



CulvertMaster®

Culvert Hydraulic Analysis and Design

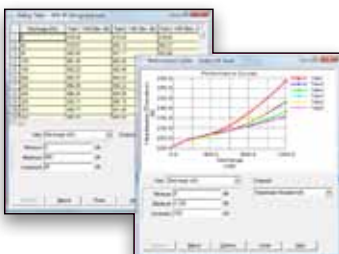
Bentley's CulvertMaster is an extremely powerful yet easy-to-use calculator product that helps engineers design new culverts and analyze existing culvert hydraulics. It can also be used to analyze everything from single-barrel crossings to complex embankment cross-drain systems, with different shapes and sizes, special tailwater considerations, and roadway overtopping considering watershed data, culvert characteristics, and even weir geometry.



Engineers can use 3 types of simulation for all phases of their projects.



Engineering libraries let users specify common parameters that can be shared across projects.



CulvertMaster's users can easily generate reports, calculate rating tables, and plot performance curves.

As Easy as ABC

Data entry and manipulation are flexible and straight forward: Users of CulvertMaster can simply enter data in clearly labeled fields with full context-sensitive help and click to calculate.

Design and analysis models can be navigated quickly, using tabbed dialog "worksheets" to edit watershed data, tailwater conditions, profile information, and more.

With CulvertMaster, engineers can conveniently organize all the designs and analyses for the same project within a single file.

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Comprehensive Analysis and Design

CulvertMaster offers three flexible simulation types that engineers can use for all phases of their projects:

- Quick Culvert Calculator -- for simple culverts with known characteristics. This simulation type allows users to plug in the data they know and solve for what they need. Its worksheet style dialog requires the minimum amount of descriptive input information to solve for discharge, headwater elevation, or culvert size.
- Culvert Analyzer -- for more complex systems with multiple barrels, different shapes and sizes, special tailwater considerations, and roadway overtopping. Engineers would typically use this simulation type to: verify the hydraulic performance of existing culverts; analyze complex situations such as main-stream culverts working in combination with

relief culverts in overbank areas; perform road overtopping analysis of existing culverts or new designs; or, supplement existing culvert structures to correct inadequate capacities resulting from urbanizing watersheds or undersized cross-drain conditions.

- Culvert Designer -- allows engineers to compare several proposed options, incorporate these design trials into complex hydraulic analyses, and evaluate the results. In this design mode, engineers would create individual culvert trials and solve for: size of a culvert of a specified shape, material, and roughness to pass the design discharge under design elevation headwater conditions; discharge for a specific culvert under design elevation headwater; or, headwater elevation for a specific culvert under design discharge conditions.

Hydraulics and Hydrology

CulvertMaster computations use the widely accepted US Federal Highway Administration's Hydraulic Design of Highway Culverts (HDS-5) methodologies, allowing users to solve for whatever hydraulic variables they don't know, such as culvert size, peak discharge, and headwater elevation.

Flow calculations handle pressure and varied flow situations such as backwater and drawdown curves. Design discharge can be calculated using either the Rational or SCS peak discharge method. Rainfall information is calculated using rainfall tables, equations, or the National Weather Services' Hydro-35 data. CulvertMaster also plots Intensity-Duration-Frequency (IDF) curves from rainfall data. Users can reuse this data for all projects in that region.

System Requirements

Processor:

As per minimum operating system requirements

Operating System:

Windows 7, Windows Vista, Windows XP, and Windows Server 2003

Memory:

As per minimum operating system requirements

Hard Disk:

150 MB of free storage space (with additional room for data files)

Display:

800 x 600 resolution, 256 colors

Find out about Bentley at: www.bentley.com

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CulvertMaster At-A-Glance

Interface, Editing, and Model Management

- Built-in interactive tutorials
- Worksheet list (for convenient display of projects' content)
- Project setup wizard
- Engineering libraries (materials, section sizes, and culvert inlets)
- Rainfall data specified using a rainfall table or a rainfall equation
- Global engineering -units management
- Support for ProjectWise

Hydraulics

- HDS-5 methodology
- Pressure or partial (free surface) flow conditions

- Gradually varied flow algorithm
- Flow profile methods: drawdown and backwater analysis
- Culvert section shapes: box, circular, arch, horizontal and vertical ellipse
- Outlet channel sections: rectangular, triangular, trapezoidal and irregular shapes
- Roadway or broad-crested weir (to check overtopping conditions)

Hydrology

- Watershed area calculation: calculation of total area and weighted runoff coefficient, based on an unlimited number of watershed sub-areas and corresponding runoff coefficients entered in CulvertMaster.

- Peak flow method: Rational Method, SCS Graphical Peak Method, user-defined peak flow rate.
- Rainfall data input: Intensity-Duration-Frequency (IDF) equations, IDF tables, Hydro-35

Results Presentation

- Summarized and detailed reports of inputs and outputs
- Rating tables
- Performance curves (single or multiple elements)