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THE BENCHMARK

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Editor's Desk

We are pleased to present the April 2023 edition of Benchmark. In this edition, you will an article on the "THE NARMADA VALLEY DEVELOPMENT PROJECT" and the contribution by Students and Faculty members of the Department of Civil Engineering highlighted in the month of March. News updates and departmental activities are part of Canvas.

Department Vision:

- To excel in every area of Civil Engineering, inculcate research oriented study to explore hidden talent.
- Providing Opportunity to display creativity, out of the box thinking & innovativeness, aimed at providing cutting edge technology for sustainable development.

Department Mission:

- Providing qualified, motivated faculties to deliver the content using updated teaching methodology, inviting industry experts from various areas to disseminate subject knowledge in Civil Engineering.
- Motivating students to undertake the Research Oriented studies, participate in competitions at all levels, grasping new techniques and methods which can be improved on further.
- Conducting and participating in seminars, workshops and training programs with a view to make the students industry ready and improve their employability factor for global career ahead.
- To create quality professionals capable of planning, designing and analytical skills for better infrastructural development in the field of Civil Engineering.

THE NARMADA VALLEY DEVELOPMENT PROJECT

The Narmada Valley Development Project is the single largest river development scheme in India. It is one of the largest hydroelectric projects in the world and will displace approximately 1.5 million people from their land in three states (Gujarat, Maharashtra, and Madhya Pradesh). The environmental costs of such a project, which involves the construction of more than 3,000 large and small dams, are immense. The project will devastate human lives and biodiversity by inundating thousands of acres of forests and agricultural land. The State (India) wants to build these dams on the Narmada River in the name of National Development. But how can you measure progress if you don't know what it costs and who has paid for it?

Each monsoon season thousands of people are told by the Indian government that they will have to be relocated as their ancestral lands are flooded out. The people whose lives were going to be devastated were neither informed nor consulted nor heard. A disproportionate number of those being displaced are tribal people: Adivasis and Dalits.

Damming the Narmada River will degrade the fertile agricultural soils due to continuous irrigation (rather the seasonal irrigation which is dependent on the monsoon), and salinization, making the soil toxic to many plant species. The largest of the dams under construction is the Sardar Sarovar, which, if completed, will flood more than 37,000 hectares of forest and agricultural land, displacing more than half a million people and destroying some of India's most fertile land.

The thing about multipurpose dams like the Sardar Sarovar is that their purposes (irrigation, power production, and flood control) conflict with one another. Irrigation uses up the water you need to produce power. Flood control requires you to keep the reservoir empty during the monsoon months to deal with an anticipated surfeit of water. And if there's no surfeit, your left with an empty dam. And this defeats the purpose of irrigation, which is to store the monsoon water.

In the end, the Big Dam will produce only 3% of the power planners say it will that's only 50 megawatts! Additionally, when you take into account the power needed to pump water through the network of canals inevitably attached to the dam, the Sardar Sarovar Project (SSP) will consume more electricity than it produces! Another problem with the SSP is that its reservoir displaces people in Madhya Pradesh and Maharashtra, but its benefits go to Gujarat. Even though the arid regions of that state, Kutch and Saurashtra, are not mentioned in the water-sharing award as recipients of drinking water.

The proposed dams will affect millions of people but only a certain percentage of them will be privy to the government's resettlement and rehabilitation (R & R) programs. The problem here arises in defining who are Project-Affected Persons (PAPs). The World Commission on Dams urges that the impact assessment includes all

people in the reservoir, upstream, downstream and in catchment areas whose properties, livelihoods and nonmaterial resources are affected. It also includes those affected by dam-related infrastructure such as canals, transmission lines and resettlement developments.

In reality, however, people affected by the extensive canal system are not considered as PAPs. These people are subject to R & R packages, but not the same ones as those living in the reservoir area. Unbelievably, those not entitled to any compensation at all are the hundreds of thousands whose lands or livelihoods are affected by either project-related developments or downstream impacts.

<u>By Aman Angne</u>

(BECivil)

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Fluid-structure interaction analysis on the response of open-top, squat, circular tank due to wind-driven rain

Wind-driven rain (WDR) is a natural phenomenon, which occurs, when rain droplets descend through a wind flow field, creating an angle with the vertical and affects any structure by impingement through the structural envelope. Existing literatures on wind-driven rain effect on structure, are focused on building envelop only. There is a huge scope, left unexplored, on studying the interaction response of squat, open top, circular tank with wind-driven rain. This available scope is the main motivation of the present authors behind this study. The present study has been conducted through fluid–structure interaction (FSI) analysis, by coupling computational fluid dynamics (CFD) analysis of a multi-phase fluid system involving air and water to simulate wind-driven rain, with the mechanical analysis of the tank structure, by importing the wall pressure, assessed from CFD model of WDR. This study is focused on ground-supported, open-top, squat, circular tank with a slenderness ratio of 0.5. The internal and external pressure distributions on the tank wall have been assessed for WDR and compared with the same caused by wind. The radius (R): thickness (t) ratio of the tank wall has been varied from 125 to 500, in order to understand the impact of wind-driven rain on the tank wall deformation. The comparative study of pressure distribution between WDR and wind (only) cases clearly demonstrates that the wall pressure (internal and external) due to wind-driven rain, is higher than wind (only). It has been observed that the wall deformation is showing an incremental pattern with the decrement of wall thickness. The maximum deformation zone has been observed at the upper half of the frontal area. Higher deformation zone for R/t ratios 500, 250, 166.67, and 125, can be seen for 0° to 40°, 0° to 37°, 0° to 35°, and 0° to 32°, peripherally.

Introduction

Driving rain or wind-driven rain (WDR) is a natural incident, which happens during storms, as the rain droplets travel through an angular path with respect to the vertical direction, due to the high wind, while falling down. Studies on the assessment of the three-dimensional distribution (spatial and temporal) of rain, driven by wind, on low-rise buildings provided the wetting patterns of building-envelope through weighted average technique. These studies progressed through the durability analyses of building envelope against the damage due to hygrothermal effect of the WDR loading through semi-empirical, experimental, and numerical method. The accuracy in WDR measurements was further studied and necessary method was proposed to assess the error due to the adhesion-water evaporation from the wetted area. To protect tropical buildings against wind-driven rain water clogging and subsequent hygrothermal damage of the building materials, different kinds of overhang barrier design was proposed, which can reduce WDR exposed floor area up to 53.85%. The effect of WDR interference was also studied numerically for an arrangement of two building by varying interference height, internal spacing, wind speed and intensity of rainfall. Studies on typhoon, hurricane etc. showed that wind velocity, direction, rain droplet size influence the exterior catch area, rain droplet impact, and also damage interior area of building through rain water ingress and propagation. There are different literatures available on the wetting, droplet impingement and hygrothermal effects on building envelopes. Few important literatures with relevance to the conceptual and methodological aspects of the present study are discussed here in brief, to showcase the scope,

motivation and objective of this study. Exploring through these previous literatures it is evident that, no studies are available on the deformation behaviour of any shell structure due to the interaction with wind-driven rain. Also, it can be observed that, there exists scope on studying the response of circular tank-shell under the influence of wind-driven rain. This available scope inspired the present authors to address this realistic issue, in the form of fluid–structure interaction analysis of open-top, squat (slenderness ratio 0.5), circular tank, under the impact of wind-driven rain. The main objectives of the present numerical analysis are to assess the pressure distribution of WDR around the surface of the wall of the tank, and, subsequently, the deformation behaviour of the tank wall.

<u>By Asst. Prof Usama Diwan</u>

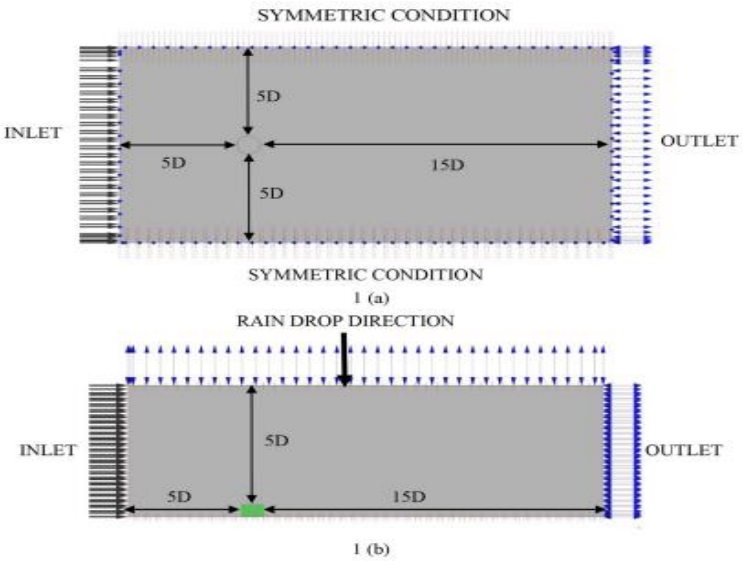

Fig. 1. Domain details (a) plan, and, (b) elevation.

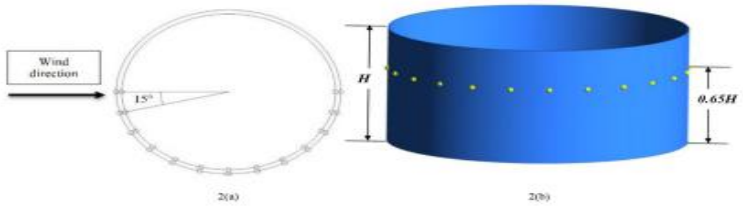

Fig. 2. Pressure tap distribution (a) plan, and, (b) elevation.

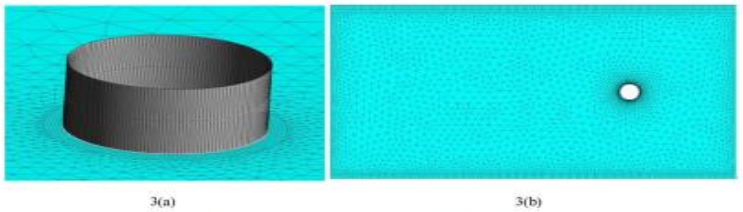

Fig. 3. Diagram of mesh for (a) model, and (b) domain.

Aurora 2k23

Aurora 2k23 was a seven-day event held annually in our college, which featured a mix of sports and cultural activities. All the divisions of each department participated in this event with great zeal and enthusiasm. This year's event was particularly noteworthy due to the excellent performance of the Civil Engineering students, who dominated the sports events and eventually won the championship.

The first day of the event began with a parade and flash mob, and it was an excellent start to the seven-day programmed. The Civil Engineering students were the stars of the show on the first day, making it clear that they were determined to win. Their energy and enthusiasm were contagious, and it set the tone for the rest of the event.

Days two to four featured various sports events, including cricket, football, volleyball, kabaddi, and kho-kho. The Civil Engineering students displayed their skills and talents in each of these events, and they were consistently in the finals of all the sports. Their performance on the field was commendable, and they scored a lot of points during these days. It was evident that they had put in a lot of hard work and practice leading up to the event.

The last three days of the event were dedicated to cultural activities, and the students did not disappoint. The students from each department gave their all in their performances, showcasing their talents and creativity. The Civil Engineering students were particularly passionate and put on an impressive display that left the audience in awe.

The Finale:

After seven days of hard work, dedication, and sweat, the Civil Engineering students emerged victorious, winning the Aurora 2k23 championship. It was a significant achievement, especially since they had lost the previous year's competition. There were a lot of controversies surrounding the event, but in the end, the Civil Engineering students emerged as the champions for the fifth time.

Aurora 2k23 was a fantastic event that brought together students from different departments and showcased their talents and skills. The Civil Engineering students were exceptional, and their performance throughout the event was nothing short of remarkable. The seven-day event was a testament to the students' hard work and dedication, and it was a fitting end to a memorable event.

Aurora 2k23

AURORA
2K23

WINNER FOR SOLO AND DUET EVENTS

WINNER FOR GROUP EVENT

WINNER FOR GROUP EVENT

WINNER FOR GROUP EVENT