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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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 **Baker**



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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 **Baker**

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

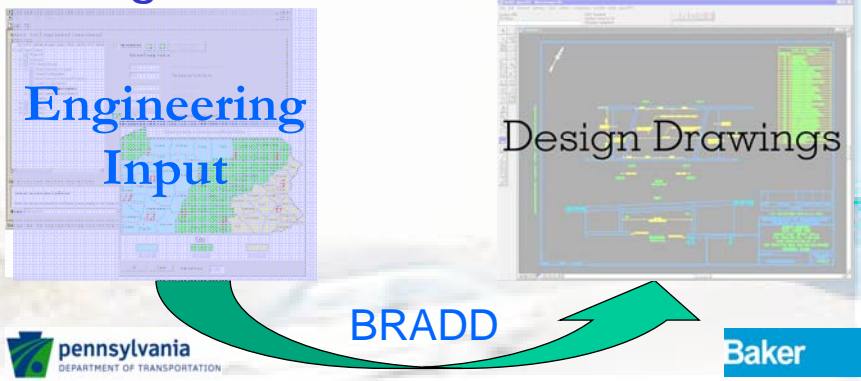


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What is BRADD?


- Automates production of scaled bridge contract drawings




Engineering Input

Design Drawings

BRADD



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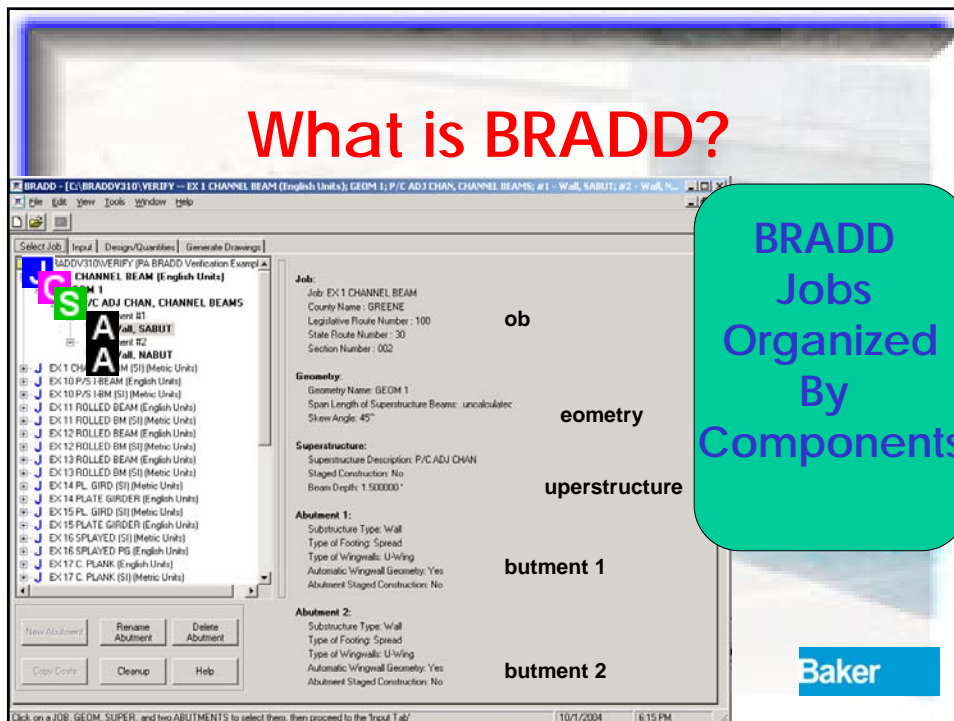
What is BRADD?

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






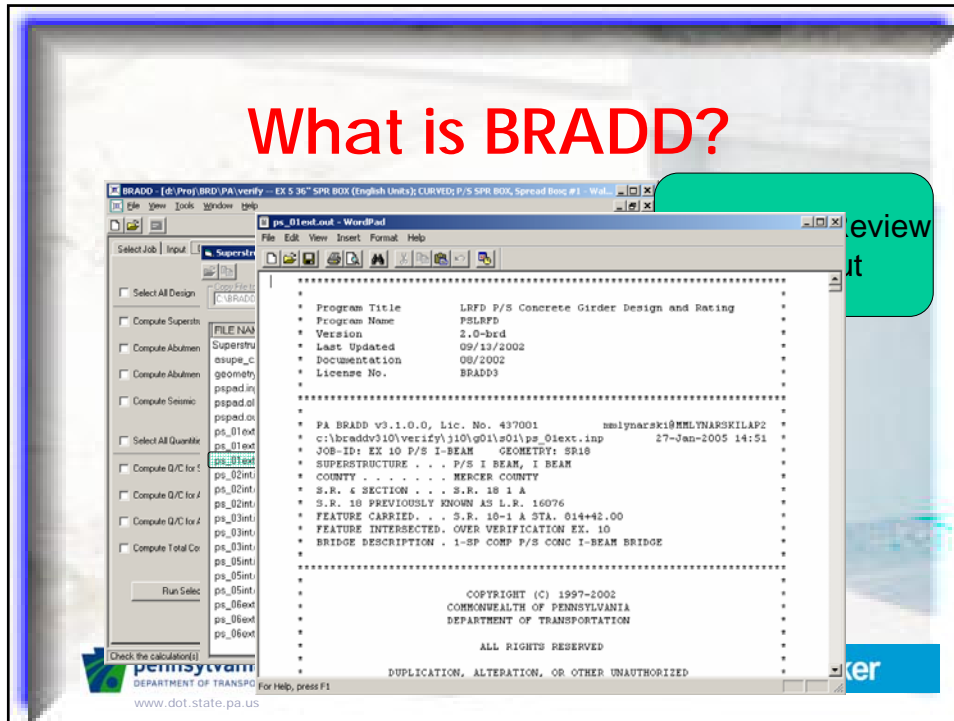

What is BRADD?



**BRADD
Jobs
Organized
By
Components**

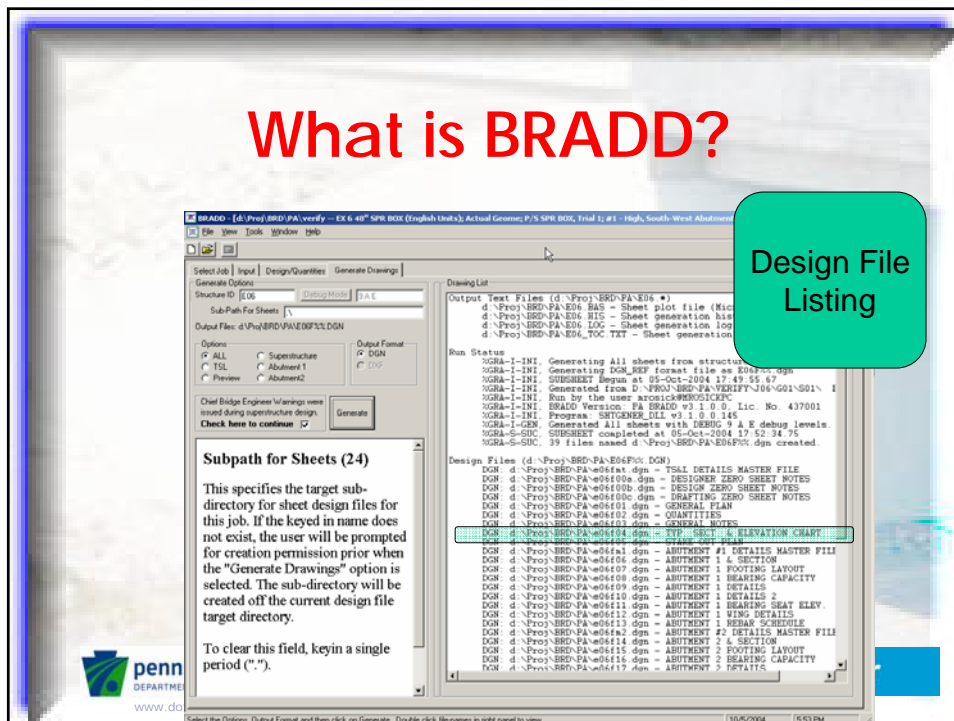


What is BRADD?

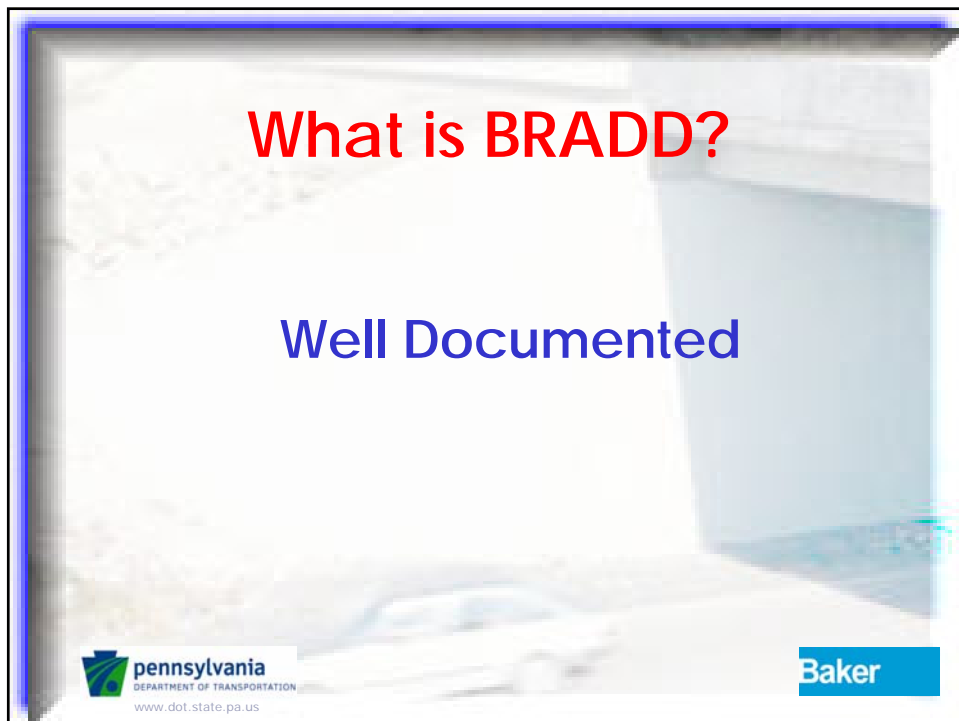
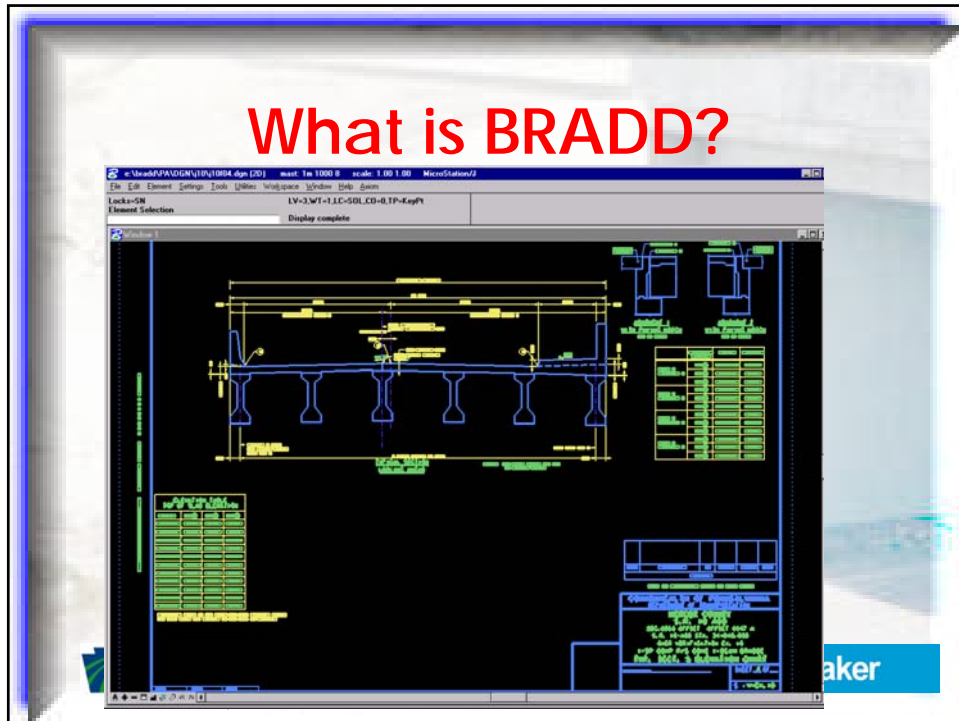


Review it

What is BRADD?




Design File Listing




Well Documented


What is BRADD?



Design Drawings

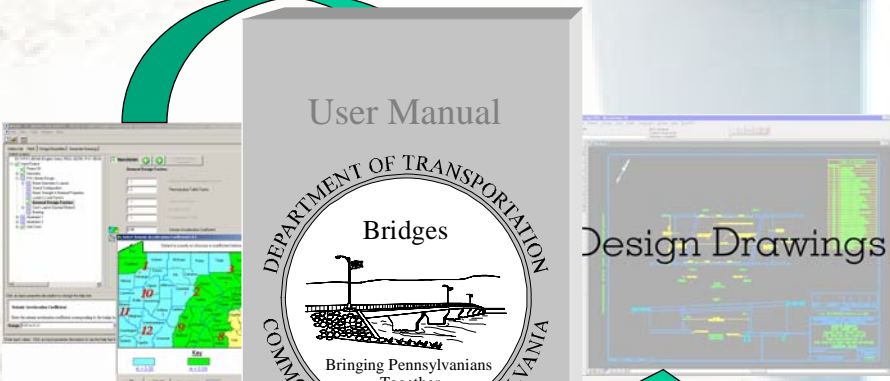


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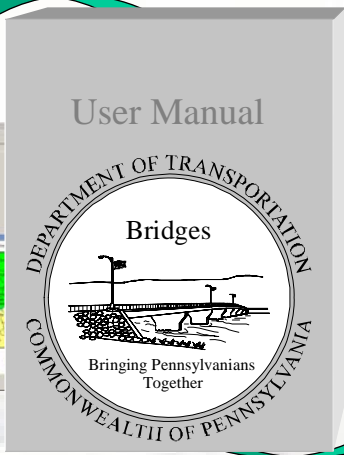


Well Documented


What is BRADD?



Design Drawings




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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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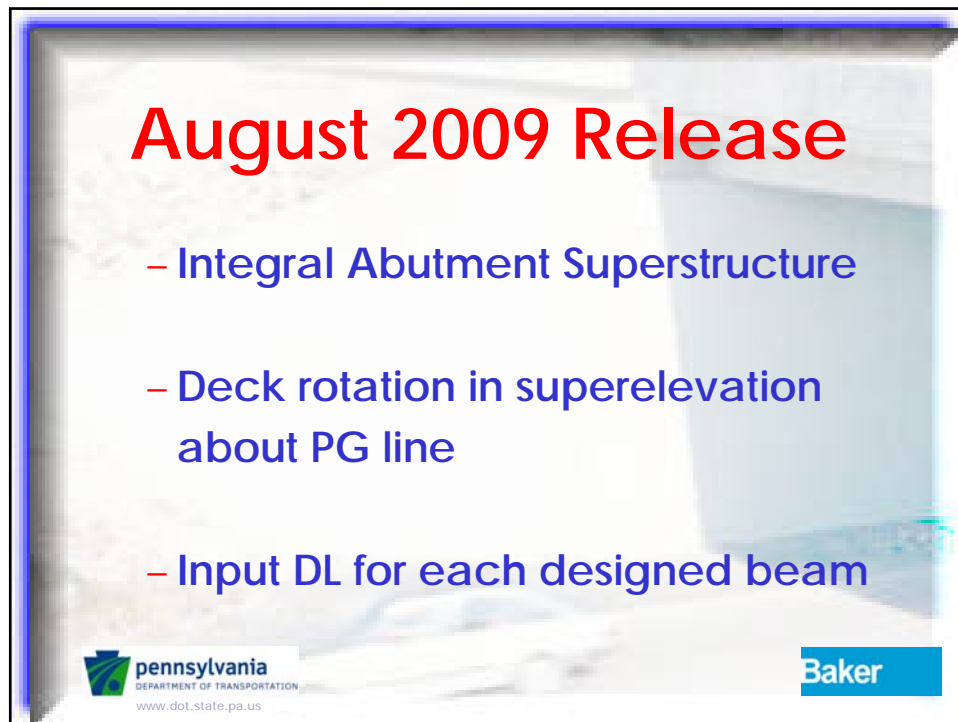
BRADD Version 3.1.3.0

- 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

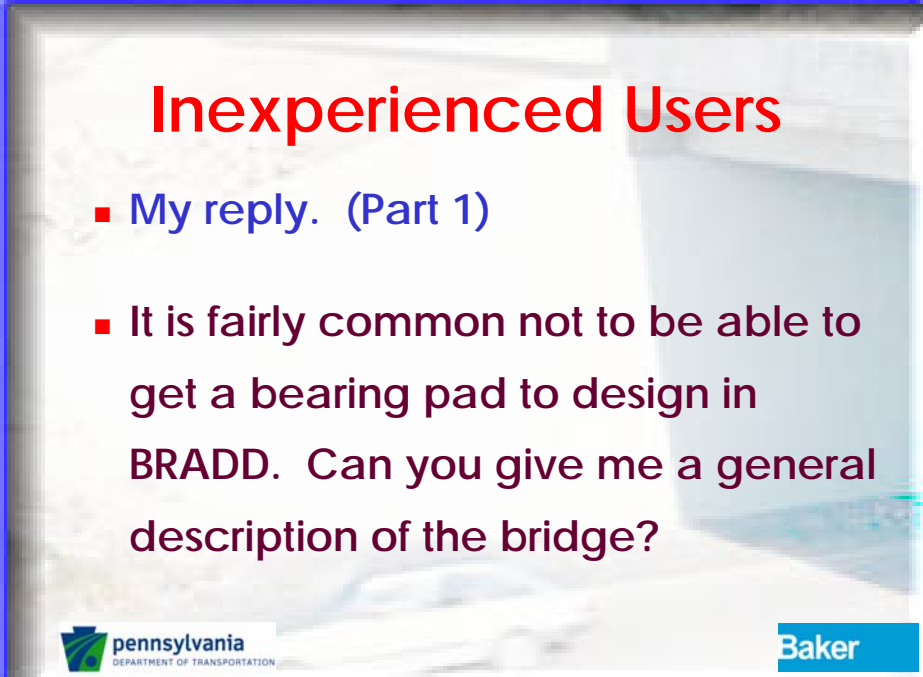
- Reply from assumed supervisor.
- *We have plenty of experience running the suite of PennDOT programs and we have never once seen this warning.*



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.

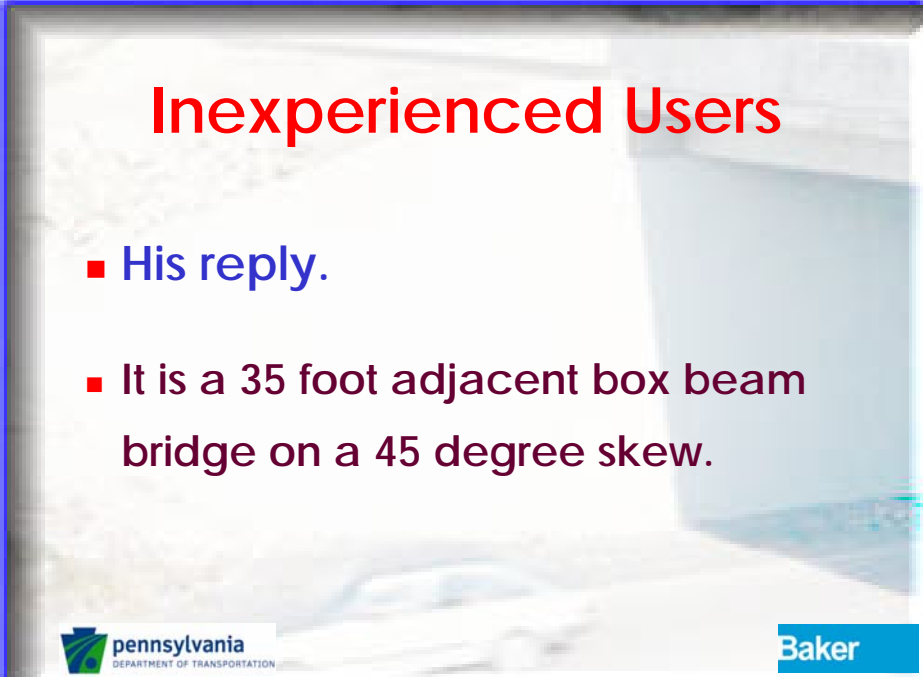




Inexperienced Users



- 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





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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




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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>

 www.dot.state.pa.us 

Contact Information:
717-787-7057
jafitzgera@state.pa.us
<http://Bradd.engrprograms.com>

QUESTIONS?

Thank you!

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