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Study on the condition of High-Level Causeway at Naved-Darapur Road, Amaravti District.

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Abstract -*Bridge construction is closely related to the development of human civilization and is also an important part of human civilization. Building bridges and surmounting obstacles are mankind's unremitting pursuit and dream. With the development of bridge science and technology and the needs of national development and construction, the construction of tens of kilometers of sea-crossing and channel bridges, high-speed railway bridges, and light rail transit viaducts and other grand projects have gradually begun. At the same time, with the continuous deepening of relevant research in the field of bridge engineering, new bridge structures, new processes, new materials, and so on are emerging, and the application level and research level of new technologies have reached a new breadth and depth. The aim of the study is to determine, analyze and investigate the present status of the Naved-Darapur high-level causeway and how it affects the commuters, pedestrians and the residents near the bridge. The researcher used descriptive research and engineering survey to identify solutions to the problems in the rehabilitation of said bridge. Thus, this study provides information that will assist the concerned government and private groups, and the community in the decision making with regard to the development of the facility. Statistical treatments were used to analyze the data and further validated through inspection or investigation of the existing structure. As a result, the respondents were unsatisfied with the physical features, serviceability, safety and maintenance of the existing facility. Thus, it is hereby concluded that there is a need for the improvement of the existing facility. In coordination with the concerned stakeholders, a redesigned plan is produced as basis for the rehabilitation of the existing High-level causeway bridge and for their decision making.*

Keywords- *Bridge, Plans, Productivity, Redesign, , Rehabilitation,.*

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I. INTRODUCTION

In this fast moving and developing world, people migrate from place to place for their work. In rural areas, not having any structure across a river for the purpose of migration from one place to another place. The bridge construction should not be adopted in every villages because of the low velocity flow and economy. From past studies in rural places cause way is enough . So, The design of cause way is adopted for our project. Here, The taken location is to renovate the damaged cause way due to the heavy flood level and over traffics

Naved-Darapur bridge has defects due to lack of maintenance procedure and not quite budgeted compared to technology that always maintained and developed. Infrastructure must always develop and maintain to have a good condition and quality. Defect structure must be improved or repaired to give more benefit to the people. Lack of maintenance for bridges can lead to sudden closure of a critical transportation that result in loss of lives and a significant decline in regional economic productivity. Safety of the public is one of the considered aspects in constructing structures. Thus, deficient bridges should have a significant maintenance, rehabilitation or replacement.

Naved-Darapur Bridge was built in 2007-2008, which connects the Communities of Darapur, Naved, Kholapur, Vathoda, Dhangarkheda, Sonarkheda and Bhalsi. The overflow- bridge was constructed between Naved and Darapur crossing the Purna River to provide service to people going to other town especially the Students from Naved, Kholapur, Vathoda, Dhangarkheda, Sonarkheda and Bhalsi for higher education facilities available at Darapur.

Figure 1: High Level Causeway at Naved-Darapur Road

Darapur was as normal as other villages with primary and upto secondary and higher secondary education facility before 2005. But after 2005 honourable laid. Dr. Dadasaheb S Gawai Sir had started to develope the higher education facilities for the welfare of students of all the villages around Darapur. But the problem there was no connection between the villages during monsoon seasondueto flooded Purna River. Therefore, Dr. Dadasaheb Gawai had requested to Government to establish a connecting path across Purna River.

The bridge was designed as High-level Causeway concrete bridge consisting of 6 spans having 15 meters per span or a total length of 40 linear meters with a roadway of 7.5 meters. They used concrete girders and concrete floor slab. The bridge was implemented in two phases, and the both two phases under the PWD Region 2. The existing bridge is very useful only in summer and winter season for the villages neighboring to Darapur which are across the river and could only get to Darapur by other long route of Amaravti-Daryapur highway only or by using the overflow bridge. The completion of the bridge has brought a tremendous impact to the development of Darapur and all the villages around. It also ended the struggles and suffering of people crossing the river through infantry or using the long route during floods. However, the bridge is not passable during heavy rains due to over flow of the water from the river. Moreover, before construction of the bridge, the maximum flood level was high as compare to design flood level as it was designed as high level causeway. But the bridge is not serving properly during rainy season , the bridge is often over flows ant even it is for two to three days . hence, brought damaged to the bridge. Technically wise, the bridge is deteriorating which is dangerous to the passers.

The study focused on the renovation of bridge across Purna River for the communities crossing at Naved-Darapur road in Amaravti district. The descriptive method of research was used in the study. The purposive sampling technique was utilized to select the respondents. Researchers-made questionnaires were used as survey tools for the administration of the study to 150 respondents from the Grampanchayati of Darapur and the villagers crossing the bridge daily from Naved, Kholapur, Vathoda, Dhangarkheda, Sonarkheda, Bhalsi, Department of Public Works and Highways (DPWH), Local Government Official, and Community Leaders as the stakeholders and who are aware of the development and management of the over-flow bridge facility. .

II. REVIEW OF LITERATURES

A bridge is defined as a structure, including supports, erected over a depression or an obstruction, such as water, highway, or railway, having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 feet between under copings of abutments, or spring lines or arches, or extreme ends of openings for multiple boxes; it may also include multiple pipes, where the clear distance between opening is less than one-half of the smaller connecting opening, (Bridge Inspection Maintenance and Repair, 1994)[4]. According to Lee G.C., et al (2008)[6], bridge failure may be defined as loss of a structural component, loss of a bridge's basic functionality, a catastrophic bridge collapse, or any damage condition in between. A bridge can fail due to a variety of single or combination of reasons including material imperfection or aging, overload, insufficient capacity, construction error or improper maintenance. Lessons can be learned through proper studies of bridge failures. Similar to reconnaissance studies of damaged or collapsed structures after a natural disaster, design guidelines can be improved through better understanding of the cause and mechanism of failure. In the construction of roads and bridges, pedestrians need to be accommodated and suitable sidewalks must be provided. The minimum clear sidewalk width should normally be 5 ft. In no case should a sidewalk not protected by a traffic railing be less than 3 ft. 6 in. wide. The need for sidewalks usually occurs in an urban area where a depressed highway crosses under a city street or on frontage road bridges. A suitable barrier rail or combination railing should be provided, if required. (Roadway Design Manual, 3rd Edition, 2010)[7].According to the Provincial Office of the DPWH at Ilagan, Isabela, Cabagan - Sto.Tomas, the existing bridge was constructed three years ago and was designed

as an over-flow bridge due to budget shortage. Since the bridge is the major means of transportation for the residents to access in neighboring towns, the government decided to temporarily build the said structure (Medestomas, R. V., et al, 2011)[3]. in recent years, in particular to improve safety of intersection, numerous of that is to be had in the court cases of the conferences that are very useful to understand the current developments in site visitors engineering. The aim of the protection techniques is to reduce annual highway fatalities. This aim can be done via the good-sized utility of low-value, tested countermeasures that lessen the variety of crashes on the kingdom's highways. Many of the hints and research for implementation of safety Plan gives techniques that can be hired to reduce the variety of unsignalized intersection collisions. The document may be of precise interest to protection practitioners with duty for enforcing applications to reduce injuries and fatalities on the highway system. Though research done on the various macroscopic parameters on the road is not highly documented, the contributions from researchers across the nation and the world have proven to be significantly essential. This paper indicates a very comprehensive review of literature for studies analyzing safety of congested intersection. Condition assessment and evaluation of existing bridges may be prompted by changes in traffic patterns; concern about faulty building materials or construction methods; discovery of a design/construction error after the structure is in service; concern about deterioration discovered during routine inspection; and damage following extreme load events. A condition assessment may be conducted to develop a bridge load rating, confirm an existing load rating, increase a load rating for future traffic, or determine whether the bridge must be posted in the interest of public safety. (Condition Assessment of existing bridge structures, 2009)[5].

III. METHODOLOGY

The normative survey of descriptive research was used in relation to the stakeholders' perceptions on the assessment of the existing over-flow bridge. Normative survey establishes norms for abilities, performances, beliefs and attitudes on samples of people of different ages, gender and other classifications. The researcher used the purposive sampling which samples were those who are aware of the existing over-flow bridge and are free to answer questionnaires relative to the condition and effect of the said facility. Engineering survey and inspection of the facility were conducted to further investigate and assess its condition.

The 150 respondents of the study composed of the residents of Naved and Darapur and the communities using the bridge for daily work.

However, since it is very important to involve the concerned agencies, the researcher decided to have one hundred fifteen respondents to ensure reliability of information.

3.1 Instruments Used

The Bridge inspections were undertaken at the bridges sites and for the entire structure. The tape used to measure the bridge length, span, and widths while the. Visual inspection was undertaken on the bridge superstructure over and under the bridge checking all the critical structural members. Measurements were undertaken for members that were damaged and affected by the flood.

Also, the questionnaires had been made for respondents' perception relative to the condition and effect of the existing over-flow bridge were used in the study. Also, the researcher used other engineering instruments during the inspection in order to investigate the physical features of the structure.

3.2 Procedure for Data Gathering

All in all, a closer investigation was undertaken at bridge substructures such as bridge abutments, bridge piers and foundation footings. Riverbanks, bank revetment works such as ripraps, groins, guide banks and other bank protection structures.

The questionnaires were administered to one hundred fifteen respondents. The data were then classified, tallied, tabulated and prepared for statistical treatment and analysis. Other information during the inspection of the over-flow bridge was noted for analysis and interpretation.

a) The Statistical Method

Statistics is basically a science that involves data collection, data interpretation and finally, data validation. Statistical data analysis is a procedure of performing various statistical operations. It is a kind of quantitative research, which seeks to quantify the data, and typically, applies some form of statistical analysis. Quantitative data basically involves descriptive data, such as survey data and observational data.

b) Data Analysis

There is a major task in statistical data analysis, which comprises of statistical inference. The statistical inference is mainly comprised of two parts: estimation and tests of hypothesis.

Estimation in statistical data analysis mainly involves parametric data—the data that consists of parameters. On the other hand, tests of hypothesis in statistical data analysis mainly involve non parametric data— the data

that consists of no parameters.

3.3 Statistical Treatment of Data

For the survey, total 150 respondents were interviewed in 7 days. For total 150 respondents the surveys in Naved and Darapur village are carried out which are across the Purna River and are mostly affected by the existing bridge condition. Total 95 respondents were interviewed at Naved and Darapur . And remaining 55 interviewed at bridge site were crossing the bridge for their purposes, which include the communities from Kholapur, Vathoda, Dhangarkheda, Sonarkheda and Bhalsi and have been using the route for many years.
After gathering and collecting the data, organized and analyzed information by using tabulation and bar graph.

Table 1: Frequency Distribution of Respondents Based on Gender

Gender	Frequency	Percentage (%)
Male	89	59.33
Female	61	40.67
Total	**150**	**100.00**

Weighted Mean. The formula to compute the weighted mean is,

$$\bar{X} = \frac{\sum Fx}{N}$$

Where:

$\bar{X}$ = Weighted Mean
$\sum Fx$ = Summation of the elements and its weight.
N = Number of respondents.
Below is the rating scale used in the study,
4.50 – 5.00 = Very Satisfied
3.50 – 4.49 = Satisfied
2.50 – 3.49 = Neutral
1.50 – 2.49 = Unsatisfied
1.00 – 1.49 = Very Unsatisfied

3.4 Outline of the existing Bridge

Table 2: Outline of Bridge Design

Bridge name	Bridge length	Superstructure type	Abutement		Pier	
			No. of Units	Foundation	No. of Units	Foundation
High level Causeway across Purna River At Naved-Darapur , Amravti District	40.00 m	6-Spans RCC Deck slab	2	Raft Foundation	5	Raft Foundation

IV . RESULTS AND DISCUSSIONS

This covers the analysis and interpretation of data relative to the perceptions of the respondents on the.condition and effect of the existing. High-Level Causeway .

4.1. Profile of the Respondents

Table 3: Frequency Distribution of Respondents Based on Age

Age	Frequency	Percentage (%)
50 – Above	14	9.33
41 – 50	21	14
31 – 40	33	22
21 – 30	44	29.33
15 – 20	38	25.33
Total	**150**	**100.00**

4.1.1. Frequency Distribution of Respondents Based on Age

Table 3 shows the frequency distribution of
respondents based on age. It reveals that age bracket of 21-30 has the highest frequency with a percentage of

29.33 seconded by age bracket 15-20. The age bracket 50 above got the lowest frequency of 10, equivalent to 9.33%.

Below is the graphical representation of the frequency distribution of respondents based on age.

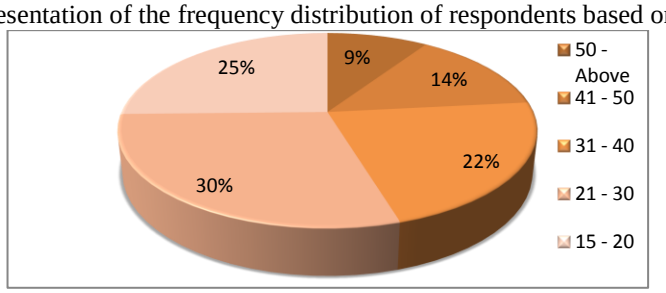

Figure 1: Graph of Frequency Distribution of Respondents Based on Age

4.1.2. Frequency Distribution of Respondents Based on Gender

Table 1 shows the frequency distribution of respondents based on gender. It can be seen that female dominants the respondents with a frequency of 61, equivalent to 40.67%, while the male got the frequency of 89 with a percentage of 59.33.

Below is the graphical representation of the frequency distribution of respondents based on gender.

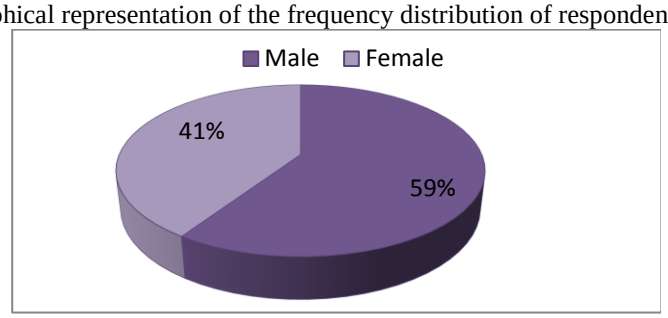

Figure 2: Graph of Frequency Distribution of Respondents Based on Gender

4.2 Perceptions of Respondents on the Physical Features of the High-Level Causeway

Table 4 shows the tabulated data on the perceptions of the respondents regarding the physical features of the High-Level Causeway.

Table 4: Perceptions of the Respondents on the Physical Features of the High-Level Causeway

Parameters	Mean	Verbal Interpretation
1. Height difference of the bridge from the water level during flooding	2.18	Unsatisfied
2. Lighting materials and electrical wirings	1.94	Unsatisfied
3. Bridge railings	2.08	Unsatisfied
4. Road pavement of the bridge	1.84	Unsatisfied
Mean-Total	2.01	Unsatisfied

The respondents perceived that they are unsatisfied with all the physical features of the existing over-flow bridge with a mean-total of 2.01.

Below is the graphical representation of the perceptions of the respondents on the physical features of the over-flow bridge.

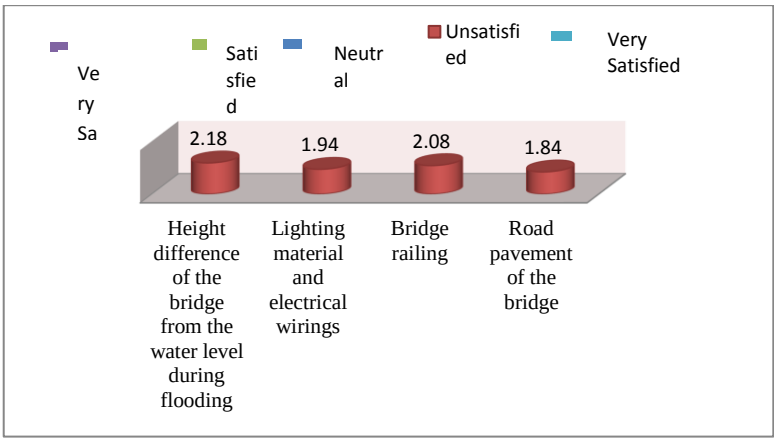

Figure 3: Perceptions of the Respondents on the Physical Features of the Over-Flow Bridge

4.3 Perceptions of Respondents on the Safety and Maintenance Measures to Sustain the Effective Use of the High-Level Causeway

Table 5 shows the perceptions of the respondents regarding the safety and maintenance measure to sustain the effective use of the bridge.

Table 5: Perceptions of Respondents on Safety and Maintenance Measures to Sustain the Effective Use of the High-Level Causeway

Parameters	Mean	Verbal Interpretation
1. Provision of safety signage including lane separator	1.85	Unsatisfied
2. Safety of pedestrian lanes	2.32	Unsatisfied
3. Cleanliness of the bridge and the surroundings	2.74	Neutral
4. Traffic flow control	3.04	Neutral
Mean-Total	2.48	Unsatisfied

Table 5 implies that the respondents were neutral on safety and maintenance measures to sustain the effective use of the bridge with a mean-total of 2.48. However, in terms of the provision of safety signage including lane separator, and safety of pedestrian lanes, the respondents were not satisfied.

Below is the graphical representation of the perceptions of the respondents on the.

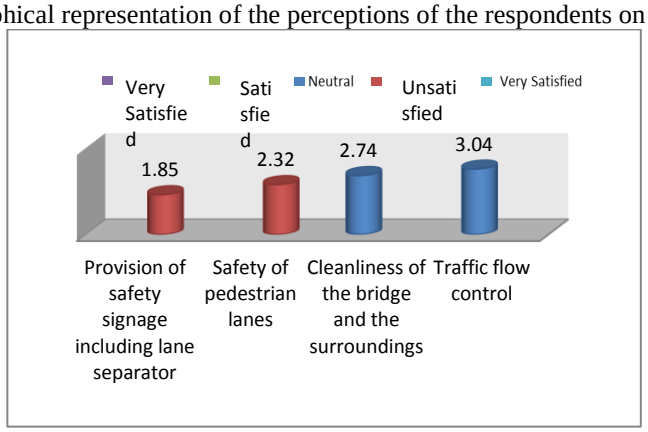

Figure 4: Perceptions of the Respondents on the Safety and Maintenance Measures of the High-Level Causeway

4.4. Result of Project Inspection/Validation

As per validation by the researcher during project inspection, the researcher noted the following status of the existing high-level causeway.

4.4.1 To prevent drawing of vehicles and motorists into the river damaged wheel guards as controlling part

Figure 6: Damage Wheel Guard and Reflectors

4.4.2 High slope of a road going down to the bridge .

Figure 7: High Slope Road Connecting the Bridge

4.4.3 During flooding , the height of the bridge from the water level that caused danger to passers

Figure 9: During flooding , the height of the bridge from the water level that caused danger to passers

4.4.4 Raised Water level during flooding

Figure 8: Raised Water level during flooding

4.4.5 Lack of Lighting and Safety Signage

Figure 9: Lack of Lighting and Safety Signage

4.5. In the Utilization and Maintenance of the High Level Causeway the problems Encountered by the Stakeholders

Based on the information gathered during the actual interview with the respondents, several accidents had happened in the said bridge due to its unfavorable condition such as the following:

1. Passers riding in motorcycles drawn to the river due to absence of railings.
2. Road traffic accidents happened due to lack of safety signage, maintenance and unimplemented traffic control regulations.

V. CONCLUSIONS

As a result of the findings, it is hereby concluded that the existing high level causeway should be renovated as evidenced by the non-standard height of the bridge from the water level, and its architectural design; absence of lightings, railings, strong guardrails, painting and safety signage including lane separator and pedestrian lane; pavement with potholes; the high slope connecting the bridge and the road causes several accidents; and absence of maintenance measures to sustain the effective use of the bridge.

This Project is expected to be direct benefit for the regions being left behind the social and economic development through the bridge renavation in cooperation with the improvement of road sections by the government, consequently contributing to the poverty reduction in those areas.

- In this project we have successfully made an attempt for "Renovation of bridge across Purna River for the communities crossing at Naved-Darapur road in Amaravti district".
- The existing high level causeway is efficiently converted as high level bridge due to flood level .
- The existing high level causeway can be completely eliminated due to adverse flood condition, rapid development of population and industrialization and unavailability of facilities and basic standard provisions.

VI . RECOMMENDATIONS

Based on the foregoing findings and conclusion, the researchers hereby recommend the rehabilitation of the over-flow bridge with a total cost of Rs.155,55,000/-

The following improvements shall be considered in the rehabilitation of the existing over-flow bridge.

I. Guardrail Improvement
II. Sidewalk Repair
III. Drainage Installation
IV. Pavement Patching
V. Lighting Installation
VI. Safety Signage
VII. Elevation of Existing Over-Flow Bridge
VIII. Signage for Maintenance

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