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ANALYSIS OF WATER LOGGING AT SJCET CAMPUS AND ITS REMEDIAL MEASURES

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Abstract - *Waterlogging is the achromatism of soil with water. Soil may be regarded as doused when it's nearly impregnated with water important of the time similar that its air phase is confined and anaerobic conditions prevails. This design deals with the analysis of water logging at SJCET campus. Which include data collection from SJCET campus, infiltration dimension of the soil, study of the being drainage system at SJCET campus, study of drainage outside SJCET campus, study of the living rain water harvesting system at SJCET campus, and eventually grounded on the studies, remedial measure for reducing water logging at SJCET campus is set up out.*

1. INTRODUCTION

Waterlogging refers to the achromatism of soil with water. Soil may be regarded as doused when it's nearly impregnated with water important of the time similar that its air phase is confined and anaerobic conditions prevail. In extreme cases of prolonged waterlogging, an aerobiosis occurs, the roots of mesophytes suffer, and the subsurface reducing atmosphere leads to similar processes as denitrification, methanogenesis and the reduction of iron and manganese oxides. Water logging may be divided into two as

1. Natural
2. Man made

Due to the geological reasons, some areas are located into low lying regions and water from highland moved toward that area and it's submersed for period of timeor fairly endless. On the other hand, some
spatial development and masonry construction help water infiltration to the soil or block the water to drain out from the affected area and that's area Came water logged. The depth and duration of alluvion vary from place to place, similar areas are freed from alluvion by process of evaporation and infiltration. The reason for water logging are Specialized, social and institutional. thus water logging is taking place as different corridor of the megacity remains submersed for several days. shy drainage sections, conventional drainage system with low gravity and capacity, natural siltation, absence of coves and outlets, indefinite drainage outlets, lack of proper conservation of being drainage system, and over and over disposal of solid waste into the rainspouts and drainage paths are reckoned for the high causes of blockage in drainage system and waterlogging.

2. LITERATURE REVIEW

Su-qin Han et al (1) Analyzed the risk of urban rainstorm waterlogging facing the city of Tianjin by using methods of probability, investigation and numerical simulation. A mathematical model for the urban rainstorm Water logging was established and the precipitation over heavy rain was divided into seven grades. The mathematical model was used to simulate various rain process according to the features of the rainstorm and the draining rule.

R.P. Silbestein et al (2) Predicted the risk of water logging by using a steady state hydrological model and a hydrogeomorphic classification. The patterns of water logging occurrence were compared well with simulations using a dynamic catchment model.

Wen-Chi Tang et al (3) The abilities for waterlogging tolerance of four herbaceous flowers (Angelonia, narrow-leaf zinnia, celosia, and medallion flower) are investigated to screen suitable ornamental plants for bioretention basins, and the influence of RW on the plants is also
evaluated. All plants were treated with 10 days of waterlogging followed by 7-day recovery.

Ziren Ambaliya et al (4) Waterlogging is a serious burden for the inhabitants of the city of surat as it creates adverse social, physical, economic, and environmental impacts. A solution for this problem proposed was the location of recharge well and design concept. The study is designed as a feasibility showing foremost options and potentials created and to apply such analysis and to evaluate the availability usability of existing data available for this.

Otti. V. I et al (5) This paper takes a look at the environmental effects of drainage system and flood control in Awka, the capital city of Anambra state. They proposed that the rain water be directed by cross slopes in the overstressed drains. Runoff and off shoots must be considered for drainage system.

Zoran Vojinovic et al (6) Proposed that grey flood mitigation measures are no longer achieving desirable results. Nature based solutions have the potential to be more effective and sustainable than traditional measures. Analysis and observation of large and small scale nature based solutions and their hybrid combinations with grey measures.

Jingwen Zhang et al (7) Proposal of a human-machine interactive method for the real-time reservoir flood control operation. Modelling, operation, and human experiences are integrated for more effective decision support. Forensic engineering analysis applied to flood control was also proposed. Development of a novel forensic engineering approach to improve reservoir operation on flood control.

Mohammad Delpasand et al(8)Proposed the development of a novel forensic engineering approach to improve reservoir operation on flood control. A criteria to guide assessment of reservoirs was also proposed. Developing forecast based prereleases of water reservoir to reduce flooding. Two key performance criteria(PDR and FVR) was developed.

3. OBJECTIVE AND SCOPE

In our campus water-logging is a problem of great concern. Main objective of our project is to solve this problem of water logging. We researched about it and find various methods to solve the problem of waterlogging in SJCET. The steps taken include implementation of drainage schemes, provision of deep drains, and excavation of new channels and improvement of existing ones. Most of the time during the monsoon, the water level remains higher inside SJCET campus. It has been identified that improvement of the drainage system is one of the highest priority to solve it. Inadequate drainage of over-land run-off increases the rate of percolation. We look at the location of the waterlogging, to build a proper modern drainage system so that it can be reduced.

4. METHODOLOGY

4.1 DATA COLLECTION

Data about annual rainfall in SJCET is collected. Mainly focused on data include amount of rainfall during rainy season. Collected data also shows the whole area of the campus and rainfall storage capacity of each area

4.2 MEASURE OF INFILTRATION

Infiltration of the campus is measured. Infiltration is the process by which water on the ground surface enters the soil. The infiltration capacity is defined as the maximum rate of infiltration. Infiltration capacity of several part of the campus is very less. The infiltration capacity decreases as the soil moisture content of soils surface layers increases.

4.3 STUDY OF DRAINAGE INSIDE SJCET CAMPUS

The size of the drainage area, topography and soil of drainage is analysed. . The larger the area, the greater the volume of runoff .By studying about the drainage system of campus, we came to the conclusion that the drainage system is not appropriate enough to transport the amount of rain water falls in.

4.4 STUDY OF EXISTING RAINWATER HARVESTING SYSTEM

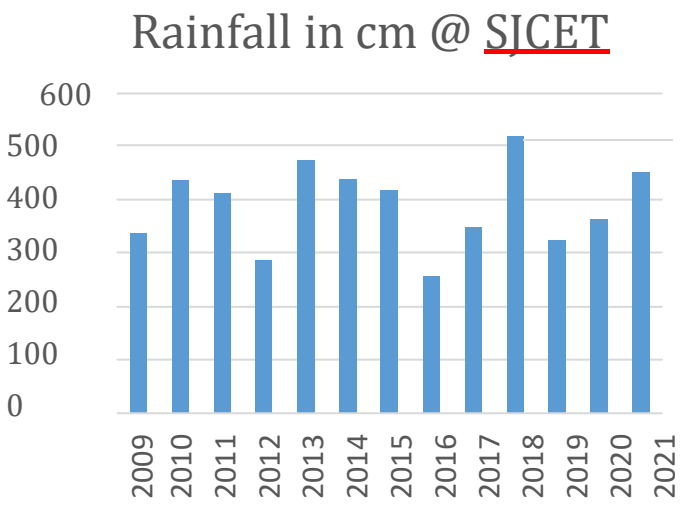
Campus already consists of rainwater harvesting system , a study about its capacity , its materials , location , overall drainage scheme are conducted and new system can be constructed based on these information .

4.5 REMEDIAL MEASURES

By using the data's in above steps, various remedial measures can be foundto reduce the water logging in SJCET campus. Measures should be in such a way that it should reduce the water logging problem to a great extent.

5. DATA COLLECTION

5.1 RAINFALL DATA



Rainfall data of SJCET campus is collected from mechanical department. This includes the rainfall data from the year 2008 to 2021. The total rainfall of each month is specified in this data. This data is collected to know the intensity of rainfall in SJCET campus during a period of time. By knowing intensity of rainfall during a period of time we can calculate the storm water flow

6. EXPERIMENTAL WORK
SINGLE TUBE INFILTROMETER TEST

Single tube infiltrometer test is conducted to measure infiltration of soil. It consists of a hollow metal cylinder of 30cm diameter and 60cm length with both ends open. The cylinder is driven in ground such that 10cm of it projects above the ground. The cylinder is filled with water, such that a head of 7cm within the infiltration of water, the water level in the cylinder will go on decreasing. Water is added to the cylinder, so as to maintain constant level. The volume of water added over a predetermined time interval gives the infiltration rate for that time interval. The observations are continued till almost uniform infiltration rate is obtained, which may take about 3 to 6 hours, depending upon the type of soil.

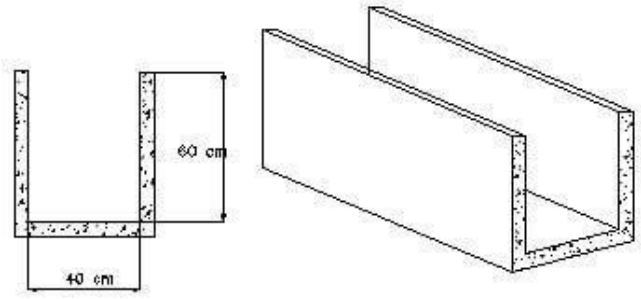
It was observed that the average infiltration rate of our campus is 4 litres in 3 hours. The infiltration rate is very lowaccording to our experiment. So it is concluded that it is oneof the main reason for the waterlogging of SJCET.

7. STORM WATER FLOW

Storm water is rainwater plus anything the rain carriesalong with it. As rainwater runs across different surfaces, it can pick up various types of pollutants including: sediments from exposed soil, oil and grease from driveways and roads.
Storm water flow is found out using rational method. This method is used for design of sewers when the area draining water into sewer is small.

Storm water quantity, Q= 2.8 CIA l/sec
Where,
Q= Quantity of storm water
C= impermeability factor or coefficient or coefficient of runoff
I= intensity of rainfall, mm/hr
A= catchment area in hectares.
C= .75
I= 12.5 mm/hr (from data collected)
A= 23 ha
Q= 2.8*.75*12.5*23
Q=603.75 l/sec
8.1 ACTUAL AREA OF DRAINAGE
Q= A* V

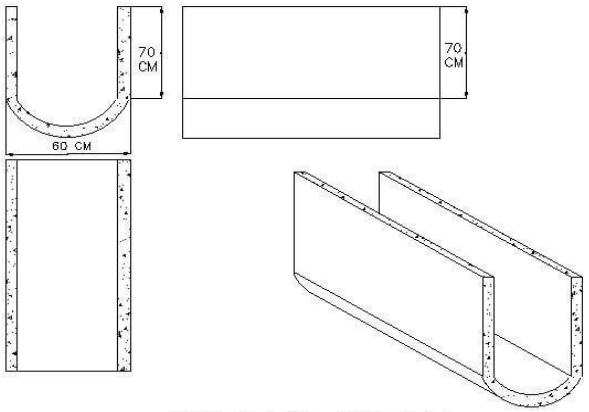
A= Area of drainage
V=Velocity of flow
A=.6 *.4= .24
V= 1.2 m/s
Q = .24*1.2 =288 l/sec
The actual storm water flow is 603.75 l/sec but, the drainage capacity is only 288 l/sec which is not enough to carry the upcoming water.



INITIAL DRAIN

8. REMEDIAL MEASURES

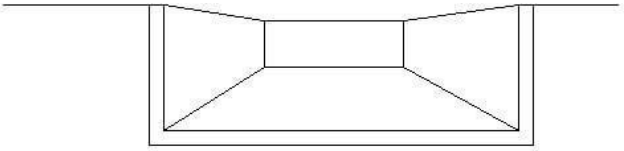
8.1 REDESIGN OF EXISTING DRAINAGE SYSTEM



DRAINAGE SYSTEM

The existing drainage system in SJCET campus is not having enough capacity to hold water during the time of heavy rain. The existing drainage system is in the shape of a rectangle, this shape may help in sedimentation. So redesign of the drainage is necessary.

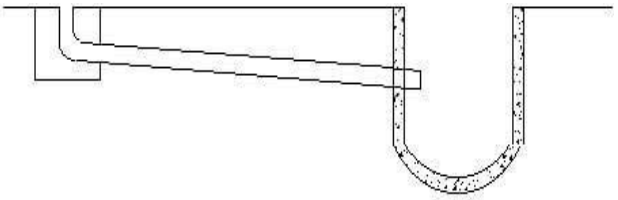
8.2 DESIGN OF DETENTION TANK



DETENTION TANK

It is an artificial flow control structure that is used to contain storm water and waste water. The system works by allowing a large collection area, or basin, for the water from different drainage systems. So this water can be used to recharge ground water.

8.3 UNDERGROUND DRAINAGE



UNDERGROUND DRAINAGE PIPE

It is constructed in front of Einstein hall so that the rainwater collected in front of it can be taken away to another drainage which is situated near the solar power plant, which reduces the water in front of the Einstein hall. Under drainage system is provided with a top grill so as to avoid littering.

9. CONCLUSION

From our investigation, waterlogging in SJCET campus is a serious issue during the time of heavy rainfall. The main reason for this is the inadequate drainage capacity, sedimentation and less infiltration of the soil. So to eradicate this problem, the existing drainage system has to be redesigned, so that the capacity of drainage system can be increased and the sedimentation can be avoided by self-cleaning. A detention tank is constructed to collect some amount of drainage water and rain water such that groundwater recharging and rainwater storage can be achieved. An under drainage system is constructed in front of the Einstein hall so that the waterlogging infront of it can be taken away to another drainage located near solar power plant. By applying all these measures, waterlogging in SJCET campus can be reduced to a much lower rate.

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