Date: February 10, 2010

To: Mr. William Adams, PE
   Chief, Design Bureau

Attn.: Mr. Stan Biddick, PE
       Consultant Management Engineer

From: John F. Black, PE
      Bridge Engineer

Subject: Load and Resistance Factored Design

This office has received a number of phone calls and emails lately from consultants in regard to our planned date for implementing Load and Resistance Factored Design (LRFD).

Our current commitment with FHWA is to be fully implemented to LFRD design methods by November, 2011. Projects where the Preliminary Engineering funds (PE) is authorized after this date will need to be designed using the latest AASHTO LRFD Bridge Design Specifications, interims and ALDOT Structures Manual (updated for LRFD).

I have included a copy of a letter to FHWA dated December 31, 2009 that updates the Bridge Bureau’s progress thus far in making the transition from Allowable Stress Design to LRFD. I am requesting that you share this update along with a copy of this letter with our bridge consultant community.

Thanks for your assistance. Please let me know if you have any questions.

/jfb

cc: Mr. Rex Bush
    Mr. Larry Lockett
    Mr. George Conner
    Mr. Robert King
December 31, 2009

Mr. Mark Bartlett
Division Administrator
Federal Highway Administration
500 Eastern Blvd., Suite 200
Montgomery, AL 36617-2018

Attn: Mr. Robert King

Gentlemen:

Re: Update to the Revised ALDOT Bridge Bureau Plan of Action for Implementation of Load and Resistance Factor Design (LRFD)

Due to recent significant developments in our implementation effort, I felt it best to write you and provide an update on our progress. The developments will be headlined below and are in no special order.

Phase II Contract

In our previous letter, dated October 16, 2008, we expressed anticipation that Baker’s support efforts under this contract would begin in the following month of November. However, the contract with Baker was not approved and signed by the Governor until this past July. This nine month delay is due to an unexpectedly long contract approval process. In addition to not having the transition support offered by Baker, we were also delayed in our own implementation efforts due to production pressures resulting from additional bridge project work for Federal Stimulus consideration.

However, with Baker having now received their notice to proceed we initiated their support effort with an invitation to their Phase II contract project manager, Mr. Ken Wilson, P.E., to make his first in-house visit on August 21. The intent of the visit was to introduce him personally to each team member, have him cover the work Baker completed in the Phase I contract, explain their scope of work for the Phase II contract, and answer questions from the LRFD Committee.

During his visit, Ken drew upon his experience working with other state DOTs in their LRFD transition to give advice on our own efforts and schedule. A recommendation he made was to make our new Structural Design Guidelines one of the last items to be
completed, as he anticipates on-going changes being made to it. Therefore, at the urging of Baker’s project manager, we are planning to finalize our new Structural Design Guidelines in January of 2011, although it will be a continual work in progress. It should be noted that our current Bridge Design Manual will be divided to create three separate manuals. At present, the following are the tentative titles of the manuals under development: Structural Design Guidelines, Guide to Developing Bridge Plans, Guide to Plan Preparation, and a new QA/QC Manual. It should be noted that despite the nine month delay, we are not expecting to extend our LRFD implementation date. That goal remains at November of 2011.

Implementation Staff

In our efforts toward full implementation we have identified the need for two additional LRFD support positions. Whereas Paul Froede will remain as the overall coordinator of this project, the technical aspects, which cover review/analysis of new software and design aids, structural design of standard features (impacted by LRFD as well as NCHRP and AASHTO reports), and training will be handled by Dr. Berhanu Woldemichael, who was promoted to this position. Additionally, the need for a quality assurance engineer, who will provide design verification for LRFD bridges, was perceived. Mr. Paul Cox was promoted to fill these duties. Mr. Froede has also requested Mr. Ramy Abdalla, a former Ph.D. candidate from UAB, to assist Dr. Woldemichael with various analysis issues. These personnel moves have increased the committee from eight to eleven.

Training

After engineers at Minnesota DOT and a local consultant gave positive recommendations of the prestressed beam / bridge design program PSBeam, we requested Mr. Roy Eriksson to provide a demonstration. Multiple bridge design consultants were invited and the demonstration was held the morning of November 10. LRFD Committee feedback was generally positive, so we are following through with a 60 - 90 day test period. Seven engineers from the Bridge Bureau will use and assess the program and make a recommendation. The testing period is expected to begin in January 2010. If PSBeam is recommended by the sub-committee and chosen by the whole Committee then it will replace LEAP as our preferred prestressed beam and substructure design program. We are also expecting to use the AASHTO program Opis, though it is currently undergoing analysis engine changes and is still in the beta testing phase.

As a trial project, we have a design team currently performing the first LRFD designed bridge using our current prestressed beam design program, LEAP. It is a simple, three-span, tangent alignment, county bridge in Lee County. The design team will be using LRFD software for the initial design and will coordinate their effort with Mr. Cox, who will perform the quality assurance on the design. The purpose of this trial run is twofold: to determine any possible exceptions we may want to apply to LRFD (in order to ensure our new designs are at least as durable as what we are currently producing), and to bring out
issues we have not yet considered and that will need to be addressed before making a full transition. Having a relatively simple design will enable us to determine how best to proceed with our in-house LRFD QA/QC and design transition efforts. The design team includes Mr. Abdalla and Mr. Nick Walker, a recent Auburn graduate. Both men have earned their Master’s degree in civil structures and Mr. Walker has been educated extensively in LRFD practices.

Dr. Woldemichael began supplemental LRFD software training last September. For five weeks he held regular training meetings with all designers and section leaders where they were given some instruction and then assigned to design a particular bridge element using LEAP. At the beginning of consecutive meetings, results were discussed and compared with the same design attained using the ASD design methodology. He anticipates this training to continue with future sessions as we settle in on computer-based design tools.

Seismic

Auburn University received Federal Stimulus research funds and contacted us to see if we needed assistance with developing our response to the new LRFD seismic considerations. We are currently working with them to determine the breadth and scope of research necessary to meet our needs and will include state research funding should it be required. One objective of this work will be to provide structural details that we can apply either state-wide or in specific seismic locations. Another outcome will be for Auburn to review and make recommendations regarding our typical substructures as placed in various seismic design zones and soil types found around the state. Dr. Justin Marshall, a recent Department of Civil Engineering hire and an expert in LRFD seismic issues, will oversee the research.

**Updated Summary of Implementation Plan**

<table>
<thead>
<tr>
<th>Task</th>
<th>Projected Completion Date</th>
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<tbody>
<tr>
<td>Organize LRFD Committee</td>
<td>Completed March 2008</td>
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<tr>
<td>Appoint LRFD Coordinator w/ redefined duties</td>
<td>Completed April 2008</td>
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<tr>
<td>MnDOT LRFD Bridge Scan Tour</td>
<td>Completed June 2008</td>
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<tr>
<td>NHI LRFD Training for all Design Engineers</td>
<td>Completed June 2008</td>
</tr>
<tr>
<td>LEAP Software Training for all Design Engineers</td>
<td>Completed September 2008</td>
</tr>
<tr>
<td>Opis Software Training for all Design Engineers</td>
<td>Completed October 2008</td>
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<tr>
<td>LRFD Code Check on new designs (as a minimum)</td>
<td>March 2010</td>
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<tr>
<td>Completion of LRFD Structural Design Guideline</td>
<td>January 2011</td>
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<tr>
<td>Full Implementation of LRFD Design</td>
<td>November 2011</td>
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Yours very truly,

John F. "Buddy" Black, P.E.
Bridge Engineer

JFB/PEF

Copy: Rex Bush
    William Adams
    Ed Phillips
    George Conner
    Larry Lockett
    Bridge Design Section Supervisors
    Bridge Bureau LRFD Committee
    Mr. Ken Wilson, III P.E. – Michael Baker Inc.