

OpenRoads Designer CONNECT Edition

Construction-driven design

Extremely versatile, OpenRoads Designer is used for all types and phases of civil projects, large and small, by users at every level of expertise. The application integrates every aspect of the civil project, from corridor studies to final design and production of construction deliverables. It handles a wide variety of complex tasks such as interchange design, roundabout design, site development, sanitary and stormwater network design, and production of construction staking reports. To ensure success, OpenRoads Designer provides a comprehensive set of functionalities to meet all corridor modeling, surveying, drainage, and subsurface utilities needs to help accelerate project delivery of road networks.

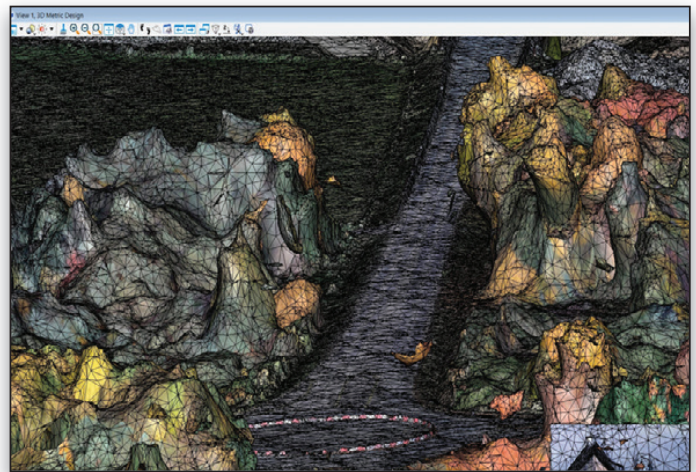
Designing in Reality Context

An all-in-one solution, OpenRoads Designer excels at data acquisition enabling users to consume multiple data types to effectively understand site and existing conditions. From photogrammetry and total station surveys to GPS LiDAR and point clouds, the application can upload, analyze, and manipulate field data, while ensuring the provenance of the original data. In addition, users can rapidly capture the “as-built” condition of an existing site or asset using Bentley’s ContextCapture to quickly produce 3D models from photographs. OpenRoads Designer incorporates reality meshes to provide continuous context of real-world conditions throughout the entire design and construction lifecycle.

Rapidly Model Design Intent

OpenRoads Designer’s design intent capabilities enable users to build associations and relationships between civil elements to ensure the design project is reflective of engineering intent. Object information (how, where, and by what method it was created) is stored with each object to ensure the original intent is retained in the design. If an element is modified, any related elements are automatically updated based on these stored relationships. This process helps designers create intelligent models to capture, store, and impart design intent to the model, increasing efficiency.

OpenRoads Designer continues to push design boundaries with its unique civil cells – flexible, reusable design elements that can be as simple or complex as required. With civil cells, users can preconfigure commonly used 2D and 3D geometric layouts while maintaining all design, constraint, and relational intelligence. Civil cells can then be repeatedly used in designs ensuring standards are implemented, while accelerating design production. OpenRoads Designer also leverages Catalog Services to manage and deliver Functional Components, enabling rapid and consistent parametric design across the engineering workgroup.



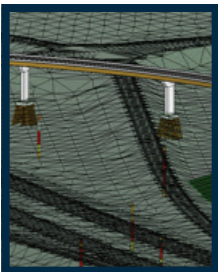
OpenRoads Designer includes reality modeling tools to incorporate and edit all reality modeling data types, including the capability to extract ground-level features from reality meshes and LiDAR, as well as to reference point clouds and imagery.

Integrate Multiple Disciplines

OpenRoads Designer CONNECT Edition provides a comprehensive modeling environment for the project delivery of road networks, unifying design and construction from concept through construction. Users can easily integrate data from different disciplines to improve collaboration and ensure the latest model is used in all phases of the design. Working in the live model reduces risk by utilizing the data interactively and working among bridge, drainage, road design, geotechnical and other design teams to help identify conflicts earlier in the process and eliminate construction errors and delays. Visibility into the design helps ensure that a proposed drainage network doesn’t conflict with existing utilities, or the foot of a bridge pier doesn’t conflict with the subgrade drainage or the roadway. Employing a comprehensive modeling environment allows users to share data that is relevant to the project and to enrich project understanding, identify potential risk, and make better engineering decisions in the design phase.

Adapt to Change

Bentley understands the demands on engineers and designers to produce models that provide information beyond documentation and construction, into operations, maintenance, and rehabilitation – and back to design if necessary. Using a model-centric approach, designs are dynamically updated throughout



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the model, guaranteeing that the current design is readily available for all team members. A federated modeling approach enables users to make better-informed decisions earlier in the design process with more complete conceptual designs; eliminate errors and omissions in the documentation process by having fully synchronized documentation from the model; explore and analyze many options to maximize the performance of the asset in the real world; and to reuse information to improve construction and operations of the asset.

Improve Project Deliverables

OpenRoads Designer automates the production of a complete array of design deliverables. The application enables engineers and designers to work faster, smarter, and more efficiently to help accelerate project delivery with capabilities such as civil cells, design constraints and relationships, design-time visualization, and dynamic model updates. Because workflows can vary widely depending on the scope of the project, OpenRoads Designer offers users the flexibility to work in ways that best suit their specific needs. The application is fully configurable, enabling users to customize the OpenRoads Designer environment to meet project standards or personal preferences. The result is better quality, consistent documentation in less time, without headaches.

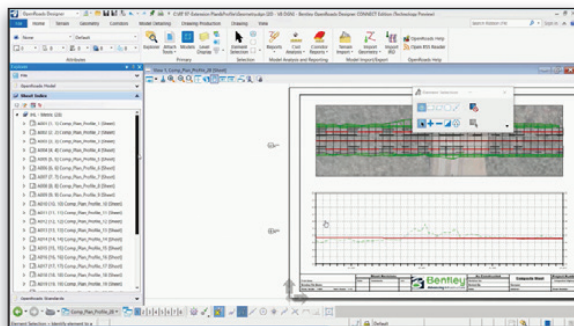
In addition, its capability to instantaneously synchronize the model and the representative drawings simplifies and automates the drawing composition process. Since all deliverables adhere to the same project standards and come from the same model, the result is high-quality documentation in which the entire project team can be confident. OpenRoads Designer provides design, volume, and cross section data in XML industry-standard format for data exchange. Project data can be used in multiple formats, including Excel spreadsheets, HTML or text files, PDFs, printable documents,

and other output. Reporting capabilities automate the production of a variety of standard reports, including horizontal and vertical alignments, quantity takeoffs, clearance reports, stakeout, legal descriptions, surfaces, and more. OpenRoads Designer provides full support to create legal descriptions. The application outputs standard formats for Trimble, Topcon, and Leica for machine-controlled grading and machine guidance.

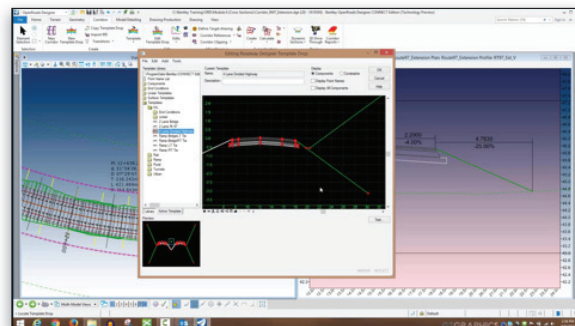
Visualizing Designs

Experience designs in real time with OpenRoads Designer constraint-driven templates, context sensitive, intuitive interface, and dynamic 3D modeling. Visualize the design at any time and on demand within the modeling workflow. No translations, application, or special workflow process are needed. Users can virtually drive through the 3D corridor model and visually inspect it for any design deficiencies or physical conflicts. In 3D QA, engineers can fully view road features from all angles to identify gaps or misalignments, look for utility conflicts, and check clearances. They can also visually evaluate sight distance, pavement marking, and signing as well as try out multiple aesthetic treatments to reach the desired result. Using OpenRoads Designer rendering features – for example, color fill, shading, lighting, and backgrounds – improves the design at any phase and adds a level of assurance in project constructability.

OpenRoads Designer seamlessly integrates with Bentley LumenRT to animate infrastructure models with elements in motion such as simulated traffic using vehicles of all types, moving people, wind-swept plants, breeze-animated and seasonal trees, rolling clouds, ripping water, and much more. You can create high-impact visuals and animations to effectively communicate the project to stakeholders for project approvals.

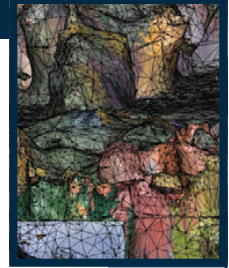


OpenRoads Designer provides automated production of high-quality drawings, including multidiscipline documentation sets, which are consistent across the entire project. Get a live view of the project in sheet orientation. As the design changes, so will the sheets.



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OpenRoads Designer CONNECT Edition At-A-Glance

Integrated CAD Capabilities

- Integrate data with MicroStation®, ProjectWise®, OpenBridge Modeler®, AECOSim Building Designer, and other Bentley applications
- Support for managed workspaces
- Works across references files
- Include other engineering data (e.g. drainage) as referencing it to the DGN model
- Utilize an unlimited number of federated reference files
- Create and edit CAD elements
- Read and write to DGN and DWG files
- Supports design history
- 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™ navigation tools
- Track annotation

Reality Modeling

- Read/write standard data formats for:
 - » 2D/3D CAD graphics
 - » ASCII/text data
 - » LandXML
 - » LiDAR data: ASCII and LAS
 - » USGS digital elevation models
 - » Photogrammetric data
 - » Raster files
 - » Contour maps
- Import and analyze point-cloud data
- Merge surfaces automatically
- Update surface data dynamically

Terrain Modeling

- Create intelligent, data-rich terrain models
- No need for secondary terrain analysis to represent the terrain display. Includes context sensitive resymbolization for triangles, contours, linear features, slope vectors, color code for slopes, elevation banding, and aspect
- Create terrain models from a variety of import sources
 - » Reality models
 - » 3D graphical data automatically using graphical filters
 - » ASCII/text data
 - » Legacy data formats of InRoads®, GEOPAK, and MX®
 - » Point clouds
 - » LandXML MX
 - » LiDAR data: ASCII and LAS
 - » USGS digital elevation model data
 - » Aerial data
 - » Raster files
- Ensure live, federated, and intelligent terrain models when stored as a DGN element
- Maintain terrain models through the preservation of relationships to source data
- Ensure correct entry with undo/redo capabilities
- Standardize displays via element templates
- Use across multiple disciplines via reference files in a comprehensive modeling environment
- Resymbolization of display across multiple disciplines using a comprehensive modeling environment
- Control maximum length of triangles

- Control boundary conditions
- Create complex and clipped terrain models
- Interrogate the intelligent data rich 3D models
- Support for different features types including but not limited to boundaries, holes, voids, breaklines, inferred breaklines, and random points
- Model intelligent 3D real-world civil features (ditches, curbs, trees, and culverts)
- Context-sensitive intelligent editing of features
- Dynamic editing for
 - » Extend, trim, and intersect features
 - » Insert, move, and delete vertices
 - » Delete, partially delete, break, or join features
- Manage large LiDAR datasets
- Exclude non-DTM features from triangulation
- Control density of points on linear features for optimal surface presentation
- Display cut-and-fill delineation
- View and edit feature properties
- Contour smoothing
- Major, minor, and depression contours
- Automatic and manual contour labelling

Modeling

- Model multiple design scenarios
- Edit designs dynamically
- Automatic model updates driven by design intent
- Design time visualization with automatic material assignments
- Undo/redo capabilities
- Interactively interrogate federated 3D models with dynamic cross sections
- Manage 2D/3D models and display representation
- Rule-based superelevation control of the model
- Use enhanced clipping and point controls
- Integrate and utilize CAD graphical elements in the model
- Create model reports dynamically
- Generate plan ready cross sections
- Utilize WYSIWYG features – control display of cross sections by simply turning on/off reference files
- Adheres to design standards for AASHTO and other regional standards

Dynamic Geometric Design

- Interactive geometry capabilities
- Enhanced integration with AccuDraw® and AccuSnap™ through CivilAccudraw
- Multiple vertical geometries supported per alignment
- Create right-of-way, lot layout, and cul-de-sac
- Design time standards input and feedback with errors and warnings in Civil Message Center
- Store rules and relationships between geometric elements
- Create horizontal/vertical by PI method or by elements
- Create circular and parabolic vertical curves
- Create arc and chord horizontal curves
- Support for multiple spiral definitions including clothoid, blossom, cosine, sinusoid, biquadratic parabola
- 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°
- Annotate alignments and points with object attribution, geometric properties, stationing, dynamically and automatically
- Additional annotation capabilities for one-off object labeling
- Review and report geometry in variety of customizable formats
- Perform design checks dynamically or in batch processes
- Display 3D geometry

Template Libraries

- Support for surface and linear templates
- Include components, end conditions, and features
- Create components for real-world objects such as lanes, curbs, walls, ditches, and 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, and elevations
- 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

- Edit designs dynamically
- 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, 3D model, profile, and cross section interactively
- Provides heads-up dynamic, interactive parametric design
- Level of detail user definable output
- Surface priority definable by target aliasing
- Transition among disparate templates
- Apply exceptions for bridges, voids, and special end conditions
- Clip model capability
- Edit stations dynamically
- Apply superelevation text tables, customizable calculations or AASHTO standards
- Allows dynamic editing of superelevation
- Assists problem resolution through intelligent color coding of transitions, and super runoff
- Component meshes provide direct volumetrics from the 3D model based on level of detail
- Reflect edits automatically in quantities and volumes
- Control component display via rules

Subsurface Utilities

- 3D modeling
- Create 3D utility model relative to topography and alignments
- Support interconnected network of pipes, curved pipes, channels, culverts, manholes, pumps, catch basins, and inlets

System Requirements

Processor

Intel® Pentium®-based or AMD Athlon®-based processor 2.0 GHz or greater.

Operating System

Microsoft Windows 10, Windows 10 x64, Windows 8, Windows 8 x64, Windows 7, Windows 7 x64, Note: Windows 7 operating system is supported only with its service pack (SP1) installed.

Memory

8 GB minimum, 16 GB recommended (More memory typically results in better performance.)

Disk Space

9 GB minimum free disk space (which includes the 5.6 GB install footprint for a complete installation)

Input Device

Mouse or digitizing tablet (Digitizing tablet requires vendor-supplied WIN-TAB driver or Bentley's Digitizer Tablet interface, the latter included with OpenRoads Designer installation.)

Find out about Bentley at: www.bentley.com

Contact Bentley

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Global Office Listings

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OpenRoads Designer CONNECT Edition At-A-Glance

- Create associative and dynamic model-based designs
 - Create storm, sanitary, or combined hydraulic networks
 - Build utility models directly from survey data
 - Identify graphics as utilities and drape relative to DTM
 - Display all network and utility objects in sections and profiles
 - Display as realistic 3D models for effective collaboration
 - Identify conflicts among utility elements as well as among utilities and other 3D data
 - Label all attributions in any view or include in user-defined reports
 - Create user-defined attributes for any required data
 - Draw 3D models of utility structures as full 3D shapes for easy clash detection
 - Hydraulic design and analysis
 - Analyze and design using industry-standard theorems such as Mannings, Colebrook-White, Bernoulli, and continuity equations
 - Analyze and design based upon HEC 22, FHWA, HDS 5, 10, 13, Rational Method, Wallingford Procedure, and regression equations
 - Analyze and design using steady state gradually varied flow, and run simulations using unsteady state time-varying flow
 - Compute Tc using methods such as TR-55, HEC-22, and Kinematic Wave
 - Compute losses using methods such as SCS CN, Green and Ampt, Horton, Initial and Constant Rate
 - Compute runoff using methods such as Rational, Modified Rational, ILSAX, SCS, and Unit Hydrograph
 - Use demand and demographic tables
 - Supports infiltration, population, peaking factors, and land usage
 - Compute or specify flows
 - Define custom intensity-duration-frequency tables
 - Generate drainage queries and customized reports
 - Color code based upon queries or styles
 - Calculate pond volumes
 - Create input and output hydrographs
 - Design inlet and outlet control structures
 - Use PondMaker for inflow/storage/outflow optimization
 - Generate linear, area, and volume quantities
 - Modify sample reports or create custom reports through XML style sheets
 - ODBC link capable for fully customizable reporting
 - Visualization
 - Walk / drive through interactively or along a defined path or corridor
 - Visualize paths through the project relative to design control by offsets and vehicle speeds
 - Predefined materials applied to components enabling realistic rendering
 - Position sun for geographically defined locations to ensure realistic shadow patterns
 - Animate vehicles in traffic lanes without additional application
 - 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
 - Image draping on DTM or 3D objects
 - MicroStation®-based rendering
 - Real-life textures
 - Lighting effects
 - Elevation and perspectives
 - Creation of fly-throughs and animations
 - Creation of 3D PDFs
 - Support for engineering data, point cloud, reality meshes
 - Seamless integration with Bentley LumenRT for real-time, immersive presentations
 - Solar and shading analysis
 - 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
 - Geotechnical integration
 - Directly interface with gINT® database
 - Visualize and annotate borings in 2D
 - Visualize and annotate borings with separate strata in 3D
 - Create subsurface terrains from boring data
- ### Reality Modeling
- Reality mesh support
 - Display of very large, photo-textured reality meshes produced using ContextCapture
 - Editing of meshes (remove facets, fill holes)
 - Automatic ground extraction
 - Breakline extraction
 - Efficient 3D modeling using sections and templates
 - Mesh classification to enrich mesh with data from many sources
 - Orthoimage extraction on any axis
 - Generation and manipulation of cross sections
 - Production of 3D PDFs and i-models
- ### Point-cloud Processing
- Fast display and visualization of billions of points
 - Drape and snap elements
 - Classification editing
 - Smart Snap
 - Batch tile export
 - Pointools, POD, LAS, and XYZ file export
 - Extraction of planar and cylindrical elements
 - Linear feature extraction
 - Recolor points for flexible presentation
 - Class management for any type of presentation style
 - Definition of custom classes
 - Point-cloud colorization from orthophotos
 - Clip and section manager
 - Support of geographic coordinate systems
- ### Scalable Terrain Modeling
- Creation of scalable terrain models (STMs)
 - High-performance display of very large digital terrain models (DTMs)
 - Display modes for smooth shading, smooth shading with shadows, aspect angle, elevation, slope, contours
 - High-resolution image draping on STM
 - STM update and synchronization with DGN files, civil DTMs, point-cloud data, and XYZ files
 - Calculate view shed from point or path
- ### Raster Data Interoperability
- ECW (unlimited), PDF, IMG, JPEG 2000, BIL, DOQ, FLI, SPOT CAP, and Digital Image Map
 - TIFF (1-to 32-bit), GEOTIFF, ITIFF, COT, CIT, RLE, CALS, PCX, IMG, BUM, TG4, INT, RGB, TGA, JPEG, RLC, RS, HMR, BMP, and IKONOS 3 (Red), and 4 (NIR) bands from GeoEye
 - Compression schemes: Deflate, Pack-Bits, CCITT3, CCITT4
 - Support for lossless compression formats: ECW, MrSID, and JPEG 2000
- ### Contract Deliverables
- Live documentation capable
 - Automate project delivery process with drafting and drawing preparation capabilities
 - User definable annotation capabilities for plan, profile, and section labelling
 - 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
 - Modify included reports easily in any text or XML editor
 - Provide standard reports for bridges, superelevation, clearances, data collection, geometry, sections, DTM, legal descriptions, design, visibility, and more
 - Compute volumes by surface to surface (triangulated surface comparison)
 - Compute volumes by 3D objects
- ### Publishing
- Export directly to Machine Guidance
 - Supports i-model creation (include 2D and 3D geometry and business data)
 - Support industry standards, such as LandXML
 - Export alignments, surfaces and other pertinent design information to other systems via XML
 - Generate PDFs and 3D PDFs
 - Direct plotting
 - Integrate with Google Earth™
- ### Integration with Bentley Content Management and Publishing Solutions
- Component-level integration with ProjectWise® for collaborative design and engineering project management
- ### Profiles and Cross Sections
- Create/generate cross sections and profiles along alignments, graphics, or between points
 - Created directly from 3D model and supports federated multidiscipline models
 - Include vertical alignments and existing and proposed surfaces
 - Automatic user-defined annotation of points and segments
 - Additional annotation capabilities available for one-offs
 - Cut cross sections orthogonally or at skew
 - Create custom cross sections
 - Dynamic update for cross sections and profiles via referencing
- ### Quantity Management
- Extraction of quantity take-offs for estimating
 - Element pay item attribution
 - Report quantities by entire project or delineate by sheets, stations, area, or phase