To,
Co-ordinator
Project Varanasi
IIT (BHU), Varanasi

Date- 6-02-2016

Subject: Project Proposal for Floating Jetty on river Ganga.

Sir,
Here we would like to present a project proposal on the topic "Design of floating Jetty on river Ganga" over which we have been working since past one year. We have pursued the project under Design and Innovation Hub, IIT (BHU) as a summer project and have developed a small-scale working model.

The current proposal is regarding the development of a medium scale-working model of floating jetty which can be analyzed and tested with a larger scale load case. We would like to pursue this project under "Project Varanasi" for which we would like you to review the proposal, which has been attached along with the letter. A brief estimate has also been attached at the end.

Please grant us the permission and provide us the needful resources so that we can purse the project.

Thanking you.

Yours Sincerely

Ankit Patel
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Recommended & forwarded

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Project Proposal (Project Varanasi):

Design of Floating Jetty For River Ganga

Indian
Institute of
Technology
(Banaras Hindu University)

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Format for submitting projects under Project Varanasi.

1	Project type	Technology Development or Prototype Development.
2	Title of the Project	Design of floating jetty for river Ganga
3	Duration of the project	12 months
5	Name address and phone numbers of PIs and Co-PI's	**PI: Dr. Rajesh Kumar** Professor Department of Civil Engineering, IIT (BHU) Phone no:+91 542 -2307016(51) Email id: rkumar.civ@iitbhu.ac.in **PI: Dr. K.K Pandey** Associate Professor Department of Civil Engineering, IIT (BHU) Phone no:+91 542 -2307016 Email id: kkp.civ@iitbhu.ac.in **Student: Ankit Patel** IDD (Part III), Semester VI Department of Civil Engineering, IIT (BHU) Phone no:+91-9453384007 Email id: ankit.patel.civ13@iitbhu.ac.in Roll no: 13064005

6. General Description of the project:

With the growing need of transportation through waterways, India faces a variety of challenges in the development of waterways through the water bodies. The water bodies of our country show diversity in its nature. The major problems faced during the development of infrastructure such as jetties includes complex water level of river during various seasons, instable structure, bi- directional motion, etc.

Considering the above challenges, the development of a floating jetty is a possible solution to every above mentioned problem. Here are a few advantages of a floating jetty:

1. Change of the jetty level with change in water level.
2. Minimum permanent construction is required.
3. All the actuating forces are derived from natural forces.

7. General Description of experience/ expertise of team on such/ similar projects

PI (Dr. Rajesh Kumar) has various research papers in Structural optimization, Non linear Structural Mechanics, Bridges, Jetties, Finite Element Analysis, etc.

PI (Dr. K.K Pandey) have various research papers in Hydraulics and Water resources Engineering and Fluid Structure Interaction.

Student included (Ankit Patel) has worked on the prototype development of a floating jetty and also on Fluid structure interaction.

8. Deliverables

(a) Model: A working model of a floating jetty is to be developed along with a testing facility where the working of jetty can be analyzed.

(b) Process model: A process model of proposed floating jetty has been developed in meandering channel lab of Civil Engineering Department, IIT (BHU), Varanasi. The model consists of plywood platform, reservoirs made from pvc pipes and mild steel guide rails. The supporting structure is also made up of plywood. The model has been tested in the meandering channel.

(c) Design/ Technical Document: Technical documentation cum report of the prototype developed has been attached along with the proposal.

(d) Software: The following software have been used:
1) AutoCAD
2) SolidWorks
Snaps of designing done on the software platforms have been attached in the report.

(e) Document (audio, visual, write ups web sites etc)- NA

(f) Any other- NA

9. Method/ Technology to reach the deliverable:

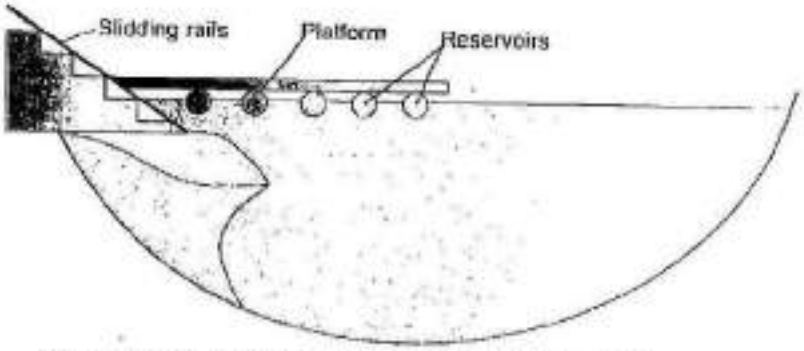
The methodology used for the development of floating jetty is as follows:

1. Use of platfonn and reservoir assembly to maintain buoyant force and gravitational forces as actuating forces. However use of HDPE blocks is more feasible.
2. Sliding cum guide rails and wheels assembly has been used to assist the smooth movement of the platform.
3. Locking system has been equipped along with the assembly to adjust the height automatically and lock it at the most suitable position.
4. The guide rails are to be installed on a beam which will act as a pile cap. Piles are to be dug inside the river to act as the foundation.
5. The guide rails will be attached at a slope so as to provide horizontal as well as vertical motion.

Kinematics:

The movement of the jetty will be actuated by actuating forces. In this case, the buoyant force and the gravitational forces will act as actuating forces. The equilibrium position of the jetty will be obtained at a position where buoyant force and gravitational force forms equilibrium. The motion of the jetty will be obtained through guide rails and wheel assembly equipped with locking system. Also, the jetty will be supported on two roller supports at front (river facing side). Base of the support will move on the guide rails provided along the cross-section of the river.

Control of the jetty movement will be accomplished using locking mechanism at the wheel of the support. The locking and unlocking of the structure will be supervised by the differences of buoy antic force and weight of the jetty. The details of the locking system will be explained thoroughly in further sections.



View of the platform in river at a certain level

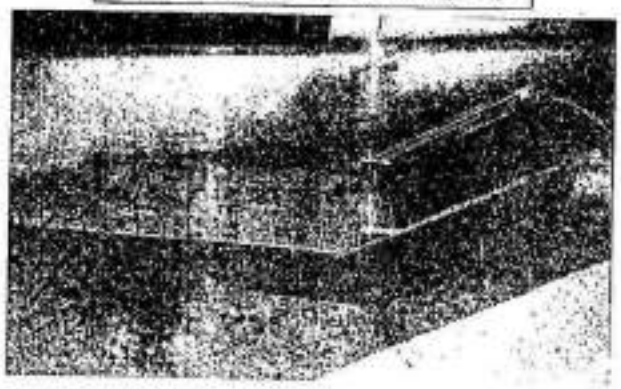
Still Well:

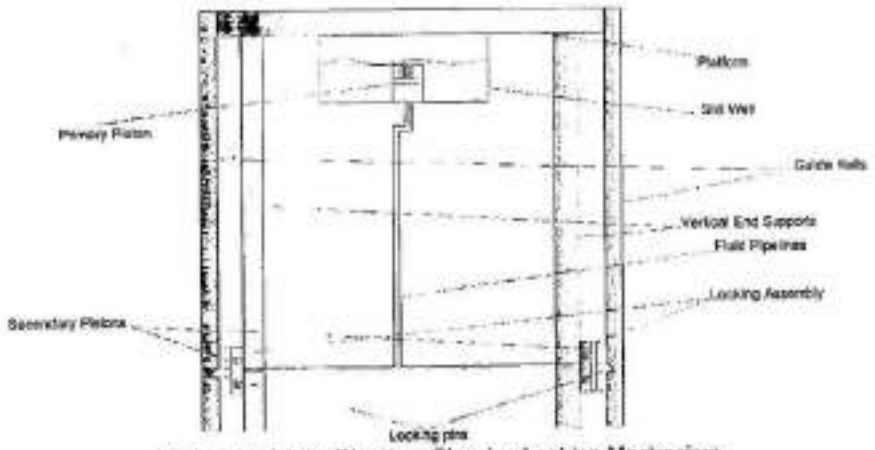
The concept of still well involves use of a closed container attached at the bottom of the structure. The purpose of using this concept is:

1. To attain stability in the structure- Still Well will act as a body which will absorb the wave energy which is generated from the ripples in the flow. These ripples if not taken into account, can cause severe instability in the structure.
2. To attain proper calibration: The locking mechanism needs proper calibration of pressure over the primary pistons because the grooves are to be made at a calculated distance. The ups and downs of the waves i.e., the ripples in the flow might cause differences in pressure at times leading to risks in the movement. Thus still well is required to nullify the effect of ripples.

The still well is to be attached at the bottom of the platform and the side walls will be made from wired mesh or steel net so as to allow smooth passage of water inside the container. The primary piston and the spring assembly is to be attached inside the container.

A process Prototype of the Floating Jetty





Elevation of Jetty Structure Showing Locking Mechanism

Rise in water level:

The rising water level leads to increase in the buoyant force thus pushing the platform in upward direction. However, the platform will start moving only when a certain threshold of buoyant force starts acting because the locks will open only when a certain compressing force will start acting on the springs which controls the locking assembly. As the locks will disengage, the platform will start sliding upwards along the guide rails until it reaches a new equilibrium position. The platform will get locked at its new equilibrium position as the locks slide in the grooves which are placed at calculated distance along the guide rails. The locks get pushed into the grooves by the pressure generated from the 'Still Well' which is transmitted to the secondary piston.

Fall in water level:

With the fall in water level, the magnitude of the buoyant force will decrease and the weight of the structure will start pushing it downwards. The downward motion is protected from any jerks by the orientation of locks inside the grooves and the calibration of primary and secondary piston. As the water level in 'Still Well' recedes, the pressure on the primary piston reduces thus reducing the pressure on secondary pistons. The secondary pistons are pulled by the springs attached to the outer housings thus pulling the locks from the grooves and opening them. The structure slides down to a position where equilibrium is maintained between buoyant force and weight of the structure. As soon as the water pressure over the primary piston in the still well becomes sufficient to overcome the elastic force of the springs attached, the equilibrium point is reached and the locks gets actuated in the nearest groove.