



Ain Shams University
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BEHAVIOR OF PRECAST CROSS BEAM – MAIN GIRDER CONNECTIONS IN BRIDGES

BY

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A Thesis

Submitted in Partial Fulfillment of the Requirements for the
Degree of Master of Science in Civil Engineering (Structural
Department)

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July – 2016
Cairo, Egypt

STATEMENT

This thesis is submitted to Ain Shams University in partial fulfillment of the requirements for the degree of Master of Science (M.Sc.) in Civil Engineering (Structural).

The experimental work included was carried out by the author at reinforced concrete laboratory of the faculty of Engineering, Ain Shams University.

No part of this thesis has been submitted for a degree or a qualification at any other university or institution.

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ACKNOWLEDGEMENT

First, I thank God for providing me every step of the way and giving me the will to finish this work in the proper way.

I want to express my deep appreciation to my advisor Prof. Dr. Ayman Hussein for his support and helpful comments and valuable discussions, which guided me to complete this work in the best form.

I am also very grateful to Dr. Mohamed Nabil; whose continuous support and unlimited advice enriched my experience and drew the main outlines of the research.

Special thanks to my mother, dad and wife who are the main engines of my motivation and for their endless prayers without which I could never complete this work.

Finally, I would like to thank all of my colleagues who encouraged and supported me to complete this work.

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Abstract of Master of Science Degree Thesis Submitted by:

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Title of thesis:

**BEHAVIOR OF PRECAST CROSS BEAM – MAIN
GIRDER CONNECTIONS IN BRIDGES**

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ABSTRACT

In the last few decades, precast concrete has become strongly recommended for the most types of bridges construction due to time saving, quality control and concrete members' consistency. In bridges construction, precast concrete elements are connected (Stitched) together in order to achieve bridge deck integrity and stability; joints between these elements shall be able to transmit all internal forces due to anticipated loads safely. This research introduces an experimental and analytical study of the performance of stitching joint between precast beams, and determines if this detail could generate a precast deck system that could emulate the monolithic cast-in-place deck systems without any disadvantages to stitching concrete joint over monolithic one regarding material properties.

In this respect, an experimental program was conducted on seven specimens, which were tested to failure under a static vertical load. Three specimens of monolithic cast-in-place beam-to-beam connection and four specimens of precast beams with stitching joints were tested using different positions of vertical load to

simulate flexural tension or diagonal tension shear failures. Nonlinear 3D finite element analysis was performed using ANSYS program and verified with the experimental results in order to give design recommendations for adoption of this type of precast joints. In addition, a parametric study as well as verification with international design codes was made to conclude the effect of stitching joint length on joint capacity and performance of cross beams.

Results obtained by both experimental and analytical works indicated that stitching joints have a reduced flexural capacity compared to monolithic joints, while two types of joints have the same shear capacity after checking shear friction failure of stitching joint.

Parametric study has proved that increasing stitching length enhances capacity and performance of joint between precast main girder and cross beam in flexure.

CONTENTS

Chapter (1) Introduction.....	1
1.1 General.....	1
1.2 Overview on Precast Elements Connections:	2
1.3 Different joint details between bridge beams	3
1.4 Scope and Objectives of the Study.....	5
1.5 Thesis Organization.....	5
 Chapter (2) Literature Review.....	 7
2.1 Behavior of Precast Bridge Deck Joints with Small Bend Diameter U-Bars	7
2.2 Construction of the First Road Bridges Made of Ultra- High-Performance Concrete (UHPC).....	17
2.3 Serviceability Limit State Improvement of Pre-cast Concrete Bridge Slab Joints Using GFRP-Fabrics	20
2.4 Improved Longitudinal Joint Details in Decked Bulb Tees for Accelerated Bridge Construction; Concept Development	26
2.5 Behavior of Field Cast Ultra High Performance Concrete Bridge Deck Connections under Cyclic and Static Structural Loading	37
2.6 Summary	50
 Chapter (3) Experimental Program	 52
3.1 General.....	52
3.2 Materials Used for Test Specimens:	52
3.2.1 Concrete.....	53
3.2.2 Steel Reinforcement	53
3.3 Specimens Details	54
3.3.1 Group-I: Monolithic Joint Specimens	55

Table of Contents

3.3.2	Group-II: Stitching Joint Specimens	56
3.4	Fabrication of beams	58
3.5	Instrumentation	61
3.6	Test setup	62
Chapter (4) Experimental Results		65
4.1	General.....	65
4.2	Overall Behavior and Failure Modes	65
4.3	Experimental Results of Group-I Specimens.....	65
4.3.1	Structural Behavior and Failure Modes	65
4.3.2	Load-Deflection and Load-Strain Relationships.....	67
4.4	Experimental Results of Group-II Specimens	72
4.4.1	Structural Behavior and Failure Modes	72
4.4.2	Load-Deflection and Load-Strain Relationships.....	75
4.5	Discussion of experimental results	81
Chapter (5) Finite Element Analysis.....		86
5.1	General.....	86
5.2	Elements Types:	87
5.2.1	Reinforced Concrete:.....	87
5.2.2	Steel Plates:.....	89
5.2.3	Interface Surface between Different Casts of Concrete:	90
5.3	Material modeling:	91
5.3.1	Concrete:.....	91
5.3.2	Reinforcement Steel and Steel Plates:	95
5.4	Modeling and Mesh Generation:	96
5.4.1	Mesh Configuration.....	96
5.4.2	Load Application and Boundary Conditions	98

5.5	Non-Linear Solution:	100
Chapter (6) Finite Element Results		102
6.1	General.....	102
6.2	Group-I Specimens Models	102
6.2.1	Failure Loads and Strains	102
6.2.2	Failure Modes	107
6.2.3	Load-Deflection and Load-Strain Relationships.....	107
6.3	Group-II Specimens Models	110
6.3.1	Failure Loads and Strains	110
6.3.2	Failure Modes	113
6.3.3	Load-Deflection and Load-Strain Relationships.....	115
Chapter (7) Parametric Study		119
7.1	General.....	119
7.2	Effect of Stitching Joint Length on Flexural Capacity	119
7.3	Verification of Splice Length with Requirements of International Design Codes.....	124
Chapter (8) Summary and Conclusions		130
8.1	Summary.....	130
8.2	Conclusions.....	131
8.3	Recommendations for Future Work	133

LIST OF FIGURES

Figure 1.1 : Cross section of girder type bridge; right part introduces monolithic joint and left part introduces stitching joint4

Figure 1.2 : Other applications of stitching joints in bridges construction; a) connecting precast concrete parapet and bridge deck slab, b) Connecting adjacent precast π -shaped beams in beam-type bridge deck and c) Connecting precast slab with precast beam in pedestrian bridge deck4

Figure 2.1: Bent U-bar joint details with lacer bars8

Figure 2.2: Orientation of Joints in precast bridge deck and Corresponding Test Specimens9

Figure 2.3: Flexural test setup schematic diagram (longitudinal U-bars joint test)11

Figure 2.4: Flexural test setup photo (longitudinal U-bar joint test)11

Figure 2.5: Tension test setup schematic diagram (transverse U-bar joint test)12

Figure 2.6: Tension test setup photo (transverse U-bar joint test)13

Figure 2.7: Flexure cracks at failure for specimens WB-2, WB-3 and WB-415

Figure 2.8: Tensile cracks at failure for specimens WT-2, WT-3 and WT-415

List of Figures

Figure 2.9: Deformation of lacer bar used for U-bar joint at failure	16
Figure 2.10: Typical cross section of precast bridge showing stitched elements	17
Figure 2.11: Typical π -shaped precast beam cross section with cast in-situ joint	18
Figure 2.12: Third-point bending test setup for jointed slab	19
Figure 2.13: UHPC jointed slab	20
Figure 2.14: Detail of loop joint between precast slabs strengthened by GFRP-fabric	21
Figure 2.15: Different GFRP-fabric arrangements for strengthened joint	22
Figure 2.16: a) Casting loop joint reinforcement in section, b) part plan and c) Full details of reinforcement in plan.....	23
Figure 2.17: Test setup for pure bending on precast slab joint improved by GFRP-fabrics	24
Figure 2.18: Typical diagonal tension failure mode of slabs specimens	25
Figure 2.19: Casting joint crack widths 0.1mm and 0.2mm and corresponding service loads	26
Figure 2.20: Cross section in bridge deck made of precast bulb tee girders	27
Figure 2.21: Proposed details of longitudinal joint between precast girders; (a) U-bar detail, (b) headed bar detail, and (c) Spiral bar detail.....	29

List of Figures

Figure 2.22: Improved joint details between precast girders; (a) headed reinforcement connection detail, (b) WWR reinforcement connection detail	31
Figure 2.23: Model specimen to evaluate headed bar and WWR joints behavior	32
Figure 2.24: Three types of specimens; (a) Headed reinforcement connection, (b) WWR connection, and (c) Control beam with straight bars	33
Figure 2.25: Specimens testing setup	35
Figure 2.26: Failure modes of tested specimens; a) Ductile failure, b) Brittle failure	36
Figure 2.27: Field-casting of UHPC on the State Route 31 Bridge over the Canandaigua outlet in Lyons, New York. .	38
Figure 2.28: Layout and rebar details for panel (8H).....	40
Figure 2.29: Layout and rebar details for panel (8E)	40
Figure 2.30: Layout and rebar details for panel (8G) & (8B).....	41
Figure 2.31: Layout and rebar details for panel (6H).....	41
Figure 2.32: Layout and rebar details for panel (6B).....	42
Figure 2.33: Test setup sketch for cyclic loading of panels (8H), (8E), (8G), and (8B).....	43
Figure 2.34: Test setup sketch for static loading of panels (8H), (8E), (8G), and (8B).....	44
Figure 2.35: Transverse joint specimens in load frame during cyclic testing	44
Figure 2.36: Cracking pattern observed on underside of panel (8H) after conclusion of static test	46

List of Figures

Figure 2.37: Test setup sketch for cyclic loading of panels (6B) and (6H).....	47
Figure 2.38: Test setup sketch for static loading of panels (6B) and (6H).....	47
Figure 2.39: Longitudinal joint specimens in load frame during cyclic testing.....	48
Figure 2.40: Cracking pattern observed on underside of panel (6H) after conclusion of static test.....	49
Figure 2.41: Cracking pattern observed on underside of panel (6B) both after the initial overload and again after 10.1 million cycles of loading from 13 to 95kN	49
Figure 3.1: Specimens typical detail with different load positions used in testing.....	55
Figure 3.2: Group-I “Monolithic joint specimens” reinforcement details; a) Main girder details, b) cross-section (A) showing cross beam details of reinforcement	55
Figure 3.3: Group-II “Stitching joint specimens” reinforcement details; a) Main girder details, b) Cross-section (A) showing cross beam details of reinforcement and c) Cross-section A-A showing cross beam details of reinforcement using bar couplers	57
Figure 3.4: Steel cages of different types of specimens; a) Group-I specimen, b) Group-II specimen and c) Group-II joint with couplers	59
Figure 3.5: Formwork for specimens casting	60
Figure 3.6: Electrical strain gauges attached to reinforcement bars	60
Figure 3.7: Stitching joint casting and finishing	61

List of Figures

Figure 3.8: Typical instrumentation used for specimens.....	62
Figure 3.9: Main beam fixation to loading frame	62
Figure 3.10: Main girder support, with horizontal LVDT attached to ensure that there is no movement due to beam torsion	63
Figure 3.11: Test setup schematic drawing	64
Figure 3.12: Test setup photos from laboratory	64
Figure 4.1: Specimen-S1 crack pattern at failure.....	66
Figure 4.2: Specimen-S2 crack pattern at failure.....	67
Figure 4.3: Specimen-S3 crack pattern at failure.....	67
Figure 4.4: Experimental load-deflection curve of specimen-S1	68
Figure 4.5: Experimental load-deflection curve of specimen-S2	68
Figure 4.6: Experimental load-deflection curve of specimen-S3	69
Figure 4.7: Experimental load-strain relationship of tension steel of cross beam in Specimen-S1	70
Figure 4.8: Experimental load-strain relationship of concrete of cross beam in Specimen-S1	70
Figure 4.9: Experimental load-strain relationship of both tension steel and shear reinforcement of cross beam in Specimen-S2.....	71
Figure 4.10: Experimental load-strain relationship of concrete of cross beam in Specimen-S2	71
Figure 4.11: Experimental load-strain relationship of shear reinforcement of cross beam in Specimen-S3.....	72
Figure 4.12: Specimen-S4 crack pattern at failure.....	73

List of Figures

Figure 4.13: Specimen-S5 crack pattern at failure.....	73
Figure 4.14: Specimen-S6 crack pattern at failure.....	74
Figure 4.15: Specimen-S7 crack pattern at failure.....	74
Figure 4.16: Experimental load-deflection curve of Specimen-S4	75
Figure 4.17: Experimental load-deflection curve of Specimen-S5	76
Figure 4.18: Experimental load-deflection curve of Specimen-S6	76
Figure 4.19: Experimental load-deflection curve of Specimen-S7	77
Figure 4.20: Experimental load-strain relationship of tension steel extended from main girder to stitching joint in Specimen-S4.....	78
Figure 4.21: Experimental load-strain relationship of concrete of cross beam in Specimen-S4	78
Figure 4.22: Experimental load-strain relationship of both tension and shear reinforcement of cross beam in Specimen- S5.....	79
Figure 4.23: Experimental load-strain relationship of concrete of cross beam in Specimen-S5	79
Figure 4.24: Experimental load-strain relationship of shear reinforcement of cross beam in Specimen-S6.....	80
Figure 4.25: Experimental load-strain relationship of tension steel extended from main girder of stitching joint in Specimen-S7.....	80