Planning And Design Of Amusement Park In Phuentsholing

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Abstract

This paper focuses on developing an amusement park in Phuentsholing. It includes the feasibility study, planning and design, water requirement for water related components, water purification system, water distribution pipe lines and finally development of master plan for the park. Feasibility study has been done from two perspectives, technical and economical point of view. The amusement park comprises of water related and non water related facilities. The various component for the park were choosen based on the questionarie survey and considering the sustainability in the dry season. Design of the components were carried out using IS codes and thumb rule adopted for design of similar components as available in literature. Water requirement and bather load calculation for the water related components are also calculated in this project. Purification system was decided after assessment of water quality and then the distribution lines were drawn. Finally, master plan for the park is rendered using photoshop.

Key Words : *amusement park, feasibility study, master plan, water related, non water related, Is codes, bather load.*

1. INTRODUCTION

An Amusement park is a park that features water play area such as water slides, water playgrounds, or other recreational bathing, swimming and bare footing environment along with non water related activities. Phuentsholing is the main economic capital of the Kingdom with the population of 30,000 at 3% annual growth rate since 2005. It experiences all four seasons with heavy monsoon and dry winter. Temperature of the place varies between 18 degrees in winter to 38 degrees in summer.

The need for facilities that will allow the populace to engage in rejuvenates, fun- filled activities are becoming increasing felt in the modern day Bhutan. The development of amusement park would address a long standing demand for an integrated entertainment facilities. This park would increase the country's tourism and it would be an added attraction for the tourist visiting the city for the various purposes. It also helps in optimizing the economy and development of the country. Coming up with these types of amenities in the country can always lead to the effective use of the leisure time. The study will focus on the development of amusement park with regard to the type of component and layout but the structural design of the components and the detailed estimation of the project are beyond the scope of this project. Therefore, a master plan of the park has been developed considering various datas from feasibility study. The steps followed during the project :

1. Feasibility study
2. Site selection
3. Detail survey
4. Planning
5. Design
6. Water Management
7. Master Plan

2. FEASIBILITY STUDY

While studying the feasibility study technical as well as economic point of view was taken into consideration which includes weather condition, water quality parameters, demography study andcompetitor analysis. All factors stating to the fact that Phuentsholing is favourable to have an Amusement park.

It was soon followed by a demand survey for components and came to a conclusion to include facilities in the park and which are :

1. Water slide
2. Mountain slide
3. Lazy river
4. Swimming pool
5. Carousel
6. Tilt a whirl
7. 3D theatre
8. Free fall drop
9. Children's park
10. Event area

Components specially water related were selected based on the findings from the questionnaire survey carried out during the feasibility study. The demand for the components are indicated in the bar graph below.

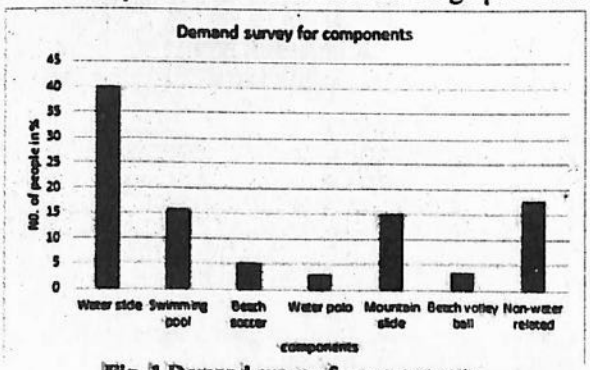

Fig. 1 Demand survey for components.

3. SITE SELECTION

The proposed site has been located along the amo chu river, Phuentsholing. It is fifteen minutes' drive from the main town. Since Phuentsholing city corporation has designated this particular area as recreational area in the structural map of phuentsholing therefore it has been concluded that the selected site is within the proper future planning of the area.

The factors considered during site selection were :

1. Distance from the main town
2. Availability of free space
3. Less vulnerability to landslide
4. Accessibility

4. DETAIL SURVEY

The determination of the total area and perimeter of the slected site has been carried out using total station. The area surveyed was found to be 28,000m^2. The map of the area surveyed was produced with the help of total station along with contours.

5. PLANNING

Based on the availability of the area of the selected site, the components specially water related facilities has been decided. Then a tentative plan of the park was produced as draft one In order to sustain the park during off season it became necessary to incorporate non-water related activities. Hence a demand survey was carried out and accordingly decided to incorporate facilities. Therefore a plan for the park which includes both water related and non- water related activities was developed as draft two. Finally third draft was produced which show cases both the features of draft one and draft two in which the dimensions and area of the facilities are properly determined.

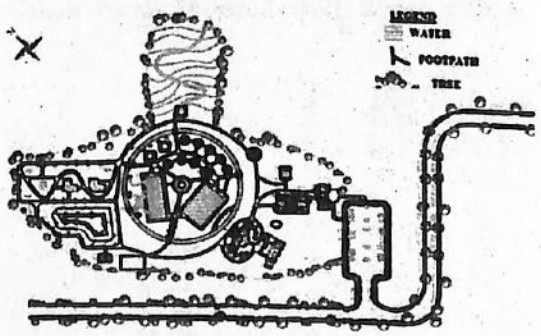

Fig. 2 Draft three

6. DESIGN

The design was mainly focused on the dimensioning of components using Indian standards.

The structural design of the individual components were not carried out where as a basic and simple design of few facilities has been carried out based on existing standards. Some of the designs are:

6.1 Swimming pool

The dimensions of pool was decided to be (25x20)m based on public based design which is of Olympic standards. Its depth varies from 1.2m at one end and 2m at another end. It has the provision of eight number of lanes each 2.5m wide. The capacity of the swimming pool is 800m^3 and fits 251 people at a time. The pipe sizes and the pump sizes has been determined based on capacity of the pool and has been found out to be 8cm diameter and 0.36kW pump.

Considering the necessary components that are required for a pool, the various components were included such as one pump, two filters and two skimmer.

The idea is to pump water from pool through filters and back to the pool. In this way the pumping system will help the pool water free from dust, debris and bacter.

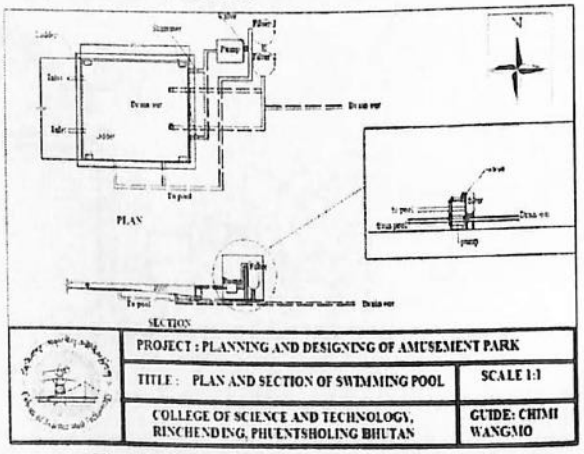

Fig. 3 Plan and section of swimming pool

The total person that can be fitted in a pool at a time is called bather load and it is calculated by the formula:

Swimming pool maximum bather load;

$$SPMBL = \frac{B}{30} + \frac{A}{15}$$

Where, A = area of the pool less than 5ft deep.
B = area of pool greater than 5ft deep.

6.2 Water treatment system for recycling of pool water

The water treatment system of a pool consist of a rapid sand filter for filtering the waste water of the pool for its recirculation. The purpose of installation of this filter is to clean the water since swimming pool has the maximum bather load which ultimately produces the maximum effluent. The turnover rate for the filtration system is 8 hours.

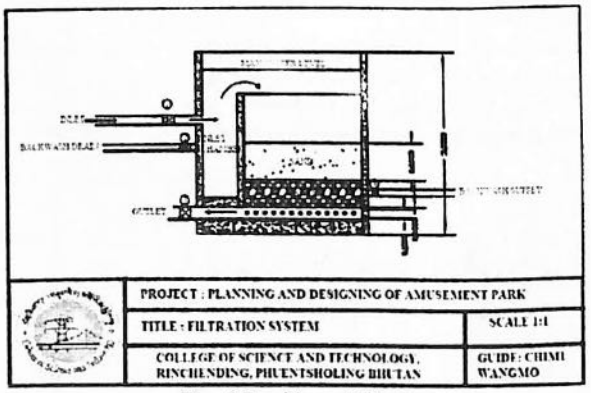

Fig. 4 Rapid sand filter.

The dimensions of the filter used were 2.5m diameter and total depth of 3m and the sizes of the filter sand used in filter were 0.5mm which was calculated using the following formulae:

1. Hudson formula
   $Qd^3h/l = Bi \times 29323$
   Where, Q= filtration rate
   d= sand size, mm
   h= terminal head loss, m
   l= depth of sand, m
   Bi= break through index = 4×10^{-4} to 6×10^{-3}.

2. Darcy's formula

$$H_f = \frac{4fl}{dx2g} \times v^2$$

f= 16/ Re for Re<2000
=0.079/$Re^{1/4}$ for Re from 4000 to 10^6

Re=Vd/v
Where, v = kinematic viscosity for water
V= velocity
d = diameter of pipe.

7. WATER SLIDE

Water slide has a height of 6 meters for two slides which is meant for adults and 3 meters for one slide which is meant for children. The width of the slide is 1 meter. Pool water depth for water slide is 0.9 meters for a length of 21.5 meters along the length from one end and then 0.4 meters for rest of the length. Ready made water slides available corresponding to the stated dimension in the market will be provided.

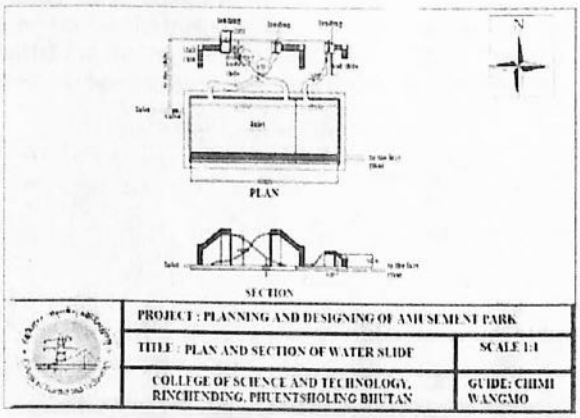

Fig. 5 Plan and section of water slide

Dimension adopted for the slide pool is (30x12) m. Bather load calculated for the pool is 258 people based on the formulae used for swimming pool. Two number of 4 cm diameter pipes were found. 0.74 kW power of pump is required to pump the water upto the top of slide from the pool.

8. MOUNTAIN SLIDE

Width of the Mountain slide is fixed as 1.5 m and pool size for mountain slide is (5x5) m with a depth of 1.2 m. Calculated bather load of pool is 17 people. Pipe size of 3 cm diameter is provided. 0.1 kW is determined.

9. LAZY IVER

The shape adopted for lazy river is circular with the internal diameter of 75 m and 2.5 m width. The shape is decided so as to accommodate water slide and swimming pool within the circle to have an aesthetic view.

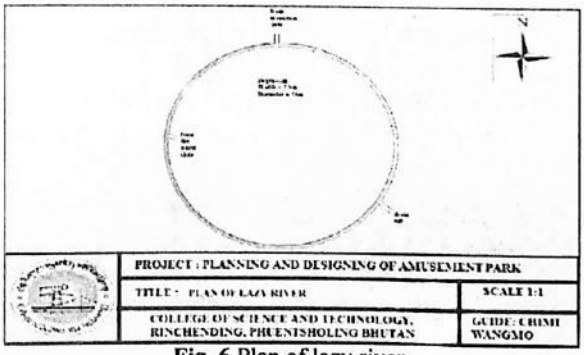

Fig. 6 Plan of lazy river

10. 3D THEATRE

It is designed to accommodate 25 people at a time. Water related components will not be enough to put up with dry season, so as to sustain the park in off season 3D theatre is incorporated.

11. CAROUSEL

Table 1depicts the information related to various types of carousel.

Single layer 16 seated carousel ride was chosen for the park by looking into area and demand constraints. Diameter of the carousle is 6 m and 6.8 m height.

Product name	Carousel, merry go round, Flying horse, carousel ride					
Carriages	Single layer				Double layer	
Passengers	10seats	16seats	24seats	36seats	24seats	48seats
Power	2.2kw	3kw	4kw	7kw	6kw	14kw
Height	3.3m	6.8m	8.8m	8.8m	10m	10m
Diameter	3.5m	6m	9.98m	10m	8m	11m
Voltage	220v/380v					
Speed	3.5RPM					
Container needed	1*20GP	1*20GP	1*40GP	1*40GP	1*40Gp	2*40GP

12. TILT-A-WHIRL

It is a large segmented undulating spinning plate form with vehicles spread over the surface. Each vehicle spins on its own axis and depending on the weight location of each guest every thrilling ride is unique. Diameter of 12.9m is decided with circumference of 41.2 m and entrance area of 360 m^2.

13. CHILDREN'S PARK

Children park consists of facilities such as:

1. See-saw
2. Slide
3. Trampoline
4. Swing

It covers an area of 1369 m^2.

14. EVENT AREA

This is the area where people can enjoy picnics with their families and friends. It can also be used as resting place especially for senior citizens. This place also includes many aesthetic components such as gardens, trees, bushes, and canopies. This covers an area of 1680 m^2.

15. WATER DRAINANGE SYSTEM

The waste water collected from various activities must ultimately be returned to the river and it is mandatory to retreat before the water mixes with the river water. The drained out water is to be treated by chlorination to cause disinfection, so to remove the bacterial load and other pollutants. According to EPA the level of chlorine needed to disinfect classified waste water effluent ranges between 5 to 20 mg/l. Sanitary waste shall be disposed directly to safety tank.

16. WATER DISTRIBUTION SYSTEM

The different sizes of pipes for the components have been determined by following specification from IS codes which states that the size of pipe shall be designed so that the water velocity shall not exceed 3m/s.

The diameter of the pipes used in different components of the park are :

Table 2 Pipe size

Sl. No	Items	Pipe diameter (cm)	Number
1	Intake	15	2
2	Swimming pool	8	2
3	Water slide	4	2
4	Mountain slide	3	1
5	Cafe	3	1
6	Rest room	3	2
7	Toilet	3	1

Hence the pipe network of the park has been developed as shown below indicating the distribution pipe and drain out pipe.

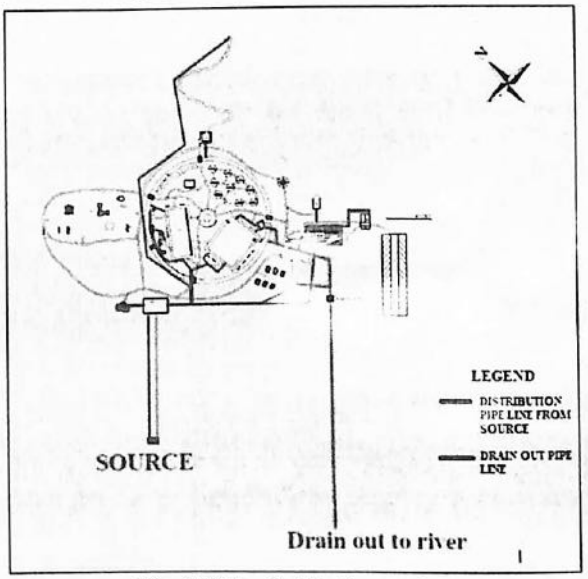

Fig. 5 Water distribution system

The effluent from the park is treated before it is drained out into the river by providing a disinfection tank as chlorine as disinfecting agent.

17. WATER PURIFICATION SYSTEM

The water purification system consist two filter at intake and two filters provided in swimming pool. The water from the source is screened before it goes into the filter and then from the filter the water is distributed to various components where as the filters used in swimming pool is used solely to perform the recirculation of pool water in order to meet its turnover demand.

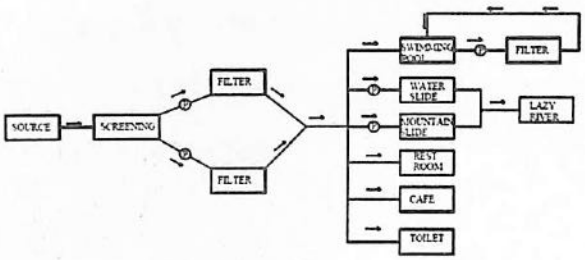

Fig. 6 Water flow layout

18. MASTER PLAN

Final master plan for an amusement park is firstly drawn in auto cad and then it is rendered in photoshop as shown below.

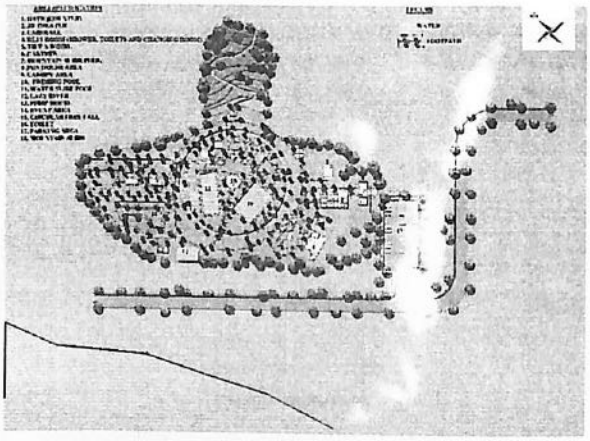

Fig. 7 Master plan

19. CONCLUSION

From the assessment of the demand survey it was established that there is a lack of recreational facilities in the country. Also most of the respondants felt that there is a need for development of such facilities as the socio-economic scenario has changed during the past few years. The Phuentsholing City Corporation has also indentified the need to diversify the functionality and attractions provided within the city and has planned to develop more robust recreational facilities. Therefore, the idea of developing an amusement park in Phuentsholing was proposed, and planning and design were carried out. The study was aimed to develop an amusement park to provide a well-organized entertainment for people to spend their leisure time and also help refrain youth from indulging in bad behavior and habbits. The major factors for selection of an area have been driven undeniably by climatic condition and demographic features. The climatic condition which is extremely warm during the summer has been suitable for the park to include water related activities which is expected to thrive economically. The demography of the area suggested that the population of the area is flexible as it is the most visited trade centre of the country and it is bordered with the neighbouring city Jaigaon of India, therefore, it is expected to result in frequent visit to the proposed amusement park. The scope of the project is limited to the development of master plan of an amusement park. Development of master plan for an amusement park consists of many important stages viz. feasibility study, selection of area, planning and design, pipe distribution lines and finally when all these stages are complied as a single component it from a master plan.

20. RECOMMENDATION

1. Flood mitigation measure for the park, since the park is near river (design of dam).
2. Structural design of each components and detail estimate of the project.
3. Expansion of the park.

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