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DISASTER RELIEF BRIDGES: A CATALYSTIC REVIEW

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ABSTRACT— Civil/Construction engineering is a stream of some exceptionally awesome constructions which can be termed as a miracle of engineering. This review paper exhibits different well-known research studies or literatures in the field of deployable bridges which can be employed in disaster relief work as well as this review can accelerate the future research work and it can also motivate researchers to work in this direction which would be helpful in the disaster relief or disaster management works and ultimately it would be helpful to whole nation and world.

Keywords- Disaster relief bridge, Disaster management folding bridge, mobile bridge, deployable bridge.

I. INTRODUCTION

Disaster is any unfortunate or deplorable event causing devastation and destruction of human lives as well as properties. Disaster is any sudden occurrence of the events that causes damage, ecological, disruption, loss of human lives, deterioration of health and health services on a scale sufficient to warrant an extra ordinary response from outside the affected community or area, defined by WORLD HEALTH ORGANIZATION (WHO). Disaster may disrupt normal day to day life as well as they hamper development projects in adverse manner and basic needs of humans like water, shelter and food are affected based on intensity and severely of the disaster. According to NATIONAL OCENIC AND ATMOSPHERIC ADMINISTRATION (NOAA) 2017 were the most devastating year of U.S.A which caused damage and destructions over and $1 billion, in India loss was around 2% of the GDP according to NDMA.

Disasters are inevitable although we can not predict accurately but the worst effects of disaster can be partially or completely prevented by preparedness. In these disasters bridge systems are failed often therefore if we possess a folding deployable bridge system which can be employed to the required place of disaster in countable minutes and can be utilized as a temporary communication link for providing food and other resources as well as to rescue affected people. In addition this kind of bridge system can be erected at the time of war too and would be proven as a blessing to humans.

II. CRITICAL LITERATURE REVIEWS

Mohd ali usta in his research on folding bridge had developed a model whose prototype can be mounted on pneumatic tyred vehicle. The structure is made up from descending size equilateral triangles and all of them are attached to adjacent larger triangle by hinges as shown in figure-1 as well as cables are used for erection mechanism. In addition he had used allied foam tech for deck of bridge and high strength steel for triangles. According to author this bridge can be employed in 20 minutes and achieves economy because high strength concrete and steel are used as construction materials.

Figure-01-folding bridge model of descending equilateral triangle

Ichiro Ario and tuki chilcahiro had a new type of mobile bridge in their research illustrated a new type of mobile bridge which was constructed from steel scissors and deck was provided at the base made up of aluminium, length of the deck was 3200mm and width was 500mm in their evaluation of load carrying capacity of aluminium alloy deck. In addition, they exhibited vehicle loading test by two types of vehicle loadings of which are described in table I. They concluded that aluminium alloy deck was clearly sufficient for vehicles to pass over it and vehicles up to 10 KN could pass over it safely.

Table – I
Loading conditions in vehicular test

Load Case	Type of vehicle	Total load (kN)	Front axis load(kN)	Rear axis load(kN)
01	Street	9.6	5.2	4.4
02	AD van	13.8	7.5	6.3

M.Nakazawa, S.one, J.Holnicki szula, P.Pawlowski and C. Graczykowski had performed their research on experimental study the design method of real sized mobile bridge for a moving vehicle. They also performed vehicular static loading as well as bending test. In addition, they had analysed their frame through finite element modelling software ANAYS which is illustrated in figure-2 Analytical and experimental data was compared by them and they had shown that strain change was arising at the time of vehicle loading and it was consistent with an analytical value of less than 10%.

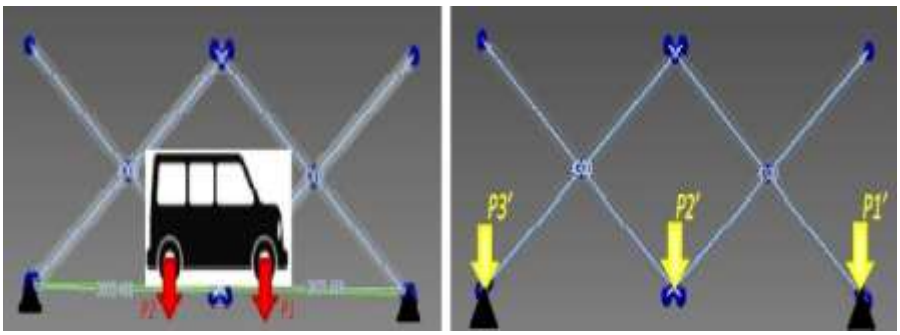

Figure-02 Finite element modeling of a bridge system

Rangdatt patel, palak patel and princy shah in their research developed a prototype of folding bridge from steel based on scissor mechanism which can be erected with hydraulic and winch pully mechanism and could be installed in trucks as well as transported to any place by means of military trucks, air ways or by water ways. They exhibited that the erection time was about 15 to 20 minutes. Addition they performed their analysis and design by constructing numerical model on FEM based software STAAD.PRO. They concluded that this type of folding bridge would be proven as a boon for mankind.

III. OBJECTIVES / NEED OF STUDY

- To increase preparedness for disaster.
- For rescuing stacked people and for providing resources to them.
- War conditions
- During any disaster if bridge system fails two things are of foremost priority. i.e rescue and to create communication link

IV. APPLICATION

This article will be precious and valuable for government officials of national and state disaster boards as well as researchers of the engineering field. It can work as a catalyser for future research work as well as it can guide national and state disaster boards to construct and employ these kind of folding bridges as well as it can encourage govt to provide funds and to provide healthy atmosphere for this kind of research.

V. FUTURE SCOPE

This research can be further carried for cost and material optimization with different types of materials or composites along with different erection and installation mechanisms.

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