Precast Concrete Bridges Barriers For Accelerated Bridge Constructions

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Abstract- *Many transportations organizations has embraced Accelerated Bridges Construction to cut back each the traffic impact and social prices. one amongst the foremost commons suggests that to attain is to used ready-made parts. that ar connected along on website to construct a bridges. first rudiment won't be effective if the barrier needs forged in situ constructions. the aim of this reports is to gift details of a precasts barriers, 2 association different between the deck, formed barriers. additionally could be a new association between 2 adjacents ready-made barriers is bestowed. One barriers to decks connections uses of inclined reinforcing bars with rib finish that gets joint to bar splicer embedded within the upper deck. The others barriers to decks connections uses u formed bars that ar inserted into the barriers from the bottom of the bridges decks overhangs. Factors that were thought of once coming up with the association were minimam harm to deck, simple replacement of barrier, constructability, durabilitys, and cost. The barriers to barriers connections use headed reinforcement within the longitudinal and transverses directions. The association was designed to satisfy atomic number 81 four masses as per MASH & LRFD Bridges style Specifications. The reports seeded result from of respectful tests and shown that each one planned joint ar viable for accelerated constructions of concrete barriers tho' some refinements to the tested details are going to be required.*

Keywords- Barriers, Acceleration bridge,

I. INTRODUCTION

In bridge system, one important element of safety ar the bridge barrier. the first purpose of bridge barrier is to contain, redirect, and protect vehicle from off road bridge accidents. forged in situ barriers ar usually used and ar established to satisfy the structural needs required to achieves this purpose. but in bridge joint the uses of ready-made part and system has been gaining interest and momentum. victimization ready-made part, bridge is made or repaired quicker with less disruption to traffic and with a safer work zone environments.

Another advantage of ready-made system is that the improved product quality thanks to the employment of precasts elements during a controlled setting. guaranteeing consistents quality throughout cast-in-place concrete barrier construction could be a challenge, that will increase the upkeep prices (see Figure). but the used of formed concrete barriers systems for bridges deck ar still a comparatively new developments that wants mores.

II. LITERATURE REVIEW

In order to induce a far better understandings of the planning and performance of ready-made concrete bridge barrier, a literature review was performed. Accelerated bridge construction and therefore the use of ready-made component and systems has received important analysis attention in recent year. However, one space that has not nevertheless received notable analysis is within the space of ready-made, crash tested barrier rails. yet, a review was completed so as to induce the state of data at the start of the comes.

III. METHODOLOGY

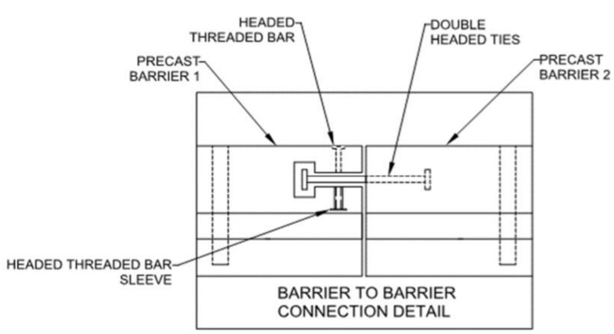
In July 2006, constructions began on associate accelerated bridge comes in backwoodsman County, Iowa that ware composed of formed substructures component associated an innovative, formed deck panel system. The structure system consisted of full-depth deck panel that were prestressed within the crosswise direction, and once installation on the prestressed concrete girders, post-tensioned within the longitudinal direction. before construction, laboratory tests were completed on the formed abutment and pier cap component. The substructure testing was to see the punching shear strength of the component. Post tensioning testing and verifications of the formed deck system was performed within the field. The force within the connective tissue provided by the contractors was verified and losses thanks to the post tensioning operation was measured. the strain distributions within the deck panels thanks to the post tensioning ware additionally measured and analyzed. the whole constructions method for this bridge system was documented. Representatives from the backwoodsman County

Engineers workplace, the prime contractors. formed fabricators, and investigator from Iowa Maharishi University info technology provided feedbacks and suggestion for rising the constructability of this style. All of those square measureas are enclosed during this 1st section of Volume. The second section of Volume focuses on the laboratory testing of full depth formed, prestressed concrete deck panels utilized in the development of the continual four beam, 3 spans bridge over American Indian Creek on one hundred and twentieth Street in backwoodsman County, Iowa. varied laboratory tests were conducted on one panel and on 2 panel connected by a closure pour. These check ranged from deciding physical properties of the panel (compressive strength and prestressing force), to deciding the panels response in varied circumstances (moving with a crane, throughout field leveling, and below loading). The third and final section of Volume documents the sphere testing portion of this project.

2 field tests were dispensed on the backwoodsman County bridge. the primary passed the summer following construction and therefore the second passed one year later. A outline of the testing method, instrumentation plans, and analysis of information square measure situated during this section of the reports.

1. Barrier to Barrier Connections

The only barriers to barriers connections chosen for testing includes four double headed ties between 2 adjacent barriers. In additions transversal reinforcement is employed to produce confinement within the directions perpendicular to the double headed ties. A diagram of this detail is shown in Figure.

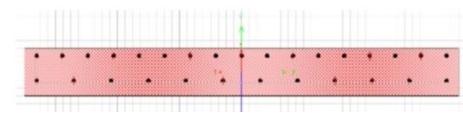


Schematic set up read drawing of the barriers to barriers connections

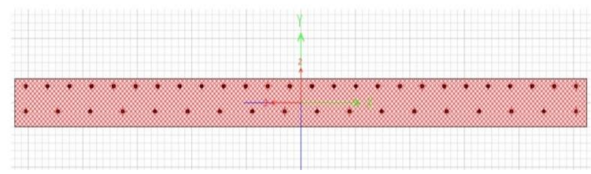
The association between the barriers ware designed to {form} continuity between barriers such the load obligatory on one barrier are fitly distributed to adjacent barriers as would be the case during a slip form barriers. The connections regions ought to thirty four be simply invented with the barrier created and put in. like the opposite association, this even have no exposed rebar to extend its sturdiness.

1. Deck style

The upper deck was designed to fulfill the quality of the Iowa DOT and a few of the reinforcement quantities was refined in step with the expected loadings conditions. the chosen failure mechanism for the complete deck and barrier system ware among the barriers association reinforcing bars. to confirm this the deck had to be ready to face up to the loading applied to the barrier analysis of the deck reinforcement ware exhausted SAP2000.



End of bridge Reinforcement (7 ft analysis)



Bridge deck reinforcement (10.5 ft segment analysis)

The flexural of the reinforced deck cross section are displaced in figure for the 7 foot cress section. The predicted yield moment ware 2282 kip inches and the predicted moment ware 2437 kip inches with an idealized yield yield curvature of 0.00058 1/in. the 10.5, foot sections have a predicted yield moments off 3457 kip inches and a predicted plastic moments of 3721 with a 0.00058 1/in idealized yield curvature.

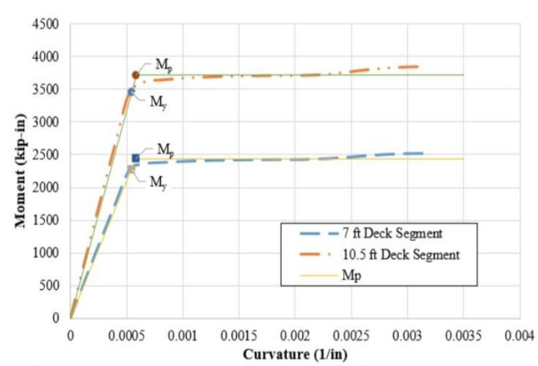
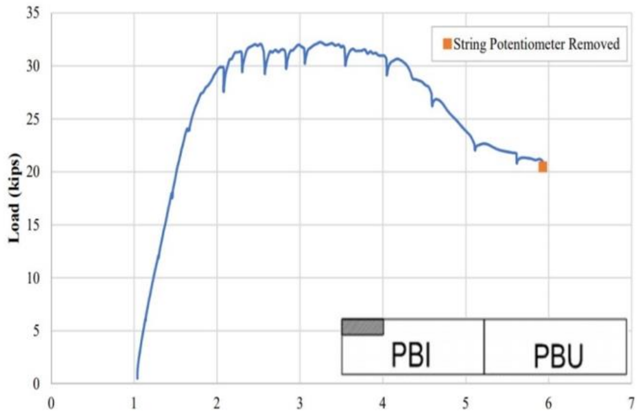


Figure 2.6 Moment curvature responses of different deck segments

1. Result

The force-displacements response obtained from Test is displayed in Figure, where the reported displacement reflect the absolute values form the beginning of Test 1. The maximum applied load in excess of 30 kips was sustained until the displacement reached close to six inches. demonstrating sufficient toughness for the connection. After that the barrier progressively failed. The test ware continued until the barrier experienced a deflection in excess of 6 inches.



Recorded force displacement Response throughout tests

The deflection at the highest of PBI durings check is shown in Figure The according displacement of this figure reflects absolutely the displacement from the start of check , whereas the values within the legend mirror the relative target displacement from the start of check. the position of the brace beam restricted the quantity of deflection at the barriers to barriers interface, that ware situated at x= “0” feet during this figure. The free finish of PBI, wherever the load was applied, skilled the foremost lateral deflections. throughout testing, instrumentation was removed at varied stages to shield them from harm. the primary testing instrument was removed when the highest of barrier deflection was at two.5 inches.

2. Conclusions

A total of half-dozen tests were conducted. Conclusion drawn from this study square measure as follows. the 2 formed barrier systems didn't have any construction challenges throughout fabrication. The barrier system connections ware assembled as planned with none difficulties, the development of PBI needed smallest access to put in the connections reinforcement. PBU needed access from beneath the bridge overhang to put in the U shaped connections. reinforcement. A outline of the loading and deflections of the barrier for every check is provided in Table.

Summary of varied Tests Conducted on the Barrier

Test	Maximum Load	Maximum lateral dis. For each Test
PMI Middle test 1 Target =54 Kips	Push =54 kips Pull =2 kips	0.81 inches Residual displacement =0.27 inches
PBU Middle test 2 Target = 54 kips	Push =36 kips Pull =4 kips	0.80 inches Final resting position =0.30 inches
Center- Attached test 3 Target = 54 kips	Push =60 kips	0.73 inches Final resting position =0.17 inches
Off center, PBI test 4 Target =failure	Push =81 kips	Loaded until 1.75 inches
End of PBI test 5 Target =failure	Push =30 kips Push =22 kips	4.9 inches
End of PBU test 6	Push =24.8 kips	Relative displacement =6.0 inches
Target =failure	Pull =27 kips	

When an isolated unit of PBI was subjected to test level four loading it performed satisfactorily, which was expected. The barrier, deck and barrier to deck connections performed well with no elastic strains developing in the deck reinforcement. The deck began to crack as the loadings approached 18 kips. Hairline diagonal cracks were witnessed on PBI as the loading reached 48 kips. The cracking that developed on the deck ware uniform and extended beyond the expected 45° force dispersions, suggesting more length of the decks participating in resisting the applied loads. As the applied load reached 54 kips, the top of the barrier experienced a total top lateral displacement of 0.81 inches with only 3.5% of the displacement coming from the barriers itself and the largest contributions are from the flexural deformation of the deck overhangs.

During the isolated testing of PBU, Test the barrier was able to resist 36 kips without experiencing significant rotations at the base. Larger rotations occurred from this point onward with localized deformations concentrated at the bottom of the barrier. This ware suspected to be due to the U bars not adequately tied to the bottom deck reinforcement in the deck and the associated deformation of the top deck reinforcement. The tests conducted on the barrier to barriers connection, Test also performed as expected. The barrier system was loaded up to 60 kips with PBI supporting the majority of the load. The strain developed in the PBI deck connection reinforcement was significantly more than the strain experienced in the PBU deck connections reinforcement. Test included loadings on the PBI side of the barriers to barrier connection and demonstrated the force distributions about the barriers to barrier connections and the failure pattern of the connection. Testing at the ends of the barriers, i.e., Test and produced lower resisting forces than Test 1 and 2. This is because the barrier ends do not simulate conditions expected at the bridge ends, making them to produce 50% of the resistance in comparison to those expected when testing away from the ends. With both connections in Tests 5 and 6, the failures initiated within the deck. The premature failure is also due to the extent of damage from the previous tests. To increase the force resistance of the ends of the barriers when used at the bridge end or where the deck is joined, it is recommended that the bridge deck be designed to take a higher moment demand. It is also recommended that the vertical, inclined bar be spaced closer together. To double the load resistance to deal with an impact at the end of the bridge, it is suggested that all spacing be reduced by 50%.

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