MXROAD

Proven Technology for Designing and Sustaining Transportation Infrastructure

Powered by OpenRoads Technology
www.bentley.com/OpenRoads

Bentley

At-A-Glance Features and Functions

Built-in CAD Capabilities

- Create and edit CAD elements
- Read, write, and reference DGN and DWG files
- Utilize unlimited number of reference files
- Apply digital signatures using industry-standard encryption
- Secure digital rights definition for reviewing, printing, and editing
- Supports multiple raster formats
- Supports PostScript and HPGL2/RTL printing
- Use AccuDraw® and AccuSnap™ tools
- Track annotation

Integrated Mapping

- Provides data interoperability
- Browse and analyze data
- Map thematically
- Generate reports

Survey/Data Acquisition

- Read/write standard data formats automatically for:
  - » Raw survey data from all major survey equipment; 2D/3D CAD graphics; ASCII/text data; LndXML; LiDAR data: ASCII and LAS; USGS Digital Elevation Models; Photogrammetric data; Raster Files; Contour Maps
- Reduce survey data
- Support custom feature coding
- Attach multimedia files such as photo, movie, and audio to any point or linear feature
- Includes Least Squares adjustments
- Edit survey data graphically and dynamically
- Import and analyze point-cloud data
- Edit survey field book data graphically
- Change instrument setup with automatic updating
- Add, modify, or delete points and linear features
- Change codes and styles
- Upload to data collectors for construction stakeout

Terrain Model Creation

- Import ASCII/text data; 3D graphical data; standard data formats; point-cloud data; LandML files, LiDAR data; USGS Digital Elevation Model data; aerial data; and raster files
- Maintain relationships to source data with complex terrain models
- Ensure intelligent models with terrain model stored as a DGN element
- Ensure correct entry with undo/redo capabilities
- Use across disciplines via reference files
- Customize and standardize displays via element templates
- Control density of points on linear features for optimal surface presentation

Terrain Model Analysis/Editing

- Create intelligent 3D models
- Model intelligent civil features for ditches, curbs, trees, culverts, etc.
- Pass survey intelligence to 3D model
- Edit context-sensitive intelligent features
- Extend, trim, and intersect features
- Insert, move, and delete vertices
- Delete, partially delete, break, or join features
- Support boundaries, voids, break lines, inferred break lines, and random points
- Control density of points on linear features for optimal surface presentation

Triangulation Analysis

- Generate contours from data points accounting for breaks, random points, voids, edges, and other criteria
- Control density of points on linear features for optimal surface presentation
- Display cut-and-fill delineation
- View and edit feature properties
- Color code display by triangles, slopes, elevation, and aspect
- View slope vectors
- Generate grade contour
- Display isopack

Modeling

- Model multiple scenarios
- Edit design parametrically visually
- Create models automatically
- Generate material assignments automatically
- Preserve designer's intent
- Ensure correct entry with undo/redo capabilities
- Utilize 2D/3D integration
- Use –rule-based superelevation
- Use enhanced clipping and point controls
- Target graphical elements
- Utilize dynamic cross sections
- Create reports dynamically
- Generate plan ready cross sections
- Control component display via rules
- Utilize WYSIWYG features – control display of cross by simply turning on/off reference files
- Adheres to regional standards

DGN-based Geometry and Models

- Integrate data with MicroStation and ProjectWise
- Works across references files
- Include other engineering data (e.g. drainage) as referencing it to the DGN model

Interactive Coordinate Geometry

- Use robust, interactive geometry tools
- Create, edit, move, and delete geometry
- Supports common geometric constructions
- Traverse: angle, direction, and curve
- Angle resection
- Parallel by element or station range
- Display inverse
- Create right-of-way, lot layout, and cul-de-sac
- Generate geometric transformations
- Create reports in variety of formats
- Monitor geometry errors and warnings in civil message center

Geometric Design

- Store rules and relationships between geometric elements
- Create horizontal/vertical by PI method or elements
- Create circular and parabolic vertical curves
- Support complex geometry: SCSCS, SCCS, etc.
- Support tangential and non-tangential curves
- Edit elements associatively and dynamically
- Define curves by radius, degree of curvature, and pass-through points
- Edit, delete, and join elements
- Support delta angles greater than 180°
- Check geometry integrity tool
- Annotate alignments, stations, and COGO
- Review and report geometry
- Annotate dynamically and automatically
- Perform design checks dynamically or in batch processes
- Display 3D geometry
- Adheres to regional standards

Profiles and Cross Sections

- Create/generate cross sections and profiles along alignments, graphics, or between points
- Include drainage structures and utilities
- Include vertical alignments and existing and proposed surfaces
- Apply user-defined annotation
- Cut cross sections orthogonally or at skew
- Create custom cross sections
- Update cross sections and profiles
- Generate earthwork volumes

Typical Sections/Template Libraries

- Include components, end conditions, and features
- Create components as roadway elements such as lanes, curbs, walls, ditches, barriers
- Define parametric components graphically
- Apply constraints to components
- Place component points as free, partially constrained, or fully constrained
- Set constraints as horizontal, vertical, sloped, projected, vectors, offsets, elevations, etc.
- Constrain end conditions partially or fully
- Set end conditions to trace existing surfaces such as rock
- Drag-and-drop assembly of templates from components and end conditions
- Perform graphical tests to verify design

Corridor Modeling

- Blend horizontal and vertical geometry with 3D topography and typical sections
- Assign component control points to existing or designed features and geometry, controlling horizontal and/or vertical location
- Assign automatic overrides
- View plan, profile, and cross section interactively
- Provides heads-up dynamic, interactive parametric design
- Manage one or multiple corridors for designs
- Transition between disparate templates
- Apply superelevation text tables, customizable calculations or AASHTO standards
- Allows dynamic editing of superelevation
- Apply exceptions for bridges, voids, and special end conditions
- Edit stations dynamically
- Assists problem resolution through intelligent color coding of transitions, super runout, etc.
- Reflect edits automatically in quantities and volumes

Drainage Layout and Design

- 3D modeling
  - » Create 3D drainage model relative to topography and alignments
  - » Place multiple drainage structures along alignments by spacing and offsets
  - » Support interconnected network of pipes, curved pipes, channels, culverts, manholes, pumps, catch basins, and inlets
  - » Creates associative and dynamic model-based designs
  - » Apply any material and coefficient of roughness
  - » Identify graphics as utilities and drape relative to DTM
  - » Display all network and utility objects in profiles
  - » Display as 3D models for clash detection
  - » Label all attributions in any view or include in user-defined reports
  - » Draw 3D models of drainage structures to full 3D shapes for easy clash detection
- Analyze and design using tools based on the U.K. Wallingford Procedure, standard Rational Method, Hydrograph Method in accordance with ARR, culvert design to FHWA HDS 5
  - » Compute ToC from 3D model or specify
  - » Analyze and design inlet and gully capacities to HEC 22, UKHA-102 and user-defined tables
  - » Position inlets and gullies automatically relative to allowable flow width and capacity, or manually place and check
  - » Use automated pipe quantity take-off in accordance with the UK MMHW and CESMM
  - » Verify design automatically with built-in tools provides that highlight possible anomalies
  - » Work with any or all of plan, profile, section, or perspective with design check and properties views open
  - » Compute storm scenarios
  - » View the effect of flood flows on the ground model
  - » Generate computation reports from design and analysis for inclusion in project notebook

Quantity Management

- Automate quantity take-offs for estimating
- Link design to a master pay item list
- Report quantities by entire project or delineate by sheets, stations, area, or phase
- Delivers more than 60 formulas
- Report on design features and graphic elements
- Generate linear, area, and volume quantities
- Integrate non-graphic (mobilization, etc.) quantities
- Apply funding splits and payer rules to quantities
- Choose from more than 30 sample reports delivered (includes CSV, HTML, TST, and PDF)
- Modify sample reports or create custom reports through XML style sheets

Contract Deliverables

- Automate project delivery process with drafting and plan preparation tools
- Extract sections, drawings, and reports directly from completed 3D model
- Automate sheet generation for plans, profiles, and cross sections
- Select from more than 550 included report formats
- Provide standard reports for superelevation, clearances, data collection, geometry, sections, DTM, design, visibility, and more
- Select end area volume options for separate materials, unsuitable materials, as-builts, and more

Publishing

- Export alignments, surfaces and other pertinent design information to other systems via XML
- Generate PDFs and 3D PDFs
- Plot directly from MXROAD
- Integrate with Google Earth™
- Supports i-model creation

Integration with Bentley Content Management and Publishing Solutions

- Component-level integration with ProjectWise® for collaborative design and engineering project management
- Integration with ProjectWise® InterPlot® for automated plot set generation and web-based access to plot archives
- Integration with Bentley® Navigator for design review, construction simulation, or automated clash resolution

Visualization

- Walk through interactively or along a defined path
- Design process produces dynamic 3D models as a by-product
- Visualize paths through the project relative to design control by offsets and vehicle speeds
- Predefine materials for standard components enabling realistic rendering
- Position sun for geographically defined locations to ensure realistic shadow patterns
- Animate vehicles in traffic lanes without additional software
- Populate 3D objects along linear paths and within designated areas
- Apply traffic paint striping plans to the 3D model
- Use sample vehicle library and plantings

Bentley® Sustaining Infrastructure