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BRADD

After 20 Years:
Where do we
go from here?



Jay Fitzgerald, P.E., SECB
BRADD Manager




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BRADD Collaboration

- **PENNDOT**
 - Jay Fitzgerald, P.E., SECB
- **Michael Baker Jr., Inc**
 - Bill Smyers, P.E.
 - Mary Rosick, P.E.
 - Mark Mlynarski, P.E.

Objectives

- Brief history from 1983 - Present
- New in the August 2008 Release
- 2009 & 2010 Releases
- Estimated Savings – Past & Present
- Challenges maintaining BRADD
- Future of BRADD

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BRADD History-1983-85

- **BRADD-1**
 - Automation of Low Cost Bridge Standards
 - Design not automated
 - 1st step - limited results

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BRADD History-1985-94

- **BRADD-2**
 - Fully automated design and drafting
 - In production from November 1988 – June 30, 2005
 - Reduces drafting time
 - 632 bridges designed

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BRADD History-1995-2000

- **BRADD-3**
 - Metric Units only
 - New LRFD Programs and Standards
 - In production from June 2000 – October 2004
 - 18 bridges designed

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BRADD History 2005 – Present

- **BRADD Version 3.1.0**
 - English and Metric units
 - Well Documented
 - New Interface (GUI)

1st Time Available
For licensing to
Consultants




BRADD History 2005 – Present

- **BRADD 3.1.1.0** - September, 2005
- **BRADD 3.1.2.0** - October, 2006
- **BRADD 3.1.3.0** - June, 2008




What is BRADD?

BRidge Automated Design and Drafting

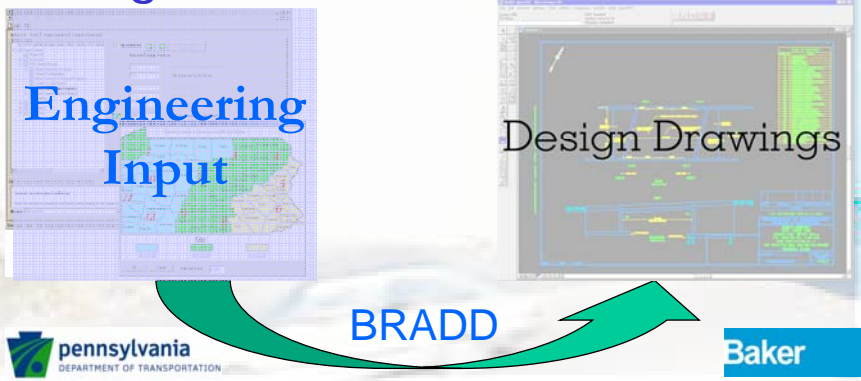


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What is BRADD?


- Automates production of scaled bridge contract drawings




Engineering Input

Design Drawings

BRADD



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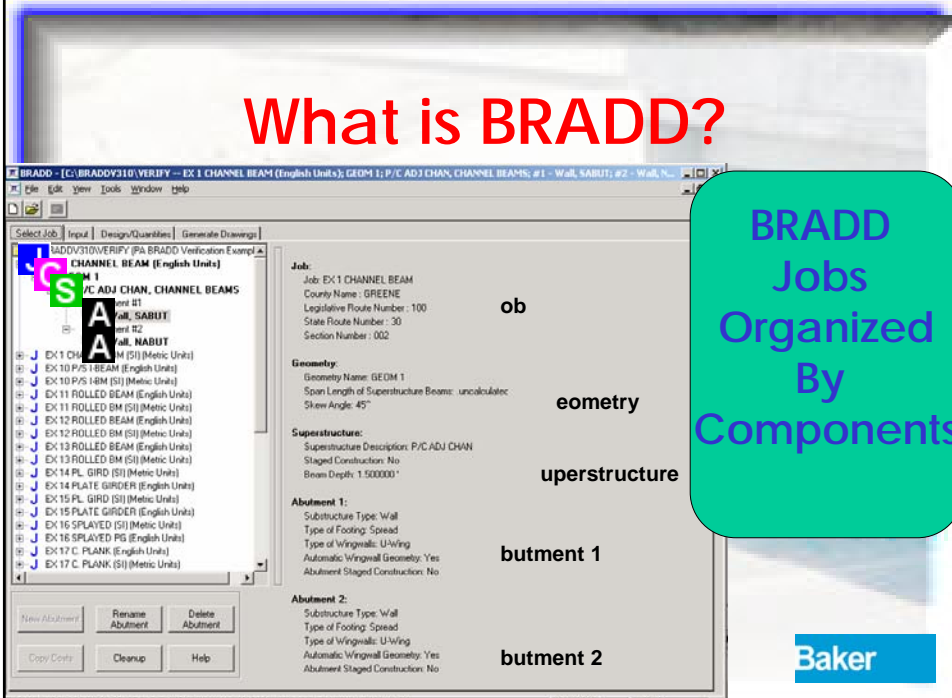


What is BRADD?


- Designs/Drafts Simply Supported Bridges
 - Alignment/Geometry information
 - Steel or Prestressed concrete girders
 - Reinforced concrete abutments
 - Full reinforcement schedules
 - Produces ~ 35-50 scaled drawings



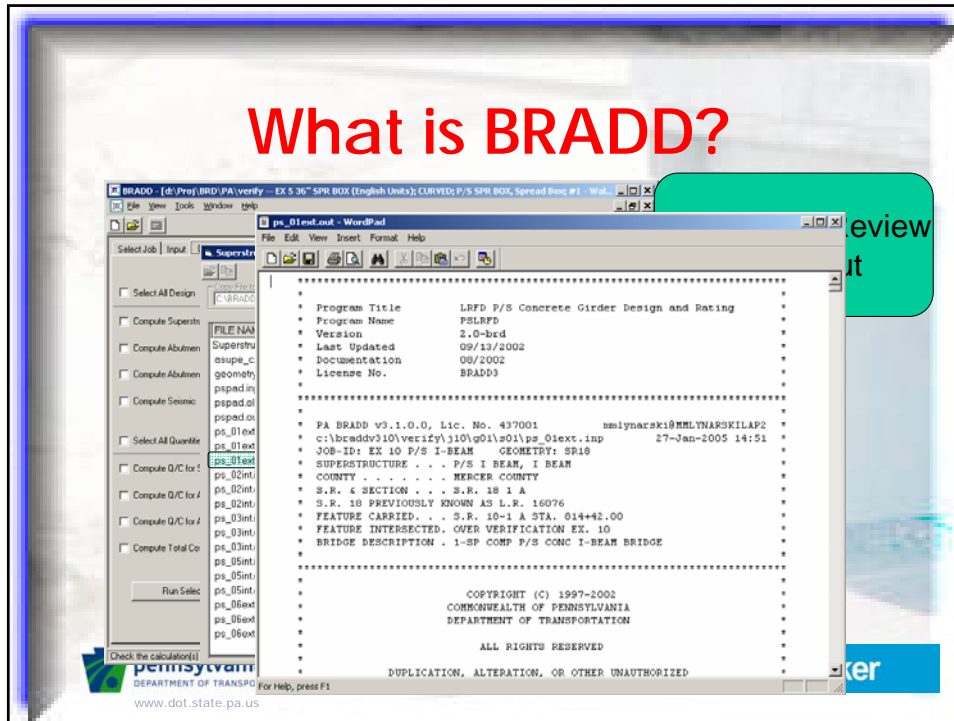

What is BRADD?



**BRADD
Jobs
Organized
By
Components**

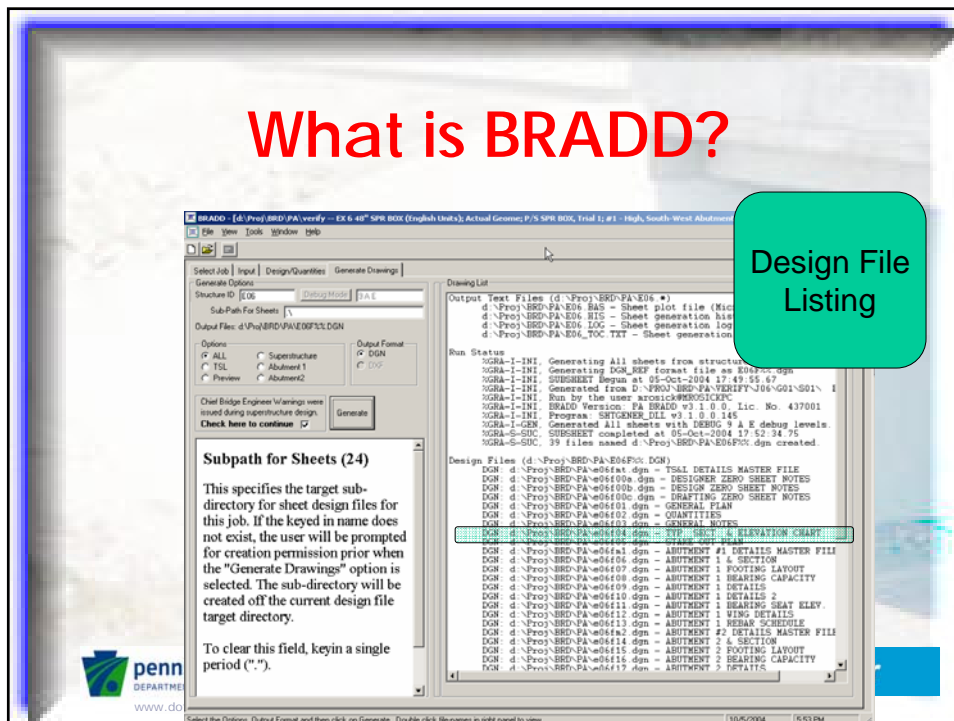


What is BRADD?

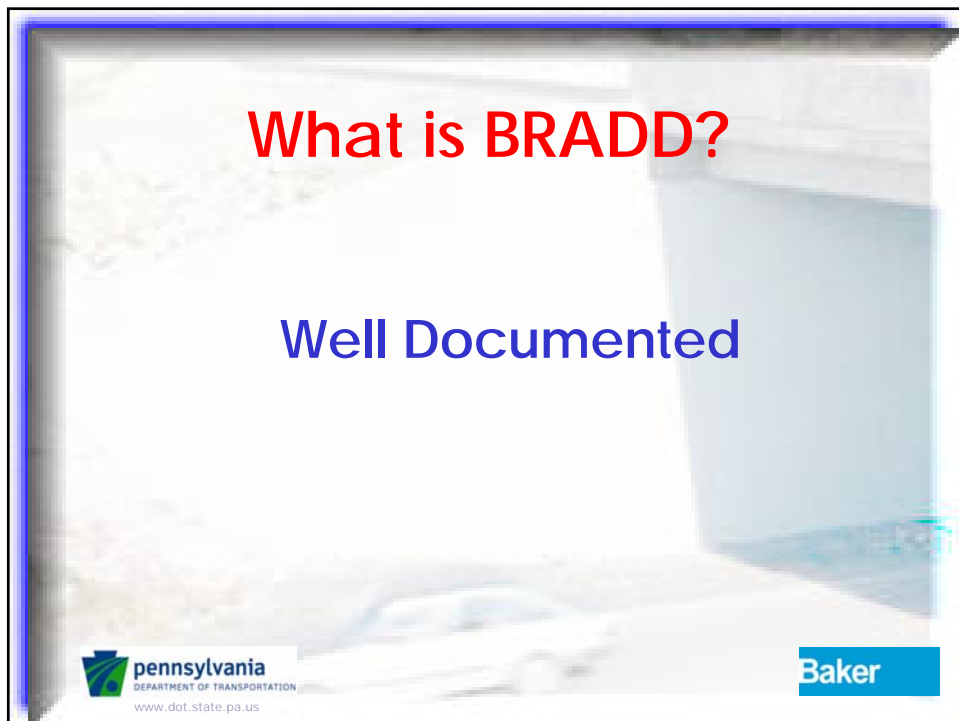
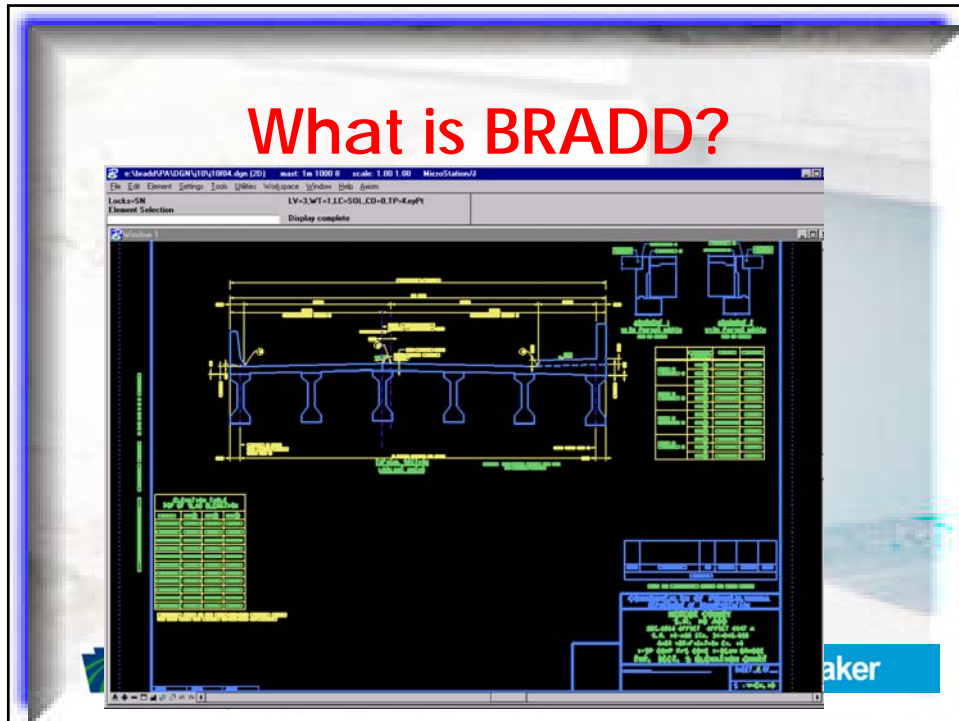


Review it

What is BRADD?




Design File Listing




Well Documented

What is BRADD?



Design Drawings

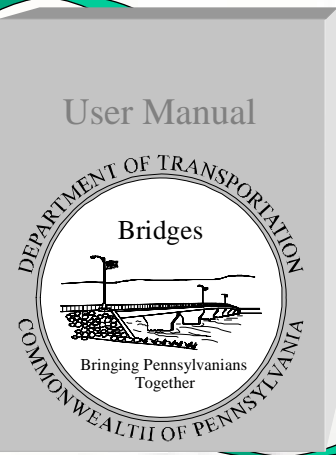


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The image shows a presentation slide with a blue border. At the top left, it says "Well Documented" in blue. In the center, "What is BRADD?" is written in large red letters. Below this, there are two overlapping screenshots of the BRADD software. The left screenshot shows a map of Pennsylvania with various regions highlighted in green and yellow. The right screenshot shows a technical design drawing with various lines and text. At the bottom left is the Pennsylvania Department of Transportation logo with the website "www.dot.state.pa.us". At the bottom right is the Baker logo.

Well Documented

What is BRADD?



Design Drawings




Baker

The image shows a presentation slide similar to the one above, but with a central graphic. The text "Well Documented" and "What is BRADD?" are at the top. Below them, a 3D-style graphic of a user manual cover is shown. The cover is grey and features the Pennsylvania Department of Transportation logo, which includes a bridge and the text "DEPARTMENT OF TRANSPORTATION", "Bridges", and "Bringing Pennsylvanians Together". The words "COMMONWEALTH OF PENNSYLVANIA" are written around the bottom of the logo. Two green curved arrows point from the manual cover towards the software screenshots on either side. The screenshots and logos at the bottom are the same as in the first slide.


Well Documented

What is BRADD?

- **User Manual**
 - Over 1000 pages
 - 400+ to the method of solution
 - Information on how the input for the LRFD programs is calculated
 - Available through the GUI
 - Searchable PDF



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Well Documented

What is BRADD?

- **Additional Documentation**
 - Designer Checklist Spreadsheet
 - Copyright
 - Designer Notes
 - Design Notes
 - Drafting Notes




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Well Documented

What is BRADD?

- Other supporting documents
 - GUI help
 - PENNDOT's DM-2,DM-3 and DM-4
 - BC, BD, and RC standards
 - Pub 408
 - Construction Items Catalog
 - Standalone LRFD program manuals
 - Applicable strike-off letters




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BRADD Version 3.1.3.0

- Superstructure only option
- Live Load Options 'D' and 'E'
- Superstructure Analysis (all beams)
- ABLRFD analysis input files
- BC/BD standard updates
- Designer Checklist spreadsheet



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BRADD Version 3.1.3.0

- As per SOL 431-06-01:
 - No channel beams
 - No non-composite adjacent beams
- No maintenance of metric units



BRADD Version 3.1.3.0

Consultant Recommended Changes

- Call out the seismic tie bars on the abutment footing plan.
- Improved the input/calculation for abutment braking force loading


August 2009 Release

- Integral Abutment Superstructure
- Deck rotation in superelevation about PG line
- Input DL for each designed beam

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August 2009 Release

- September 2007 edition of DM-4
- LRFD Program recent releases
- Output in PDF format

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August 2010 Release

- Approach Slab Details for Integral Abutments
- Bulb-Ts
- LRFD Program recent releases

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August 2010 Release

- Implement July 2007 Standard changes
- Update barrier detailing on u-wings
- Bearing Stiffener Design for Critical Beam

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August 2010 Release

- Changes to STLRFD for Splices
- Deck and barrier - corners of deck and end of barrier






Estimated Savings

(By Experienced Users)



Values as of 06/30/2008	BRADD-2	BRADD-3 (Metric)	BRADD
# of BRADD Jobs	632	18	51
Estimated Max. Hours Saved	1500	350	1500
Estimated Min. Hours Saved	10	0	0
Estimated Average Hours Saved	440	189	323

- BRADD generated drawings typically 70 - 80% complete



License Cost Information

Licensee Category \ License Type	New	Updates	Patches
Private Organization:	\$5000	\$1500	\$0
Educational Institutions - Consulting Use:	\$5000	\$1500	\$0
Educational Institutions - Educational Use:	\$500	\$150	\$0
Local Governmental Agency :	\$500	\$150	\$0
Foreign Government:	\$500	\$150	\$0
Department Executive Agencies:	No Fee	No Fee	No Fee
State Transportation Agencies outside PA:	No Fee	No Fee	No Fee

BRADD Licenses

- 117 Licenses issued to date
 - 99 to Consultants
 - 8 to Local Government
 - 7 to County Government
 - 3 to State DOT (Oklahoma & Utah)

Challenges

- Maintenance
- Inexperienced Users
- Experienced Users

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Maintenance Challenges

- Maintenance Contract Approval
- Adequate Funding
- Ever changing LRFD Programs, Standards, and DM-4

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Maintenance Challenges

- Limited Testing Capability
- Hidden Problems

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Inexperienced Users

- Estimated Savings are based on assuming experienced users are running BRADD

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Inexperienced Users



- BRADD available for 4 years
- Little BRADD experience – OK
- Little Bridge Design experience - ~~OK~~



Inexperienced Users


- Question: (Young engineer)

“Should ‘chief bridge engineer’ warnings be expected?”




Inexperienced Users

- My reply. (Part 1)
- Chief Bridge Engineer Warnings are issued by both the LRFD Programs built into BRADD and by BRADD itself. The examples probably have numerous Chief Bridge Engineers Warnings.




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Inexperienced Users

- My reply. (Part 2)
- Your supervisor should be familiar with the LRFD programs and these warnings.





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Inexperienced Users

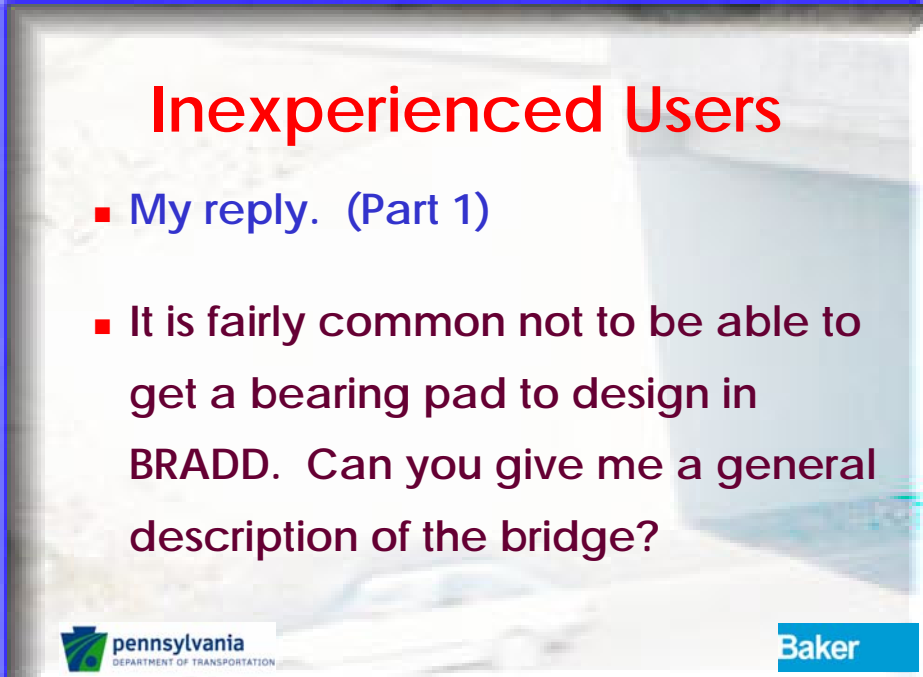
- Reply from assumed supervisor.
- *We have plenty of experience running the suite of PennDOT programs and we have never once seen this warning.*



Inexperienced Users


- Question received from a new Civil Engineer from a District Bridge Unit.
- I have a bridge that I cannot get the bearing pad designed in BRADD.




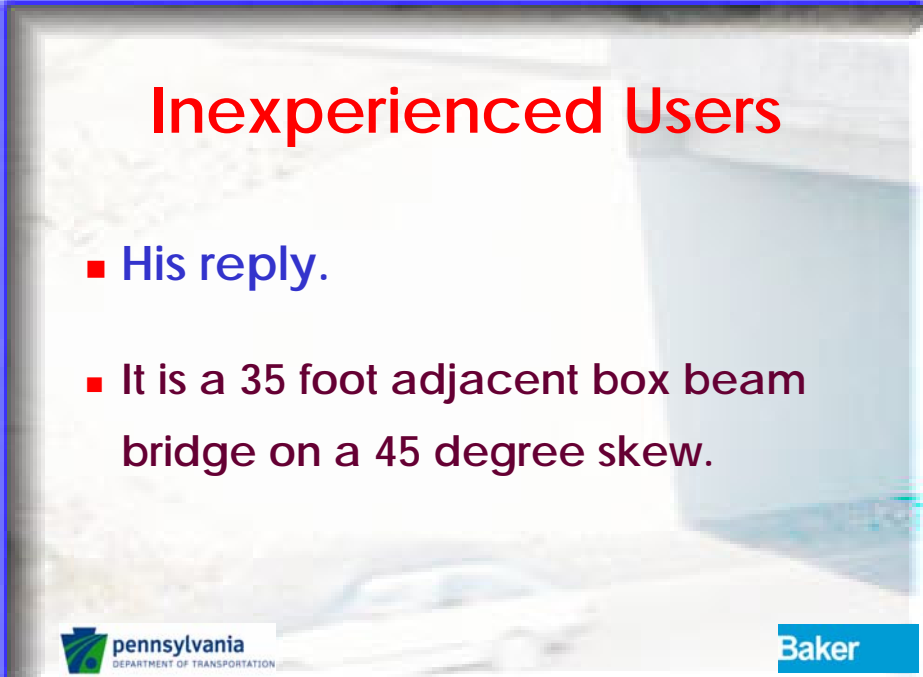


Inexperienced Users

- My reply. (Part 1)
- It is fairly common not to be able to get a bearing pad to design in BRADD. Can you give me a general description of the bridge?


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Inexperienced Users


- His reply.
- It is a 35 foot adjacent box beam bridge on a 45 degree skew.

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Inexperienced Users

- My reply. (Part 2)
- You will never get an expansion bearing pad designed for these conditions. Consider designing both bearings and abutments as fixed.



Inexperienced Users

- BRADD is a tool
- Experienced Bridge Engineers
- Supervised by Experienced Bridge Engineers
- Results need to be checked



Experienced Users

- BRADD is a tool



“I can’t use BRADD because...”

Experienced Users

“I can’t use BRADD because...”



- Multi span bridge
- Integral abutment bridge
- My bearings aren’t elastomeric
- BRADD doesn’t have my barrier
- Trusting the results
- It takes too long to learn

Experienced Users

“I can’t use BRADD because...”



- **Multi span bridge**
 - User defined superstructure option
 - User provides the superstructure loads
 - BRADD designs/drafts the abutments



Experienced Users

“I can’t use BRADD because...”



- **Integral Abutment (IA)**
 - BRADD doesn’t currently support IA
 - Consultant used BRADD super details for an IA bridge
 - BRADD not used fully, but did save time



Experienced Users

“I can’t use BRADD because...”



- **No Elastomeric Bearings**
 - BRADD only designs elastomeric bearings
 - User defined bearing option
 - Can be used for different bearings
 - Can be used and BPLRFD run outside of BRADD



Experienced Users

“I can’t use BRADD because...”


- **Different Barrier**
 - BRADD supports Typical, Alternate, & HT barriers
 - BRADD does not support the Type 10M barrier
 - Use BRADD to come up with the framing plan
 - Generates the PSLRFD,STLRFD input/output files
 - Deck elevations




Experienced Users

“I can’t use BRADD because...”

- **Can I trust the results?**
 - Great lengths are taken to verify BRADD
 - Results and drawings must still be checked
 - If designing by hand, one person runs the LRFD program, another checks
 - BRADD is no different




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Experienced Users

“I can’t use BRADD because...”

- **It takes too long to learn**
 - BRADD is very well documented
 - Majority of BRADD input mirrors LRFD programs
 - Laid out in a logical manner
 - Other consultants are using BRADD effectively



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Future of BRADD

- BRADD maintenance contract runs through Sept, 2010
- Approval and Funding for a New 5 Year Maintenance Contract




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Summary

- BRADD is a design & drafting tool
- Used for design/drafting single span bridges
- Other uses possible as you learn to use this tool



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Summary

- Bridge 101 Training
- BRADD Manager commitment

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Summary

- BRADD e-Notification
 - Provides updates
 - Automatic
 - Sent to your email address
 - Sign up on the BRADD Web site

<http://Bradd.engrprograms.com>

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QUESTIONS?

Thank you!

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