



Research Paper of Analysis of Storm Water Drainage System for Bridge Underpass

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ABSTRACT:

The underpass of at mominpura located at Nagpur. waterlogged every year during monsoon due to which the whole traffic systems gets blocked for hours. mominpura underpass has a major issue such as traffic, water logging in nearby areas, spreading diseases by water, blockage of storm drain & back flow of suction valve. Surrounding topography, Road gradient, rainfall data of previous year, sewer network analysis and improvement in pump capacity is required to solve this problem. Also drain system, tank system, pump system is the most important possible solution for fight against storm water. Defects in current situation of underpass will overcome by using Google earth, Auto Cad.

Keywords: Storm Water, Storm-Drain System, Underpass, Drain System.

Introduction

- **Storm water**

Storm water is water that originates during precipitation process & snow melt. Heavy Rains in a day of June to September As per its trends for several years has held less to extensive water logging on several road stretch across India. Storm water is a major cause of urban flooding which includes flash flooding snow melt, heavy rainfall & depends on catchment area. Some of the stretch and major cities where water Logging was seen in major cities Delhi, Mumbai, Pune, Nagpur Also in newly Constructed structures such as Railway Under pass, Road tunnels, Highway Underpass and due to that water logging traffic moved at slow. Public Works Department (PWD) officials said water logging complaints were being desalt with priority. As reported the media, there are challenges and opportunity to provide solution on underpass water logging problem based on civil

engineering concepts and case study.

- **Underpass**

A place where a road or railroad crosses under another road or railroad is termed as underpass

- **Storm Water Drainage**

Storm drain system is designed to drain excess rain and ground water from impervious surfaces such as paved streets, car parks, parking lots, footpaths, sidewalks, and roofs.

- **Site Information**

Mompura underpass lies at Latitude 23.0665694° N Longitude 72.5596109° E. The underpasses of Nagpur city are waterlogged every year during monsoon due to which the whole traffic system gets blocked for hours.

- Height of underpass from road is in between .
- In underpass main drainage line diameter is
- There are 5 no of pumps are used for pumping out of water stored in underpass.
- Pumping water is uplift on the bridge of the underpass.

Methodology:

Based on data collected from municipality we will design the storm water drainage system with the help of various storm water design manual.

Existing storm water design facilities will also be studied and now requirement of these facilities will be identified.

Besides this requirement if some new techniques or remedies can be approached base on the storm water drainage system design, these can be taken into consideration thus full filling the gaps and between the existing and what should be exact design elements for minimizing the water logging problem.

Designing a storm water drainage system involves several steps and considerations to ensure effective and efficient management of rainwater runoff. Here is a general methodology for developing a storm water drainage system solution

Probable Solution :

1. Proper arrangement of site drains at the entry and exits of the underpass so water collected and diverted properly before as the water enter into the underpass .
2. Proper cleaning of storm water collected from drains by grit/mesh provided on the upper face on opening of drains so the suspended and large floating, non-floating particles not get enter in drains due to that there is low risk of chokage.
3. A underground storage tank is provided besides the underpass so the water collected in drains flows out the to the storage tank. Basic function of storage tank is to store storm water and gives some time to settle down suspended fine particles also s fine mesh is situated at the opening of tank to to make water free from dirt
4. Provide pumps to increase the efficiency of whole system so we can collect the storm water easily and at faster rate further the pumps pump out the water from storage tank to recharge well. □
5. Pumping water into a recharge well and then in case of water is remain it get pumps out water into the main drainage line of the city.

Pumping System Used

A sump pump is a key component of a storm water drainage system in an underpass. It is used to remove excess water that collects in the underpass during heavy rain or flooding events. The sump pump is typically installed in a sump pit at the lowest point of the underground water storage tank.

When the water level in the sump pit reaches a certain height, the sump pump is activated and begins pumping the water out of the tank and away from the underpass. This helps to prevent flooding and ensures that the underpass remains passable for vehicles and pedestrians.

Sump pumps are available in different sizes and capacities to suit the specific needs of the underpass.

Ground Recharge well

Open wells have a major role to play in the artificial recharge of groundwater. Rooftop rainwater and surface water flowing in storm water drains can be filtered; the silt removed and allowed to recharge the open wells.

Experimental Details

Soil testing is an important step in construction projects for several reasons:

Determining soil properties help determine the composition and properties of the soil at a construction site, such as its strength, density, and bearing capacity. This information is crucial for designing.

1. Specific Gravity:

Specific gravity of soil is a measure of the density of soil particles The specific gravity of soil is calculated by dividing the mass of a given volume of soil solids by the mass of an equal volume of water. This ratio provides an indication of the void spaces in the soil and can be used to determine other important soil properties such as porosity, permeability, and compaction characteristics.

2. Dry Density:

The dry density test of soil, also known as the bulk density test, is a common laboratory test used to determine the density of soil in its compacted state.

3. Liquid Limit:

The liquid limit test is a common test conducted on soil to determine its consistency and plasticity characteristics. It is used to establish the moisture content at which the soil transitions from a plastic to a liquid state.

4. Plastic Limit:

The plastic limit test is another important test conducted on soil to determine its plasticity characteristics. It helps in assessing the ability of the soil to deform without cracking under pressure. The plastic limit is the moisture content at which the soil changes from a plastic to a semi-solid state.

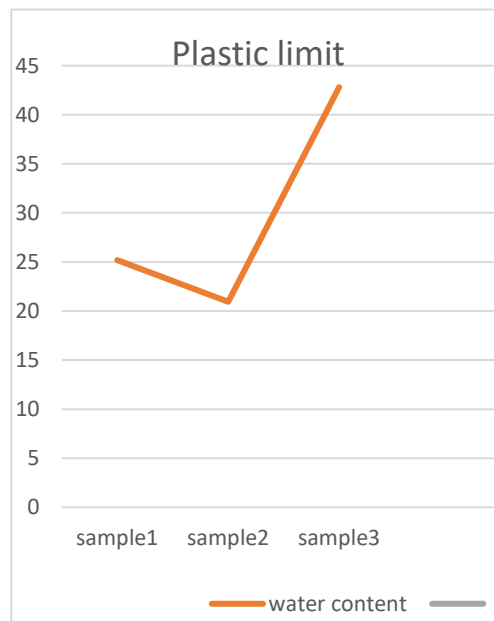
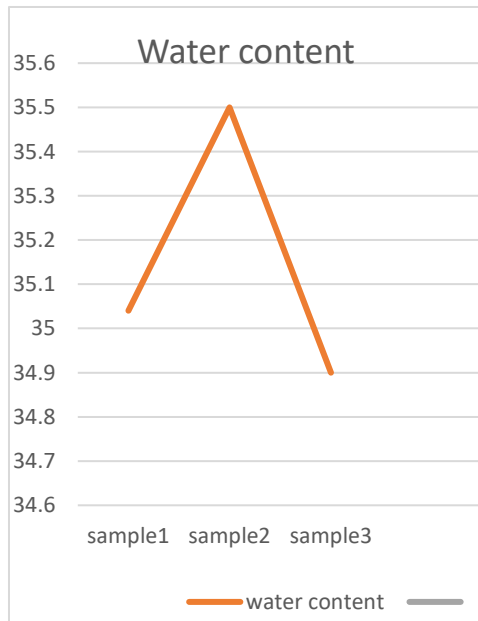
5. Shrinkage Limit:

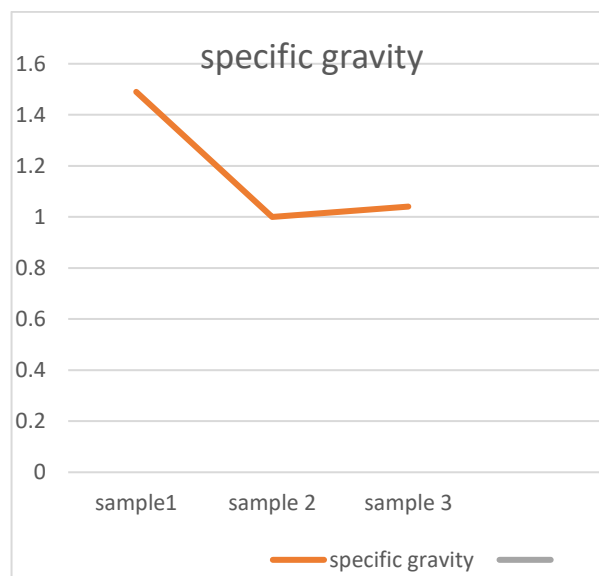
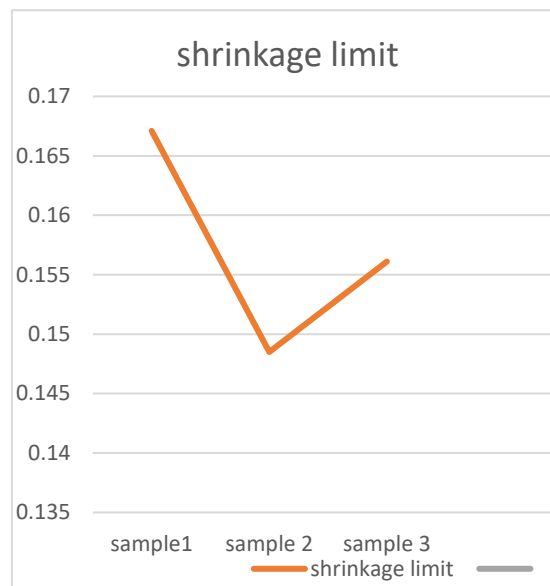
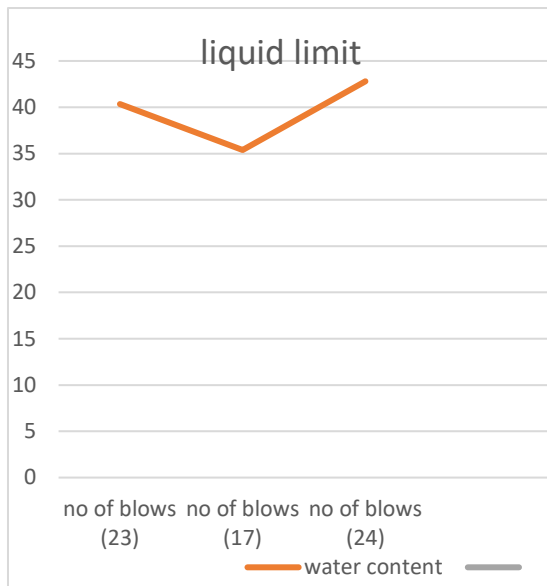
As the moisture content of the soil sample is gradually reduced by evaporation, the volume of the soil decreases. The point at which further reduction in moisture content does not result in any further decrease in volume is known as the shrinkage limit

6. Silt Percentage:

The silt content test of soil is conducted to determine the percentage of fine particles (silt) present in a soil sample. Silt particles are smaller than sand particles but larger than clay particles, and they can have a significant impact on the properties and behavior of soil.

Test Name	Results
I. Specific Gravity	1.49
II. Dry Density	8.59N/mm ³
III. Liquid Limit	50%
IV. Plastic Limit	25%
V. Shrinkage Limit	38%
VI. Silt Percentage	3%





Result and Conclusion:

Mominpura underpass has a vast problem of water logging due to storm water. To overcome this problem we make some designs structures which can reduced the water logging problem in underpass, by Constructing drains system at entry and exit of underpass also provide a storage tank tank with pumping system so the water get stored and circulate it into the recharge so also the ground water can recharge. Nearly 70% to 80 % problem will solve if we provide this system to drain storm water from underpass. Also Nagpur Municipal Corporation has to pay special attention on cleaning of storm drain for better flow of water..

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