Center for Advanced Information Processing (CAIP)
Rutgers Infrastructure Monitoring and Evaluation (RIME)
CoRE Building, Busch Campus
96 Frelinghuysen Rd, Piscataway, NJ 08854
Tel: 732-445-4414, Fax: 732-445-4775

QUARTERLY PROGRESS REPORT

Project Title:	New Jersey Department of Transportation Elimination of Weight Restrictions on New Jersey's Rail Lines
Project NUMBER: NJDOT Project #2010-11	NJDOT RESEARCH PROJECT MANAGER: Edward S. Kondrath
TASK ORDER NUMBER: N/A	PRINCIPAL INVESTIGATOR: Dr. Hani Nassif
Project Starting Date: 01/01/2010 Original Project Ending Date: 6/30/2011 Modified Completion Date:	Period Starting Date: 04/01/2010 Period Ending Date: 06/30/2010

1. Project Progress Summary

Task No.	Task Description	Percent of Total Project Budget	Cost of Task	% of task this quarter	Cost this quarter	% of task to date	Total Cost to date
1	Literature Search	15%	$28,564	10%	$2,856	100%	$28,564
2	Bridge Inspection	20%	$38,085	70%	$26,660	75%	$28,744
3	Load Rating and Finite Element Modeling	30%	$57,128	36%	$20,790	36%	$20,790
4	Field Tests and Load Rating using the Test Results	25%	$47,606	30%	$14,282	30%	$14,282
5	Recommendation and Plan for Weight Increase and Bridge Maintenance	5%	$9,521	10%	$952	10%	$952
6	Implementation and Quarterly Report	5%	$9,521	10%	$952	20%	$1,904
Total		**100%**	**$190,425**	**35%**	**$66,492**	**50%**	**$95,235**

2. Project Overview

2.1. Project Objectives

The main objective of this study is to evaluate current conditions of various railroad bridges, and load-rate the bridges according to AREMA provisions to allow travels of 286-kip railcars. Additional field tests and detailed finite element analysis will be conducted for more accurate condition evaluation of the bridges. Recommendations for appropriate maintenance of the bridges will be provided to operate the bridges safely and cost-effectively for the remaining life of the bridges. Based on the study of the selected railway bridges, general guidelines for bridge inspection and maintenance will also be provided in this study.

2.2. Project Abstract

The overall growth in the economy and population in the United States led to a significant expansion of railroad traffic levels by the late 1990s. The freight railroad system facilitates large volume of freight movement cost-effectively. The railroad system is obviously important because the other alternative transportation methods, such as vehicles and trucks, cause concerns about congestion, air quality, and safety. Moreover, the cost to build and maintain new infrastructure and equipment is extremely high. Many railroad bridges were built before World War II approaching their design lives, and freight railcars, in many cases, use passenger rail systems to reduce maintenance cost.

In New Jersey freight railcars travel over many passenger rail systems. Recent increase of railcar weight limits from 263,000 lb to 286,000 lb raised additional concerns for the passenger rail systems since the bridges in the passenger rail system were not designed based on the increased railcar weight. Impact of the railcar weight on those bridges should be evaluated first to allow the use of passenger lines for the freight travels.

In this study, the impact of the increased railcar weight was investigated on the bridges located in New Jersey. The research approach adopted by the RIME team is aiming at evaluating current load-carrying capacity of various types of bridges and providing recommendations for load rating, repair, and maintenance to allow 286,000-lb railcar traffic on the passenger lines.

More detailed literature review will be conducted to find similar previous research and practices, followed by a review of inspection reports of all bridges. In cases where inspection reports are not available or there is lack of information, current bridge conditions and actual dimensions of the bridges can be evaluated from field inspections. Based on the field inspections, a number of critical bridges on New Jersey's rail lines will be selected and load-rated based on the current American Railway Engineering and Maintenance-of-Way Association (AREMA) specifications as well as the analytical studies. Enough number of sample bridges will be selected, so that the selected bridges can represent bridges with various structural systems and material types. Finite element modeling will be also adopted for the more accurate assessment of the bridges and to develop a methodology for evaluating and load-rating railroad bridges. Based on the field inspection results, critical bridge(s) will be selected for field tests. The selected bridges will be instrumented and tested under live loads (moving railcars). Finally, recommendations for load rating, maintenance, repair, and rehabilitation of the bridges will be provided for safe operation of the bridges on various New Jersey lines. The recommendations

will be applicable for other railroad bridges that support railcars with the increased standard weight.

Briefly, this project will address problems with the existing railroad bridges under the increased railcar loading. From this research, the RIME research team will provide guidelines for the inspection, maintenance, and load rating of the existing railroad bridges as well as the cost-effective analysis of this change in the freight weight limits.

3. Description of Work Completed by Task over This Period

Task 1— Literature Search

- Literature review related to bridge load rating, field testing, and finite element modeling is completed and summarized. Summary of important and valuable research studies was provided in the last quarterly report.
- Additional literature search will be conducted for new publications and report, if any.

Task 2— Review of Bridge Inspection Reports and Coordination of Tasks

- Inspection Reports of 5 NJ Transit Bridges were reviewed. Detailed review is still in progress with the coordination of Arora & Associates, P.C. to identify the most critical bridges for field testing.
- Additional Inspection Reports will be reviewed after obtaining from the Rail-line owners or agencies.

Task 3— Load rating and Finite Element Modeling

- Preliminary load rating for various structural members that are critical was performed on 5 NJ Transit Bridges with 286 kips Rail Car loading.
- Among these 5 NJ Transit Bridges, the Bergen County Line MP5.48 Bridge showed the lowest load rating. Thus, Bergen County Line MP5.48 Bridge was selected for Finite Element Modeling. Both As-Built and As-Inspected section properties were taken into account. The loading rating results based FE Modeling was compared with loading rating based on sample beam analysis.

Task 4— Field Tests and Bridge Load Rating using Field Test Results

- Various structural members have been identified and selected for potential instrumentation and field-testing.
- Various sensors and equipment needed for the filed testing has been acquired and tested under Laboratory conditions to ensure their functionality and operation.
- Data processing procedures and signal processing techniques have been developed to evaluate data collected from instrumented bridges.

Task 5— Recommendation and Plan for Weight Increase and Bridge Maintenance

- Not initiated yet.

Task 6— Implementation and Quarterly Progress Report

- First quarter report including detailed literature review has been submitted.

4. Proposed activities for next quarter by task:

Task 1— Literature Search
- This task has been 100% completed.
- Additional literature search will be conducted for new publications.

Task 2— Review of Bridge Inspection Reports and Coordination of Tasks
- Rutgers and Arora & Associates, P.C. will coordinate efforts and finalize the selection of the most critical bridges after concluding the checking of the load rating computations and reviewing past inspection findings.
- The research team will continue to coordinate with rail-line owners and other agencies to obtain the inspection and maintenance information for other target bridges, if needed.
- For selected bridges, field inspection will be arranged and coordinated with rail lines owners to evaluate access to the selected bridges and their current conditions. The bridge inspection reports and field inspection results can be used for accurate bridge load rating.

Task 3— Load Rating and Finite Element Modeling
- Besides the load rating for controlling structural members of 5 NJ transit bridges, more load rating computations will be performed using detailed finite element method and analysis.
- Additional Finite Element Modeling will perform, if needed.

Task 4— Field Tests and Bridge Load Rating using Field Test Results
- Select Bridges for inspection and filed observations and testing, if applicable.
- The Rutgers team will coordinate the efforts with NJ Transit and Conrail to obtain a 286 kips rail car needed for field-testing.
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Task 5— Recommendation and Plan for Weight Increase and Bridge Maintenance
- N/A.

Task 6— Implementation and Quarterly Progress Report
- Second quarter report will be prepared for NJDOT.

3. List of deliverables provided in this quarter by task (product date):

4. Progress on Implementation and Training Activities:
N/A

5. Problems/Proposed Solutions:
N/A

Year 1 Budget	$190,425
Year 1 & 2 Cummulative Budget (Pending 01/01/11)	$302,571
Total Project Expenditure to date	$95,235
% of Total Project Budget Expended	31%

NJDOT Research Project Manager Concurrence: _____ Date: _____