

# The present situation of ropeway construction and key assessment indicators in China

**Abstract:** Most ropeways in China were built in tourism area. Basing on the problems that we have met and will meet probably during the construction and development of tourism area and passenger ropeways, this article tries to put forward basic requirements and key assessment indicators for passenger ropeways admittance to tourism area or ski resort, in terms of protection of environment resources, safety demand, service function, service quality, future developing trend. The basic requirements and key assessment indicators will meet the scientific development principle which is to develop while protecting and to protect while developing, help investors make scientific and reasonable choices on layout and installation type, as well as provide referencable proposals for authority in administrative examination of passenger ropeway project.

**Key words:** passenger ropeway, tourism area, programming, resource protection

Along with the prosperity of economy, tourism in China is getting hotter and hotter, which brings good development for ropeway. According to the statistics, we had 869 ropeways till to June of 2010 in China mainland,

with types varied from surface lift、 fixed grip lift、 monocable detachable grip lift、 reversible lift to funicular. Among them, 94% are domestic products, 6% are imported. The most are fixed grip lifts and surface lifts, taking up 89%. Monocable detachable grip lifts, 5.4%. The total number has been getting bigger with about 30 new installations every year since 2000. In recent 5 years, the safety situation has been good and stable, few accidents and incidents occurred. Only 1 death and several light injuries were caused, and the reasons were not of installations' technology itself, but of 2008 earthquake, passengers and operators` behaviors.

Since the first ropeway built in 1981, after 30 years' development in Chinese ropeway industry in modern history, now we are facing life-span problem of installations. About 73 installations have served for more than 15 years, 10 installations for more than 20 years. How to treat the old equipments, especially the concrete foundation and basic mechanical equipments, such as towers and lorry, is placed in front of us. We are initiating research on it and wish gain experiences from worldwide fellows. Meanwhile, it means much more replacements in the near future. By then, fast-speed and advanced-technologic equipment will be attractive. Up to May of 2010, the first domestic detachable grip lift was passed safety test. Because of its cheaper price, it will give better options for investors.

China is a mountainous country, almost 34% proportion are mountain

terrain. And most mountains are scenic, or carry rich historic and cultural legacy. Some have been listed in the Cultural Heritage of The World, or the World Heritage, which usually have strict demand for ropeway construction. Furthermore, the people's awareness of environment protection has been aroused and strengthened. Environment protection administration usually hold magnifier to review ropeway project plans in 5A grade and 4A grade scenic spots.

At the same time, Disputes emerge in China, focusing on whether ropeway project impacts environment and how to make rational plans. On the one hand, some call for that, passenger ropeway can not only improve transportation in tourism area, satisfy the demands of increasing numbers of visitors, but also has its unique uses on facilitating rescue of mountain area emergencies, and on decreasing pollution brought by concrete road construction. On the other hand, some insist that, some ropeway projects influenced badly upon environment and sights. Generally speaking, the main focus is obviously on how to balance development and protection. Tourism area and passenger ropeway have close ties, they depend on, promote, upgrade each other. Therefore, in order to keep tourism developing scientifically, sustainably and healthily, and also to avoid potential problems, it is highly necessary for us to put forward requirements on layout, construction and operation of passenger ropeway admittance to tourism area.

Basing on problems that we have met and will meet probably during construction and developing of tourism and passenger ropeway, this article tries to put forward basic requirements and key assessment indicators on passenger ropeways admittance to tourism area, in terms of protection of resource, safety demand, service function, service quality, future developing trend. Among these 5 terms, the preceding 3 terms could be compulsory. The other 2 terms could be recommended. When making the requirements, 2 points must be emphasized. The first one is to pay much attention to the influences on environment brought by ropeway construction and use, and to try best to avoid them. The second is to choose a proper line profile, to avoid wasting resources, destroying sights and safety problems probably caused by improper line profile.

## **1. Requirements of resource protection in tourism area**

Resource protection is important for tourism area. If an installation would be planned to build in tourism area, it should comply with the requirements of environment protection.

### **1.1 Requirements of environment and zoology resource protection**

#### **( i ) Basic requirements**

A series of laws and rules should be complied, including: ENVIRONMENTAL PROTECTION LAW, THE LAW of LAND ADMINISTRATION, FOREST LAW, LAW on THE PREVENTION and

CONTROL of WATER POLLUTION, LAW on THE WATER and SOIL CONSERVATION, LAW on THE PREVENTION and CONTROL of POLLUTION from ENVIRONMENTAL NOISIES, LAW on THE PROTECTION of WILDLIFE, REGULATION on THE NATURE RESERVES, RULES of SCENIC SPOTS AND HISTORIC SITES, REGULATIONS on THE ADMINISTRATION of CONSTRUCTION PROJECT ENVIRONMENTAL PROTECTION, etc.

All the laws and regulations mentioned above have its specific requirements, for example, requirements on pollution releasing, noises, requirements on water pollution, etc. As to such requirements, a ropeway project should satisfy them, and at least minimize the impacts.

( ii ) Key assessment indicators

a. Impact on vegetation

How the vegetation coverage destroyed, whether it is possible to recovery.

b. Impacts on botanic species

How the key protected plants reduced, whether it is possible to recovery.

c. Impacts on animal species

Whether ropeway line blocks the travel route of animals, whether noises of ropeway impacts animals' living, etc.

d. Impacts on water and soil conservation

e. Impacts on capacity of tour environment

Capacity of tour environment mainly includes capacity of space, capacity of facilities, capacity of ecology, capacity of social psychology. For ropeway construction, we need to assess the capacity of space and capacity of ecology for protecting environment and ecology.

f. Impact from pollution

How dirty water, poisoned gas, solid waste impacts on environment during ropeway construction and operation.

g. Impacts on geological environment

Assess the impacts on geological environment from the construction and operation.

h. Since no air pollution caused by ropeway construction and operation, it is no need to take them into account.

## **1.2 Requirements of sight resources protection**

( i ) Basic requirements

For avoiding impact on core sight resources, requirements of sight resources protection should be taken into account during ropeway construction. Meanwhile, esthetic principle is also necessary to be complied with. Installations in tourism area should better bring new sight and harmonize with original environment.

( ii ) Key assessment indicators

a. Impact on relative gradient

b. Impact on relative distance

- c. Impact on visibility of sight
- d. Impact on striking sensitivity of sight
- e. Impact on local history and culture

## **2. Requirements of tourism area safety**

Along with the enlarging tourism scale, tourism safety gradually grasps attention of the government and people. Especially under the guidance of present policies aiming at enlarging domestic demand and promote consumption, tourism is going to be fever consumption. Hence, social pressure from tourism safety is getting higher.

To avoid tourism accident and ensure tourists' security, ropeway should be completely safe.

### **2.1 requirements for line profile**

#### **( i ) Basic requirements**

Usually, ropeways are located at places with complicated terrains where usually are hardly reached by tourists, and it brings dangerous threats to tourists if without helps of special transportation. So a good line profile should be completely considered during design period, which can help avoid scenarios.

#### **( ii ) Key assessment indicators**

- a. Capacity compatibility between tourism area and ropeway.

Capacity, type and location of ropeway shall meet the capacity of tourism

area's space and environment, and shall be effectively utilized.

b. Characters of terrain

Line profile, type of ropeway shall fit to the terrain. Rescue shall be available in such terrain.

c. Geology

The potential geologic impacts on ropeway, such as coast, turbid, flood, landslide...

d. Weather

The potential weather impacts on ropeway operation, such as lightning strike, cyclone...

e. Surrounding traffic situation

Safety distance between ropeway and other possible traffic means, buildings.

## **2.2 Requirements for ropeway safety**

### **( i ) Basic requirements**

Normally, the height of carrier above ground could vary from several meters to even hundreds meters, and the number of passengers on the line could be several hundred. To ensure the safety of such numbers of passengers, a ropeway shall comply with the requirements and regulations set for design, manufacture, construction, operation. At the beginning of ropeway project, design is very important to decide ropeway's safety character.

(ii) Key assessment indicators

a. Main technologic data

Such as type, speed, rope inclination, gauge, drive power, etc.

b. Layout

Such as terminal layout, profile layout, height above the ground, space envelop on the line, etc.

c. Type of component equipments

Such as rope, lorry, return system, tower, roller battery, saddle, tension system, carrier, etc.

d. Safety element and function

Such as all kinds of the safety switch, safety distance, alarm, etc.

e. Electrics

Such as power supply, motor drive system, electric control system, main electric component, etc.

f. Rescue equipments and rescue ability

Such as type and number of rescue equipments, compatibility with terrain, rescue ability, etc.

g. Design review

Design review is a key guarantee for the design quality.

### **3. Requirements of service function of tourism area**

#### **3.1 Service requirements of ropeway in mountainous tourism area**

( i ) Basic requirements

China is such a country with many mountains. According to statistics, mountains and hills take up 43% of the whole territory, which forms the main nature reserves. At present, most of ropeways are used for tourism, and built in mountainous areas. To adapt to mountain tourism, Ropeways shall meet the following requirements.

- a. To conquer complicated terrains and fulfill point to point transportation

A proper type and line profile could avoid capital waste, sight destroying, rescue difficulty, etc.

- b. To satisfy demands of transportation capacity.

Basing on the practical and future potential capacity demands, a ropeway with reasonable capacity could improve the utilisation of installation. At the same time, the transportation capacity should fit the track of tourism, and pay attention to the difference of low season and midseason.

( ii ) Key assessment indicators

- a. Capacity

Ropeway capacity factors comprehensively including carrier numbers, carrier capacity, speed, carrier interval, length, should fit to the capacity of tourism area, sighting route, capacity of space, etc.

- b. type

Terrain and weather conditions should be taken into account. Capacity,

sighting route, sight protection should be satisfied.

c. Line profile

The line should be relatively hidden, having less influence on core sights.

Terminal area should be easily reached by other transportations.

d. Rescue equipments and its ability

Mentioned above.

e. Proper capacity of ropeway installation basing on the capacity of tourism area

Mentioned above.

### **3.2 Requirements of ropeway in ski resort**

Along with the development of ski sport in our country, skiing section prospers rapidly, more and more people begin to get familiar with and even be fascinated by this passionate sport. Medium and small skiing resorts are emerging in northern, northwestern of china. Even some indoor skiing fields come to people's leisure lives. As main transportation, ropeway is supportive element for a skiing resort.

( i ) Basic requirements

Besides the requirements of ropeway in mountain area, ski resort has its unique requirements for ropeway, as following:

a. High demand on installation numbers.

Comparing with tourism area for sightseeing, a ski area demands more installations. Presently, in China skiing sport for common people is still at

the beginning process, a medium scale ski resort has 6~8 lifts. Nevertheless, in Europe, a large scale ski resort has hundreds of lifts.

b. Large capacity

Usually, a skier would take lift for many times in short time. Moreover, a lift probably serves for more than 1 ski run. Therefore, comparing with tourism area for sightseeing, ski resort demands on large capacity of ropeway. According to 《regulation for managing ski area》 drafted out by China Ski Association, total capacity of a first class ski resort could exceed 5000 p/h.

c. High speed

Cold weather in ski resort requires that trip time on the line should be short, which demands fast speed. Meanwhile, large capacity also requires high speed.

d. Long distance transportation.

Due to the function requirements of ski resort and ski run, ski resort demands long distance transportation. And normally, continuous ropeway is suitable for ski. But because of low capacity and speed of fixed grip ropeway, if possible, detachable grip ropeway is a better choice.

( ii ) Key assessment indicators

As the same as those mentioned above in ( ii ) of part 3.1.

#### **4. Requirements from service quality of tourism**

《 Standard of Rating for Quality of Tourist Attractions 》  
(revision,GB/T17775-2003) is a comprehensive standard of rating,  
aiming at guiding tourism area construction and improvement of service.  
Since the promotion of 《Standard of Rating for Quality of Tourist  
Attractions》 in China, more and more scenic spots began to set high  
demands on quality of service, and to take part in the rating program.  
As a kind of popular transportation, ropeway obviously has close tie with  
tourism area where ropeway usually is located. Therefore, this standard  
shall be helpful for ropeway construction.

Meanwhile, an another standard, 《Safety and Service Quality for  
Passenger Ropeway》 (GB/T24728-2009) drafted by China Ropeway  
Association, also sets specific requests on service quality.

(i) Basic requirements

a. Transportation demand from tourism area

《 Standard of Rating for Quality of Tourist Attractions 》  
(revision,GB/T17775-2003) sets relevant requirements, which could be  
useful for ropeway construction.

b. Quality requirement of passenger ropeway

Scenic spot has its characters and market orientation. Accordingly, the  
quality of ropeway shall be compatible with the characters and market  
orientation of tourism area. For example, cosiness, landscape and the type  
of ropeway should be taken into account.

c. Capacity demand on passenger ropeway

The capacity of ropeway shall fit to the capacity of tourism area. The capacity include the number of ropeways, the location of the ropeways, the type and the capacity of transportation.

d. Requirement of Safety and service quality of passenger ropeway

Besides safety, it is necessary for ropeway to pursue higher service quality, to provide comfort, fast, convenient service.

(ii) Key assessment indicators

Besides the indices listed before in part 3, the following indicators shall be taken into account: emergency responding plan, fire protection, public security, service discipline, sanitation, environment protecting behavior, communication means, information service, etc.

## **5. Requirements from future development of tourism area**

(i) Basic requirements

Future development of scenic spot shall be fully considered during ropeway construction. Protecting resources is basic requirement. The further requirement is to utilize the advantages of ropeway for benefiting future development of tourism area.

(ii) Key assessment indicators

a. Demand from the potential capacity of tourism area;

b. Demand of ropeway profile from the adaptation to the development of

tourism area's core resources and extension;

- c. Demand from the possible changing of tour route in tourism area;
- d. Demand on the capacity compatibility between different ropeways, if there is not only 1 ropeway installation.
- e. Demand on the ropeway capacity compatibility with other transportation in tourism area.

## **Conclusion**

In line with the main policy of tourism area construction, which is “layout scientifically, manage centrally, protect strictly, utilize sustainably ”, basing on the situation of tourism area construction and ropeway construction, this article put forward the basic requirements for ropeway admittance to tourism area, tries to meet the scientific development principle which is to develop while protecting and to protect while developing, help investors make scientific and reasonable choices on layout and installation type, as well as provide referencable items for authority in administrative examination of passenger ropeway project. All the requirements and indicators in this article shall be satisfied in further detail, and be more feasible, during the full ropeway construction process, from plan, design, to protection. Here, I would propose to organize experts from fields of ropeway, environment protection, regional economy, geology, and tourism, to initiate special research on

establishing standards of ropeway admittance to tourism area, to build an integrated and scientific assessing system for ropeway construction and standardize ropeway construction. On the other hand, such standard could also help correct the view that currently some think ropeway brings impact on tourism area, construct a better atmosphere for ropeway construction.

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