

## TITLE: CASE STUDY ON FLOOD MITIGATION WORK IN THE BUSINESS PARK WITH THE INFRASTRUCTURE DEVELOPMENT”

Anusha P<sup>1</sup>, Amith B J<sup>2</sup>, Sachin M S<sup>3</sup>, Akshay Kumar H S<sup>4</sup>

1. Assistant Professor, Department of Civil Engineering, BGSIT, BG Nagara
2. Assistant Professor, Department of Civil Engineering, BGSIT, BG Nagara
3. Assistant Professor, Department of Civil Engineering, BGSIT, BG Nagara
4. Assistant Professor, Department of Civil Engineering, BGSIT, BG Nagara

Adichuchanagiri University – BGSIT, B G Nagar -571448 Karnataka

### 1.0 INTRODUCTION:

Office parks have a more man and vehicular movement, required infrastructure development like bridge, storm water drain, traffic control, roads, cross overs, and flood mitigations during high peak rains. With required drainage, system and proper planning of infrastructure & water management system will help to eliminate the flood during high peak rains.

Other criteria for the office parks existing buildings property managed by including and adopting new technologies which is reduce the carbon emission and reduce the energy consumption by using the energy efficient and renewable source of energy equipment's.

Using renewable sources of energy helps in reducing the greenhouse gas effect and lower the effect on environment and human beings.

In addition, the existing building can enhance their durability by adopting the waterproofing technology, arrest the water seepage and leakage, and enhance the durability of the structure.

**M/s Embassy group** has developed the biggest IT park in North Bengaluru as Manyata Embassy Business Park (also called Manyata Tech Park) is a software technology park in Bangalore, Karnataka, India. The park is situated in Nagawara (near Hebbal) on Outer Ring Road and has a building area of 9.8 million square feet. The park is spread over 300 acres (1.2 km<sup>2</sup>)

A Nala crossing the MEBP campus from West to East and this Nala contains sewerage/Storm water from the various Inlets, nearby lake, and other outlet water from the nearby-located buildings.

Due to the excessive rainfall last year, the Nala overflowed into the MEBP property roads & basements of adjoining buildings, to avoid such scenario in future during the monsoon season Embassy group has appointed structural consultant **InfoTech Engineering consult pvt ltd** for appropriate solutions to enhance the surface/storm water capacity of the existing nala.

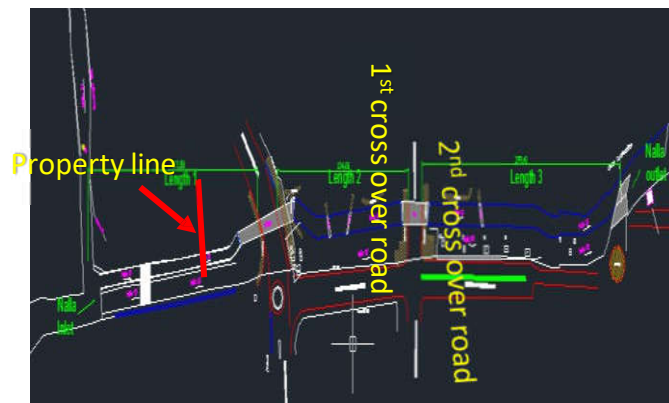
This report avoids the flooding of water from the nala to the campus, as checked from recent monsoon no flooding from nala to campus.

Along with this infrastructure being developed inside the campus like road, cross overs and Embassy Group also implementing new technologies and developed infrastructure inside the campus like fly over, sky walk, cyclic path, walkway ,internal bus stands and other world class amenities.

Usage of skylights and this will reduce the co2 emission and help in the sustainable development and environmental friendly ecosystem.

Hence, manyata Tech Park is one of the largest tech park in India and provide the best class work place for the world top companies.

**Nala Profile to renovate inside the campus:**



**Existing Nala running through campus and divided into following length to easy to understand and work execution.**

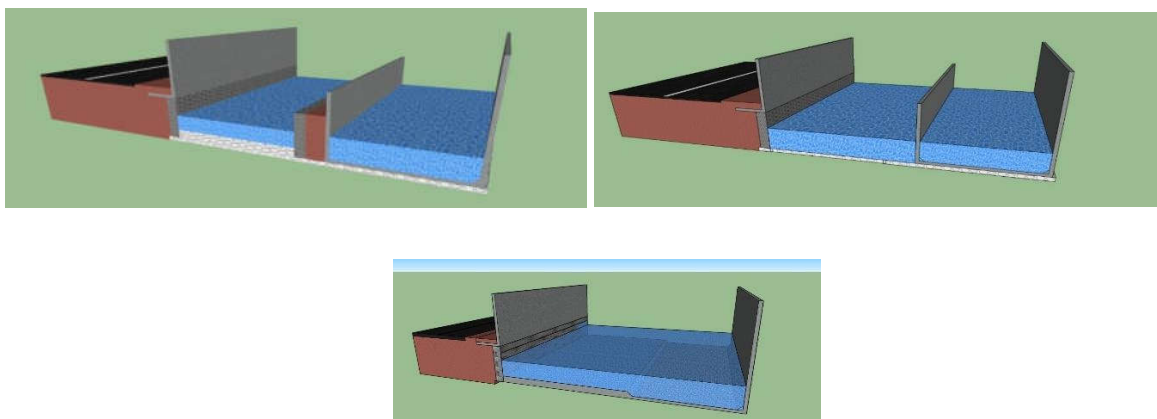
**Length 01: Nala from inflow to the 01<sup>st</sup> cross over road.**

**Length 02: From 1<sup>st</sup> cross over road to 2<sup>nd</sup> cross over road.**

**Length 03: From 2<sup>nd</sup> Cross over road to outflow of Nala.**

**Total nala running inside the campus is 490mts**

**3- Different options worked out view of 3D images**



### Steps involved during completion of project.

- Analyze the site.
- Understand the requirement.
- Examine the problem.
- Work out the possible solutions for the problem.
- Discuss the fitted solutions as per the site conditions.
- Select the options based on the faster, economical and maintenance free solutions.
- Proper planning of schedule and materials.
- Successful completion of the project and make its serviceability friendly.

### 1.4 Execution site images:



**Wall reinforcement & shuttering work in progress.**



**Wall reinforcement work in progress.**

### 1.5 Before and after work site execution images :

#### BEFORE



#### AFTER





## 2.0 INFRASTRUCTURE DEVELOPMENT INSIDE THE CAMPUS

### 2.1 Roads & Drainages.

Since its tech park more vehicle movement are inside the campus and providing a convenient for the end user its bit challenge. For providing hassle free movement roads must be wider and smooth to flow traffic.

Tech Park has two roads one is named as corporate avenue road and residential avenue road and both having two rotary circles on both roads to bifurcate and reduce the stoppage of vehicles.

Hence, 2-lane road is being constructed and along with rotary circle to bifurcate, the traffic and road width maintained by 3.5mts per lane and with the tree planting divider of 0.9m.

For any layout or any tech park drainage system shall be good enough to avoid the over flood and back flow of sewage water and in the tech park designed such way that sufficient NP2 Hume pipe and drainage HDPE pipe being installed to withstand the pressure as well as maintenance free system and installed boost pump and down laid areas to push the water and most of the location swage line design such way that to flow in gravity towards the end outlet points.

Drainage RCC trench being created and covered with the openable covers to easy maintenance.



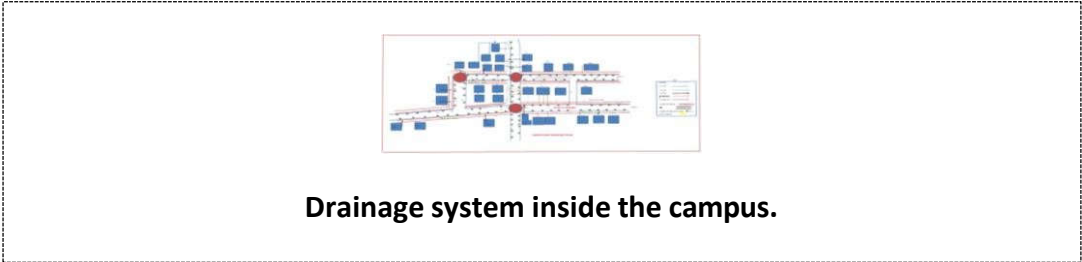
Figure 2.1:- Drawings of the road and drainage system.

### 2.2 Site Images:



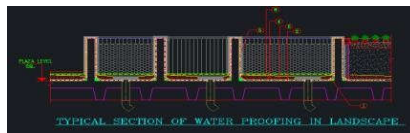
**Figure 9.2.1:- Development of skywalk for the crossing of pedestrians.**

**2.3 Common area Drainage system :**







**3.0 WATER PROOFING WORK**

Concrete is a porous and permeable material. It requires additional treatment to become watertight. Sub structure elements require protection against structural damage/water ingress/carbonation effects from durability requirements. Cracks in the foundation or joints exposed to water can lead to more serious structural problems. Concrete surfaces at foundation and basement level continuously interface with soil and water present below ground due to seasonal variations and that requires protection against corrosion, water seepage, carbonation, etc.



**3.1 Site execution images:**

 <p><b>Cleaning work of structural slab</b></p>	 <p><b>Unused Dowels any exposed rebar treating by chipping around the rebar</b></p>
 <p><b>Moisture test prior to application</b></p>	 <p><b>Primer application to receive the Waterproofing coating.</b></p>



**Pull out test to check bond adhesion.**



**Layer thickness**

#### **4.0 RENEWABLE SOURCE OF ENERGY:**

- As the part of the renewable energy and embassy always work towards reduce the greenhouse gas emissions, as part of the initiative all the towers are proposed to have a solar panel and this will reduce almost 80% consumption in electricity.
- The elevation of the building is done with the glass façade for better skylight transmissions.
- Inner side of the office space are used with the LED bulbs centralized air conditioner with the chiller unit at terrace to consume the electricity.
- The inner side of the office is planted and arranged with the indoor plants to get the good oxygen and to create a better working space.
- Common areas of Tech Park are installed with high illumination Led streetlights for better illumination.
- All remaining green patches are maintained with landscaping to get good oxygen and park aesthetic views.
- Green Waste is used in organic waste compactors and make as natural fertilizers for the plants and trees inside the campus.
- As per the latest report 100MW operational solar plant, 20MW ongoing solar rooftop project ,450-acre solar plant in bellary,215 million units of energy generated yearly and 150K tons of carbon reduction yearly.
- To encourage the Electrical vehicle, electrical fast charging being adopted in common area and with parking facilities to wellbeing of the end users.

#### **4.1 Solar panel erection images at the roof of the building inside the tech park:**



**Purlin to support solar module**



**Purlin to support solar module**

#### **5.0 CONCLUSIONS:**

- The Manyata Tech Park in Bengaluru's Nagavara is one of the largest & one of the oldest software technology parks in the country Provides with world best class amenities, infrastructure, safety and environmentally friendly tech park to the end users.
- Embassy Group always work towards full fulfilling the client requirements and provides world best class facilities to the client.

- Though its largest tech park embassy group not only concern on infrastructure and act as responsible organization towards reduce the co2 emission and create the ecofriendly environment.
- Tech Park includes the work of all the best MNC companies as the name itself indicates, “Where World’s come to work”.
- On site preliminary investigation we come to know what the problem are facing as per the present condition and understood on the site topography and what are the possible best options can be worked.
- Based on the site survey conducted understood the high flood level and this helped us on what height retaining wall need to be developed to avoid the flood from the Nala to the tech park campus.
- Suggested for the different tests this gives us existing partial structure are strength to add additional load on the same ,this gives us the satisfactory results and based on this structural detailing is being designed.
- Hence, retaining wall constructed on either side of the Nala ht of about 5.2 mts above the NGL and this will sufficient to avoid the water/flood of water from Nala to the campus.
- By this we are successfully mitigate the flood/overflow of Nala water to the campus, even in peak rains.
- Embassy Group also implementing new technologies and developed infrastructure inside the campus like fly over, skywalk, cyclic path, walkway, internal bus stands and other excellent amenities.
- In addition, by implanting renewable sources of energy and using less energy consumption equipment, more usage of skylights and this will reduce the co2 emission and help in the sustainable development and environmentally friendly ecosystem.

## 6.0 REFERENCE

- 1) Multi parameter flood hazard, socioeconomic vulnerability and flood risk assessment for densely populated coastal city 2023.
- 2) The rain deluge and flash floods of summer 2022 in the United Arab Emirates: Causes, analysis and perspectives on flood-risk reduction 2023, Journal of Arid Environments.
- 3) Causes, impacts, and mitigation strategies of urban pluvial floods in India International Journal Disaster risk reduction 2023
- 4) Building flood-resilient cities by promoting SUDS adoption: 2023, International Journal of Disaster Risk Reduction
- 5) Community resilience mechanism in an unexpected extreme weather event: An analysis of the Kerala floods of 2018, India International Journal of Disaster Risk Reduction, Volume 49, 2020, Article 101741.
- 6) The benefits of flood mitigation strategies: effectiveness of integrated protection measures Elisabetta Genovese 1 Thomas Thaler 2
- 7) Reducing Urban Flood Risk Through Building- and Lot-Scale Flood Mitigation Approaches: Challenges and Opportunities Dan Sandink<sup>1</sup> Andrew D. Binns<sup>2</sup>
  - 1) Institute for Catastrophic Loss Reduction, Toronto, ON, Canada
  - 2) School of Engineering, University of Guelph, Guelph, ON, Canada
- 8) Criss, Robert E., and Everett L. Shock. "Flood enhancement through flood control." *Geology* 29,2001
- 9) Yi, Xiu Yong, and Yang Zhang. "Study of Urban Flood Control Planning in Taiyuan." *Advanced Materials Research* 838-841 (November 2013)
- 10) Yamashita, Sampei, Yukihiro Shimatani, Ryoichi Watanabe, Toshiyuki Moriyama, Tomoko Minagawa, Kumiko Kakudo, and Terukazu Yamashita. "Comprehensive flood control involving citizens in a Japanese watershed." *Water Science and Technology* 68, no. 4 (August 1, 2013).