

## **TR-655**

### **Updating the Iowa Culvert Hydraulics and Iowa Bridge Backwater Software**

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#### **Introduction**

The Iowa Highway Research Board has previously funded the development of software used for the hydraulic design of culverts (Iowa Culvert Hydraulics: TR-447, TR-504) and estimation of the backwater due to bridges (Iowa Bridge Hydraulics Software: TR-476, TR-564). The first version of the culvert software was released in 2001 and the first version of the bridge software was released in 2003. The software is used by the Iowa Department of Transportation, Iowa County Engineering Offices and consultants.

#### **Outcomes**

##### **Iowa DOT Culvert Program and Iowa DOT Bridge Backwater Program**

Both software programs were originally written in Visual Basic 6.0. Visual Basic 6.0 is no longer supported by Microsoft and the language is no longer being updated nor service packs released to fix known problems. Although the current programs will run under Windows 7 there are sometimes problems with getting the programs installed and these problems may increase in the future. Future updates to the visual basic 6.0 code base for the software would not be able to take advantage of improvements in the Microsoft programming environment.

Both programs, the Iowa DOT Culvert Program and Iowa DOT Bridge Backwater Program, have been converted from visual basic 6.0 to Visual Basic.NET. Although both are called visual basic, Visual Basic.NET uses the .NET framework and other than some syntax similarities is really a completely different programming system than visual basic 6.0. The .NET framework is built into Windows 7 and newer and the software runs without problems on Windows 7, Windows 8 and Windows 10. Both of the new programs are designated as Version 3. The Version 3 software will also be easier to update and maintain in the future.

Both version 3 programs are backwards compatible with project files created with previous versions. The interface for both programs is similar to previous versions. Users of previous versions will find the new versions familiar and easy to use.

In version 3 programs, printed output can now be previewed, and sent to a pdf file if a non-hard copy output is desired.

##### **Iowa DOT Culvert Program**

Additions and updates to the Iowa DOT Culvert Program include:

The addition of Steel Pipe Arch with 3" by 1" or 5" by 1" corrugations as part of the IA DOT Standard Designs and General Culvert Design.

Added 35 new standard sizes and barrels for Reinforced Concrete Box culverts.

### **Iowa DOT Bridge Backwater Program**

Additions and updates to the Iowa DOT Bridge Backwater Program include:

Added a project title that is included on all print-outs.

Added a form that lists the limitations under which the software is applicable for bridge backwater calculations.

For more flexibility in analysis the user can now select or un-select the design Q values to be used for Backwater or Scour.