

Hydraulic Actuated Storage System for Flood Affected Regions

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Abstract:- A lot of equipment's books, utensils, gadgets were damaged or lost at the time of last two floods in Kerala. In order to prevent these damages, we came up with an idea of a height adjusting waterproof storage which can be controlled by hydraulic or mechanical means. In this system hydraulic lifting mechanisms are used to lift the storage. The base structure is fixed in such a manner that it won't get detached from the bottom layers of soil. To support the base concrete layer, small pile like structures are provided, hence the base concrete layer will act as a strong support even under the action of water currents due to flooding. The structures are designed aerodynamically to reduce the resistance of air and to increase stability which makes it more stable at the time of storms. The box like structure or the storage head is placed on the top of the hydraulic arm which acts like a prismatic joint system. It is designed in a disc like curved structure to reduce fluid and air resistance. Inside this structure, a waterproof layer of coating or a jacket like structure is placed to protect the objects from water at the time of raining or higher waves. The height of the whole system can be varied by using a removable or permanent lever or handle like structure (plunger). At the time of flood, people could safely place their gadgets and other equipment inside the waterproof jacket inside the disc like structure.

Keywords:- Water proof storage system; Hydraulic system; Flood Storage.

I. INTRODUCTION

In last two years, we saw that the flood and heavy rains caused a terrible destruction and many lost their lives, houses, personal belongings, farms and they even lost their way of earning. After these man-made natural calamities, all that was left is a pile of mud and rubbles. The post flood issues made the people more difficult to come back to normal life. Some of the main issues were that they have to replace things like electronic gadgets, utensils, household items etc. Many people lost their election cards, Aadhar cards, books, certificates, files related to government policies etc. students lost their textbooks, notebooks etc. The most people affected by the flood issues were farmers, so it became difficult for them to start again. After analyzing the demand for innovative solutions for post flood issues, we came up with an idea about a height varying storage which

can be used to store various object that are difficult to carry along with people at the time of flood. The storage structure is waterproof and it provides wet free protection to the stored items. The storage structure is designed in an aerodynamic disc like manner to increase the stability of the structure at the time of floods or storms.

II. BASIC LAYOUT AND COMPONENTS

The basic components can be divided into three parts a) Base Structure b) Hydraulic machine or Mechanical Member c) Storage Head.

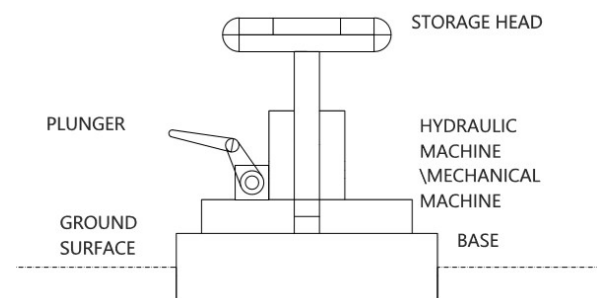


Fig.1. Basic Layout of Storage

A. Base Structure

In clay soil, it is difficult to build structures which require strong support. If the clay content extends to greater depth, structures will require a strong foundation. The Kuttanad regions are a marine deposit filled with grey marine or soft black clay. They are highly compressible and have low shear strength. To improve the stability of the structure, various ground improvement techniques can be done. Some of them are a) by providing reinforcements like stones, geosynthetic structures etc. b) by densification methods like compaction grouting c) by consolidation techniques like stone columns d) by chemical modification methods like deep soil mixing. We can use a large concrete structure with maximum surface area and should have a medium level thickness and it is fixed in the clay depending on the depth of the clay layers. We can fix this base structure to the ground by using sand piles.

B. Hydraulic Machine or Mechanical Member

A hydraulic machine is a device used to lift loads by using the pressure force created by the cylinder chamber. The pressure is created by moving oil through cylinders along a pump plunger. When the pump plunger is drawn

back, it opens the suction valve and draws oil into the pump chamber. As the plunger is pushed down, the oil is transported through an external discharge valve and into the cylinder chamber. Then the suction valve closes and it results in building up a pressure within the chamber and the piston in the chamber will rise and lifts the body. It can be repeated for several times and it makes the piston with the load to move upwards

C. Storage Head

It is a disc like aerodynamic structure used for storing objects and since it is placed on the top of the entire structure, it can be called as storage head. It has two protective layers. The outer layer is the disc like structure to withstand various calamities and provides protection to the objects inside it. The inner layer is a waterproof jacket with a zip like opening and has a good thickness. The required objects are stored inside it for their safety from the various disasters. The opening of the disc like structure has a door and it can be locked for safety measures.

III. WORKING AND ADVANTAGES

The main part of this system is the mechanical member or the hydraulic machine. The mechanical jack consists of a screw thread for lifting the storage head. The necessary items can be stored inside the waterproof jacket like membrane inside the storage head. It can be locked from outside to provide safety to the objects stored inside it. A hydraulic machine is a device used to lift loads by using the pressure force created by the cylinder chamber. The pressure is created by moving oil through cylinders along a pump plunger. When the pump plunger is drawn back, it opens the suction valve and draws oil into the pump chamber. As the plunger is pushed down, the oil is transported through an external discharge valve and into the cylinder chamber. Then the suction valve closes and it results in building up a pressure within the chamber and the piston in the chamber will rise and lifts the body. It can be repeated for several times and it makes the piston with the load to move upward.

The base structure provides a rigid support to the whole system. It is designed to withstand floods and storms and for increasing the stability, we can provide pile like structures similar to sand piles and it provides additional strength to the system. At the time of flood, people can store their goods or belongings inside the storage box and by using plunger; it can be raised to a sufficient height. The aerodynamic design helps the structure to withstand in harsh conditions. After the flood, people can use the plunger to move the storage vertically downwards and the objects can be taken back to home.

A. Advantages

It mainly serves as a height variable waterproof storage for housing important objects and goods and provides safety to the stored items. The emergency box storage inside the storage head contains food items, water, medicines, bandages, gloves for anyone who lost their way during the time of flood. Initial cost can be reduced by batch

production and sharing the use of this machine by different families. Installation of this device is easier due to the availability of assembled parts. Solar panels can be placed on the top of the storage head and at night, it can be used as a light source. A lot of customisations can be added to improve the better use of this device.

IV. CONCLUSION

Hydraulic actuated systems provide an efficient method for the storage of our important gadgets and other documents during flood affected times. The system can be manually operated at our demand. The operation is so simple that even a common man can effectively operate it and it is very simple to implement in the flood affecting regions. It is cheaper to construct at the time of batch production or in large scale production. Also it can be converted into a shade in summer seasons.

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