front of people, as a kind of stereo garage, people would no longer refuse and feel strange to it, it may not only be brought the parking situation within the district improved but also the improvement of people's awareness of parking, and even play a role in promoting the healthy development of the entire national parking industry.

## Summary

Whether in new building area or old building area, car owners almost have a common feeling, hard to find parking spaces. Each vehicle has a home, which is constantly becoming a reality in Shenyang.

Of course, the choice of parking facilities must also be combined with the planning and layout of the entire district, considering the level of local economic development, and the capacity of residents, residential density, number of layers, such as a series of factors. The importance of parking in the residential district of planning has no non-exclusive, designers must pay sufficient attention of the residential area parking being in the planning and design of the entire district perform their proper potential, so that the parking plan has advanced consciousness, in order to adapt to the needs of the times.

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