Summary Minutes Of The
AASHTOWare Bridge Design-Rating (BrDR) Task Force Meeting
August 17, 2017
Kansas City, KS

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General Information – Meeting of the Bridge Design & Rating Task Force

Date: Thursday, August 17, 2017

Participants:

AASHTO SCOA	Judy Tarwater	AASHTO	Project Manager
T&AA	Will Holmes (by phone)	T&AA	T&AA Liaison
BrDR Task Force	Todd Thompson	South Dakota DOT	Chair
	Joshua Dietsche	Wisconsin DOT	Bridge Rating (BrR)
	Ping Lu	Iowa DOT	Bridge Rating (BrR)
	Jeff Olsen	Montana DOT	Bridge Design (BrD)
	Tom Saad	FHWA	FHWA Liaison
	Dean Teal	Kansas DOT	Bridge Design (BrD)
BrM Task Force	Beckie Curtis	Michigan DOT	Bridge Management
	Mark Faulhaber	Kentucky DOT	Bridge Management
BrDR Contractor	Jim Duray	Michael Baker, International	BrDR Contractor
	Herman Lee	Michael Baker, International	BrDR Contractor
	Krisha Kennelly	Michael Baker, International	BrDR Contractor
	Geoffrey Trees	Michael Baker, International	BrDR Contractor
Guests	Richard Pickings	BridgeSight	Third Party Developer
	Ron Pierce	BridgeSight	Third Party Developer
	Brian Goodrich	BridgeTech, Inc.	Third Party Developer
	Jack Dartman (phone)	Montana DOT	T&AA Member
	Brian Guerette (phone)	Maine DOT	T&AA Member

Notes Taker: Judy Tarwater

Agenda Item 0: Review Agenda/Assign Minutes Recorder

Todd Thompson opened the meeting at 8:00 am. The attendees performed self-introductions. The agenda was reviewed and no additional items were added.

Agenda Item 1: Third Party Development

1a. Modernization API

Baker provided an overview of the status of Modernization Project

- The domain portion of the modernization (the API) is almost complete.
- The User Interface is approximately 30% complete
- The Engine is approximately 50% complete.

A discussion ensued between Baker developers and the third party developers on the differences Baker has experienced between the old code and the new code. The legacy C++ code is much more lengthy than the modernized C# code. Baker is using the C# Microsoft Compiler 2016 but will soon move to the 2017 version. Baker conveyed that they put a priority on moving to the latest version of the compiler as soon as it is available. API calls in the binaries also supports easier conversions when updated compilers are introduced.

A new approach for installing the engines will be developed. A registration mechanism will be provided to connect third party engines and an API example will be provided. A few changes have been made to the event object. The event object is not like a .Net event. The scope of the modernization does not include the capability to support the plugin of a third party component; however, the modernized code will be extensible to allow this feature to be added in the future should the Task Force make the decision to pursue. The incorporation of an engine specific toolbar is also not in the scope of the modernization project. The third party developers expressed their desire to have a 'rich' interface that supports complete integration of third party engines, etc. (i.e. direct access from menus included in the user interface).

1b. Open Discussion with Third Party Developers

BridgeSight advised that there are capabilities in BRASS that are not available in the BrDR export process.

BridgeSIght expressed a desire to look for options to include a mechanism for AASHTO Members to secure PGSuper training via the AASHTOWare catalog (similar to the service unit arrangement between Baker and AASHTO or possibly an alternate PGSuper licensing arrangement that includes a defined amount of training). Judy Tarwater explained that AASHTO does not have a contracting mechanism in place with BridgeSight to support a service unit type arrangement.

BridgeTech requested access to the NCHRP project results used by BrDR to develop the Regression Tool in order to allow BRASS to incorporate necessary changes to their code. The desire is to ensure there is uniformity between BrDR and BRASS. The group agreed that someone needs to take ownership of the report ID standards.

In response to a question from BridgeTech, Baker advised that a feature in General Preferences allows the BrDR users to change the analysis module for all the bridges, or separate bridges by bridge type.

1c. Task Force Discussion

Baker provided the Task Force with the definition of Polymorphic - In programming languages, polymorphism is the provision of a single interface to entities of different types. A polymorphic type is one whose operations can also be applied to values of some other type, or types.

The Task Force discussed the need to document the Report ID Standards which deal with a portion of the output. Baker recommended developing a document to provide details on the Report IDs and the contents of the regression file.

The Task Force discussed options for users to obtain support and training services from BridgeTech and BridgeSight via AASHTOWare Service units through the Baker contract.

The Task Force made the decision to share the API with the third party developers as soon as practical. Although not 100% complete, early delivery of the API would help the third party developers get started on their code conversion activities with the understanding that there could still be some minor changes made between now and the final release. The final release of the API will be provided to the third party contractors in the January 2019 timeframe; however, the Task Force may make the decision in the future to provide a pre-release of the API between now

and then. This will be discussed further during future Task Force meetings.

Agenda Item 2: Prior Business

2a. Review June Meeting Minutes

Minutes from the June 27 - 29, 2017 Task Force Meeting in Seattle, WA were reviewed and approved as-is.

Updates to the Attachment A (to the meeting minutes) to reflect the recent changes to the Task Force membership was discussed. Information contained within Attachment A (i.e. Task Force and TAG/TRT members) are also posted on the RADBUG website. The updated information needs to be forwarded to David Schroeder so he can make the necessary changes. A photograph of Ping Lu will also need to be provided to David Schroeder for posting on the website.

2b. Review Action Items

Jeff Olsen reviewed the Action Items and provided updates to the Task Force.

Agenda Item 3: User Group

3a. Summary Minutes from April Meeting

The summary minutes for the June BrDR Task Force meeting in Memphis, TN were provided. Judy Tarwater will post these on the SharePoint site for Task Force review and comment. Once in final form, the summary minutes will be forwarded to David Schroeder (Secretary RADBUG) for posting on the RADBUG website.

3b. Discussion / RADBUG Follow-up Actions

The final attendee registrations was 136. 59 attendees attended the meeting for the first time. There were 6 no-shows.

A majority of the meeting attendees stayed until the end of the meeting on the second day. This may be a first!

The Task Force had a few take aways from the User Group meeting, including:

- Marketing Recommendations (marketing to the consultant community)
  - Make consultants aware of the fact that BrDR is delivered with the Prestressed Design Tool. This could be accomplished via some extra verbiage included in the email communique which delivers their license key.
  - Possibility of making BrD available to the consultants on a limited basis for them to 'test drive' BrD?
- Use of a technology such as WebEx to allow users to view the slides real time on their laptops or phone to view the presentations during the meeting. OR Load the presentations real-time on the RADBUG website so attendees can down-load during the meeting.

3d. Survey

Some of the issues reported in the survey responses are old issues that have already been resolved. The Task Force discussed the low response rate to the recent survey and the fact that it's hard to determine if the survey responses actually reflect the opinions of a majority of the users. The Task Force decided to continue to survey the users every other year rather than annually.

There were a lot of comments on changes needed to reports. There was also a high level of interest in having the ability to export data into Excel. Release 7.0 will have the report to Excel capability.

The responses to agency priorities by category will be useful to the Task Force in making decisions on specific enhancements to be incorporated into the product.

3c. 2018 RADBUG Meeting

Shanon Murgoitio, incoming RADBUG President, advised that the 2018 meeting will be held in Boise, ID. Shanon is working within ITD to move forward with licensing both BrR and BrD in FY2019. She plans to secure an evaluation copy of BrD late this fiscal year to get a jump on implementing it in FY2019. With the 2018 RADBUG meeting in Boise, ITD will be able to allow a large group of designers to attend the conference in line with implementing the software within their department.

Judy Tarwater has been in contact with the Grove Hotel in Boise, ID. The Grove Hotel has availability and has held the space for the 2018 RADBUG. Judy expects to sign the contract within the next week.

The 2018 meeting dates are - RADBUG: August 7 – 8, 2018, BrDR Task Force Meeting: August 9, 2017. The incoming RADBUG Officers are George Huang, California DOT (VP Rating) and TBS, Colorado DOT (VP Design).

Agenda Item 4: Modernization

4a. Update

The windows are approximately 30% complete. The BWS tree is almost finished and work on the simplied tree will begin soon. The Engine is 50% complete (Prestressed and Reinforced Concrete are complete. Steel is getting underway and work has started on NSG and truss).

4b. TAG Update

The decision on whether or not on-site testing will be conducted in the spring of 2018 has not been made.

Agenda Item 5: Enhancements

5a. Strategy for Supporting User Funded Enhancements

The Task Force is working to update the five year financial projection for BrDR. The Task Force is interested in looking at options to allow user funded development to begin sooner than later. Once the Task Force has a handle on the amount of funding available for service unit funded and program funded enhancements, decisions need to be made on how to secure adequate development staff to initiate the development of the requested enhancements.

Agency Requested (and funded) Enhancements include:

Mississippi DOT – Rating Tool Enhancement: Addition of Post Tensioned Boxes

Virginia DOT – Rating Tool Enhancement: Addition of LRFR

Illinois DOT – Rating Tool Enhancement: Addition of LFR Floor Systems

Idaho DOT – Rating Tool Enhancement: Addition of Concrete Box Culverts (LFR)

California DOT - Caltrans is willing to fund the following enhancements for both the legacy and modernized product.

- Modeling - (BRDRSUP-1306) Allow user to choose a pinned connection at the top of column/support when using Integral with Substructure structure type. Currently software allows a pinned connection only at the bottom of column/support. Pinned top of column details on "framed" structure types are possible as well as pinned connections forming after a seismic or other overstress event. Many RCB bridges that are integral with superstructure; however, they made them as "pinned" at top.
- LLDF – (Medium) LLDF for One or Two Cell Box girder bridges. Phase 3 Development of MCB: Current AASHTO LRFD specification

does not provide an expression to establish the LLDF for one or two cell box girders. Based on research done by UC-Davis, Caltrans has incorporated expressions for LLDF of one and two cell box girder bridges. This agency defined LLDFneeds to be incorporated to the BrR software. LLDF need to have this enhancement now

- Agency LLDF – (Medium) Limiting "Lever Rule" values of One Lane LLDF to Multi-Lane LLDF, since Multi-Lane LLDF includes the single Lane LLDF (with MPF of 1.2). Agency defined overwrite option - For exterior webs and girders, AASHTO recommends to use Lever Rule for exterior girder, however, they do provide an expression to establish the LLDF for the two more lane case. The researcher who developed this expression tells us that the Two or more lane expression includes the single lane LLDF (with MPF) and as a result, the single Lane LLDF cannot be greater than multi lane LLDF. As a result, we would like to create an option where single Lane LLDF based Lever Rule is limited to multi lane LLDF generated using AASHTO expression. This enhancement will cut down significant time in the future.
- Agency LLDF – (Small) When extending the range of applicability, limit the values to Lever Rule (LLDF) Agency defined overwrite option - At present, when we extend the range of applicability the value established by the AASHTO equation sometimes exceeds the value established by the Lever Rule. We'd like to have an option (another overwrite option) to use the lowest of the Lever Rule or value established by the AASHTO equation. This enhancement is a good feature, not many example brought in by LREs yet.
- Agency LLDF – (Small) Establish the LLDF for exterior using "full box" case - set to interior girder LLDF. Agency defined overwrite option - Moment LLDF for exterior web of Current MCB is established by We/14 method. Specification allows us to set the value to interior web LLDF thereby establishing whole width LLDF. We'd like to have an option to choose one or the other method. This enhancement will be good for comparing our demand with CtBridge. Will assist in checking the designed by DES folks using CtBridge.

In addition to looking for options to support the development of User Requested/Funded enhancements, the Task Force also discussed the need to investigate opportunities to support the development of the impending Prestressed Design Tool, Phase 2 and Steel Design Tool Projects.

5b. User Group Enhancement Priorities Discussion

5c. Option to use both legacy and modernized NSG engines (2017-BrDR-031)

Baker presented the Task Force with three approaches to provide the users with an option to use both the legacy and modernized NSG engines.

Option 1 - For 6.8.3 only, add a checkbox to indicate whether to use the legacy or modernized Distribution Factor Analysis engine. The Analysis Progress window will initiate the Distribution Factor engine based on the checkbox selection.
This option requires database, Db, De, Dm, Domain and UI changes. Migration and version conversion will set the checkbox to selected. The checkbox needs to be included in the Help, Report Tool and API.

Option 2 - For 6.8.3 only, add a Legacy Distribution Factor-Line Girder analysis type in the Analysis Settings window. The Analysis Progress window will initiate the Distribution

Factor engine based on the analysis type selection. This option requires database changes. The new analysis type needs to be included in the Help and API documentation.

Option 3 - This is a low-cost option assuming the modernized Distribution Factor Analysis engine will only be used for testing purpose in 6.8.3. For 6.8.3 only, the Analysis Progress window will use the 3D analysis module selected in the Superstructure Definition window's Spec tab to determine whether to use the legacy or modernized Distribution Factor Analysis engine.

The Task Force directed Baker to proceed with Option 2.

Agenda Item 6: Miscellaneous Topics

6a. Hard-coded Tolerances (2017-BrDR-032)

There are roughly 1,000 lines of code that contain a hard-coded tolerance. Hard-coded tolerances are used in the user interface, domain, and in the engines.

The following are some examples:

Comparison and validation of geometry:

- For example, internal coordinate geometry for testing if two points are exactly the same uses a tolerance of 0.000001.
- Internal coordinate geometry for testing if a point is to the right or left or on a line uses a hard-coded tolerance. Similar for numerous other internal geometry-related comparisons.
- Checking if the start of a range equals the end of the previous range uses a hard-coded tolerance (i.e. no gap between ranges). If it does, set this range's start equal to previous range's end so there are no rounding problems.

Comparison to zero:

- FE analysis produces moment and shear actions that can be very small so we test against zero with a hard-coded tolerance and set the value to zero if within the tolerance.
- In determining if impact is zero a hard-coded tolerance is used.

Comparison of two objects to determine if they are an exact duplicate:

- Comparison of two objects (vehicles, materials, etc.) to determine if they are the same uses a hard-coded tolerance.

Comparison to an expected value:

- Checking if dead load distribution equals 100% a hard-coded tolerance is used.
- In spec-checking there are numerous comparisons to values presented in the spec articles. Those comparisons generally use a hard-coded tolerance.

Comparisons for the finite element analysis and model generation:

- The FE engine uses a hard-coded tolerance for coordinate transformations.
- In generating finite element models a hard-coded tolerance is used to determine the number of elements of the target length to add between nodes.
- In determining the orientation of members for the truss reports a hard-coded tolerance is used.

Comparison for validation

- Validation checks for cross section properties use a hard-coded tolerance.

6b. Maintenance Items

Caltrans has reported three bugs that are causing a slowdown of their load rating production operations. (Caltrans has 300 Tee beam bridges that are affected).

- BRDRSUP-1417 ("L" is established incorrectly for LRFD LLDF calculation)

- BRDRSUP-1513 (Phi for Grouted Tendon should be 0.9 instead of 0.85 in Article 6A.4.2.1)
- BRDRSUP-1519 (LRFD LLDF for first interior girder and right exterior girder are incorrectly established)

Two of the three bugs are being addressed under warranty.

Mississippi and Illinois (any user with a large number of bridges in their rating tool) are having a problem with delays in opening the rating tool. Baker advised that a fix for this issue has been identified and can be included in the next patch release.

Fixes for the above referenced issues will be deployed via a patch release in early to mid-September.

Agenda Item 7: Review Action Item list from this meeting

Judy Tarwater read the action items recorded during the meeting.

Agenda Item 8: Task Force Executive Session (as needed)

No Executive Session. The meeting adjourned Thursday, August 17 12:00pm.