

**NEW ENGLAND TRANSPORTATION CONSORTIUM
QUARTERLY PROJECT PROGRESS REPORT**

A. PROJECT NUMBER AND TITLE:

Project: NETC 18-1

**Title: Development of MASH Computer Simulated Steel Bridge Rail and Transition Details
State Project No.: 023430.18**

B. PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S):

Chuck A. Plaxico, Ph.D.

Roadsafe LLC

Canton, ME

C. WEB SITE ADDRESS: www.RoadsafeLLC.com

D. START DATE (Per NETC Agreement): 09-October 2018

E. END DATE (Per NETC Agreement): 1-June 2020

F. ANTICIPATED COMPLETION DATE: 15-April 2019

G. PROJECT OBJECTIVES:

Phase I

The objectives of the project are to: 1) review existing NETC bridge rail and AGT designs and assess performance aspects to determine preliminary MASH compliance/equivalency, 2) review current standard details and specifications for NETC style bridge rails and transitions used by MaineDOT, NHDOT, RIDOT and VTrans to identify differences in material specifications and dimensional details and 3) evaluate the crash performance of the NETC bridge rail and approach guardrail transition (AGT) designs using finite element analysis (FEA) computer simulation. The impact conditions and assessment procedures for the FEA will conform to the specifications in *MASH* for TL-3 or TL-4 (as appropriate) and will include evaluations of structural capacity of the railing, risk of occupant injury, and vehicle stability during impact and redirection. The systems included in the evaluation are listed below along with the target test level for each system:

- Bridge Rail Systems:
 - NETC curb-mounted 2-Bar Rail (TL3)
 - NETC curb-mounted 3-Bar Rail (TL4) (4-bar curb mounted NETC rail would be considered equivalent to this type)
 - NETC sidewalk-mounted 4-Bar Rail (TL4)
- Bridge Rail Transitions:
 - NETC Style 2-Bar Rail to Thrie Beam (TL3) (NHDOT steel rail transition)
 - NETC Style 3-Bar Rail to Thrie Beam (TL4) (NHDOT steel rail transition)
 - Concrete Transition Barrier to Thrie Beam (TL4) (MaineDOT standard detail)

Project Tasks

- Task 1: Literature Review and Preliminary Assessment of Current Designs
- Task 2: FEA Model Development and Validation of Baseline R350 Design(s)

- a) Develop model of sidewalk-mounted 4-bar bridge rail based on existing validated model reevaluate validity against Test NETC 3.
 - b) Develop model of NETC AGT for 2-Bar bridge rail and validate with Test 401181-1 (R350 Test 3-21).
- Task 3: MASH TL-4 Simulations for NETC 3-Bar Bridge Rail
 - Task 4: MASH TL-4 Simulations for NHDOT 3-Bar Transition
 - Task 5: MASH TL-4 Simulations for NETC 4-Bar Bridge Rail
 - Task 6: MASH TL-4 Simulations for MaineDOT 4-Bar Transition
 - Task 7: MASH TL-3 Simulations for NETC 2-Bar Bridge Rail
 - Task 8: MASH TL-3 Simulations for NETC 2-Bar Transition

Phase II Project Tasks

- Task 3b: Evaluation of the NETC 3-Bar Bridge Railing with Stronger Lower Rail
- Task 4b: Evaluation of 5.5-ft Post Spacing Between Transition and Bridge Rail
- Task 5b: Test 4-12 Evaluation of NETC 4-Bar Bridge Rail with W8x28 Posts

H. REPORT PERIOD: October 1, 2019 through December 31, 2019

I. ACCOMPLISHMENTS THIS PERIOD:

- Phase II project tasks were completed.
- Results of Phase II were presented to Technical Committee on December 17, 2019.

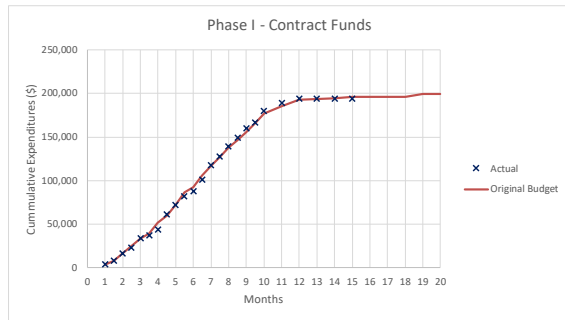
J. PROBLEMS ENCOUNTERED (If any): We were recently informed that the deliverables for NETC projects include a Poster and Fact Sheet that is to be developed by the contractor at the conclusion of the project. Although these deliverables were not included in our contract, we (Roadsafe) have agreed to provide those at no additional cost to the project.

K. TECHNOLOGY TRANSFER ACTIVITIES: None.

L. STATUS BY TASK:

	Task		Task Description	QTR	QTR 1			QTR 2			QTR 3			QTR 4			QTR 5			QTR 6			QTR 7			% Complete
	NO.	Code			Month	Oct	2	3	Jan	5	6	Apr	8	9	July	11	12	Oct	14	15	Jan	17	18	Apr	20	
Phase I	1	Literature Review	Literature Review and Preliminary Assessment of Current Designs		25	50	75	85	100																	100
	2(a)	BR Model Validation	Development and Validation of NETC 4-Bar Bridge Rail Model			25	50	80	90	100																100
	2(b)	AGT Model Validation	Finite Element Model Development and Validation of 2-Bar AGT				10	12	15	70	100															100
	3	3-Bar BR (TL4)	TL4 Simulations of the NETC 3-Bar Bridge Rail Design					10	50	75	100															100
	4	3-Bar AGT (TL4)	TL4 Simulations for AGT to 3-Bar Bridge Rail							25	50	75	100													100
	5	4-Bar BR (TL4)	TL4 Simulations for the NETC 4-Bar Bridge Rail Design								50	100														100
	6	4-Bar AGT (TL4)	TL4 Simulations for AGT to Concrete Abutment									50	80	100												100
	7	2-Bar BR (TL3)	TL3 Simulations of the NETC 2-Bar Bridge Rail Design										33	66	100											100
	8	2-Bar AGT (TL3)	TL3 Simulations for AGT to 2-bar Bridge Rail											25	60	100										100
	9	Interim Meetings	Interim Reports / Meetings				13	25	38	50	63	75	88	100												100
	10	QPR	Quarterly Progress Reports					33				67			100			100								100
11	Final Report	Final Report											13	65	89.94										90	
	Direct Expense	Computational Resources and Software (Is-dyna)		0	8	17	25	33	42	50	58	67	75	75	75										75	
Phase II	3B	3-Bar BR (Mod)	Test 4-10 on NETC 3-Bar Bridge Rail with Larger Lower Rail													50	100								100	
	4B	3-Bar AGT (Mod)	TL4 for 3-Bar Transition with 5.5-ft spacing														50	100							100	
	5B	4-Bar BR (Mod)	Test 4-12 on NETC 4-Bar Bridge Rail with 8x28 Posts																100						100	
	9B	Interim Meetings	Interim Reports / Meetings													33	66	100							100	
	11B	Final Report (Mod)	Update Draft Final Report																							0
		Direct Expense	Computational Resources and Software (Is-dyna)													25	75	100								100

Original Schedule
Projected Schedule



Phase I		Time Expended:	
Funds Expended:	97.16%		75%
Contract Amount:	\$ 199,936	Start Date:	10/9/2018
Expended this Month:	\$ -	Completion Date:	6/1/2020
Total Expended to Date:	\$ 194,253.42		
Balance:	\$ 5,682.78		

Phase II	
Funds Expended:	85.37%
Contract Amount:	\$ 30,307.82
Expended this Month:	\$ 25,873.67
Total Expended to Date:	\$ 25,873.67
Balance:	\$ 4,434.15

M. PERCENT COMPLETION OF TOTAL PROJECT : 75%

N. ACTIVITIES PLANNED FOR NEXT QUARTER:

The updated draft final report including Phase II results will be submitted February 2020.

O. FINANCIAL STATUS:

As of December 31, 2019

Total Phase I Project Budget:	\$ 199,936.00
Total Phase I Expenditures:	\$ 194,253.42
Total Phase II Project Budget:	\$ 30,307.82
Total Phase II Expenditures:	\$ 25,873.67