

AssetWise for Roads and Bridges

Advancing asset performance to deliver safe, reliable, compliant, and cost-effective service

Bentley®
Advancing Infrastructure



Improve Accessibility, Quality, Integrity, and Relevance of your Road and Bridge Information

Industry-leading road and bridge agencies around the world are establishing processes and implementing enterprise-wide information systems to support compliance with BIM technology and emerging asset management strategies. AssetWise for Roads and Bridges delivers an enterprise-wide information solution that can accelerate your organization's progress into the world of digital asset information, optimizing the use of intelligent assets by connecting operational technology (OT) with information technology (IT), and connecting digital information throughout the full asset lifecycle, from conception to end of life. Through this digital advancement, AssetWise empowers highly effective asset management practices, supporting a transparent and insightful approach. The application enables information management through the whole lifecycle of an asset, from planning and design to operations and maintenance. AssetWise provides a spatially-enabled connected data environment and supports you in managing all transportation infrastructure assets, including roadway, bridges, and tunnels and any related information. The software delivers complete information management and decision support during the transportation infrastructure's operating life and enables safe and reliable life extensions.

Road and Bridge Agencies Use AssetWise to:

- Improve overall service, safety, and reliability
- Reduce maintenance and operational costs
- Ensure compliance with regulatory reporting requirements
- Enhance strategic decision making
- Improve field-reporting accuracy



Highways England improved decision making and reduced road closures by 3,600 per year.



Asset Lifecycle Information Management (ALIM)

Trusted Information, When and Where it is Needed

AssetWise Asset Lifecycle Information Management (ALIM) manages road and bridge information throughout the lifecycle of change – ensuring the delivery of relevant, trusted information, in context – where and when it is needed. AssetWise ALIM makes it easy to define information types and the relationships between them, including documents, requirements, people, processes, policies, physical assets, and more.

Connected Data Environment

Bentley's Connected Data Environment (CDE) leverages existing investments in information, establishing an open framework for collaboration and asset information management throughout the

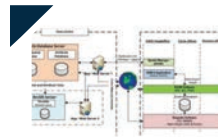


Oregon Department of Transportation realized a **66 percent** increase in overall efficiency.

lifecycle of transportation infrastructure to support a BIM approach. The CDE ensures the accuracy and availability of design, construction, and operational information and documents at every stage of the asset lifecycle. This accessibility allows for faster project start-up, streamlined workflows, adherence to standards, standardization, reduction of risk, enhanced decision making, and, ultimately, increased asset performance.

Spatially-Enabled Asset Information

AssetWise ALIM provides the ability to view and use information from a graphical perspective for spatially-located assets and related information. This asset-centric approach allows you to view information in a manner that can support enhanced decision making across different types of linear assets and information. You can locate assets based on spatial coordinates, on a position along a network, or by proximity to another asset. This network-based approach allows you to perform complex linear-based analysis across the entire network.



Odisha Works Department Asset Management System provides a single source of truth for **inventory** and **condition** of roads and bridges.

Enterprise Interoperability Delivers Maximum Flexibility

Interoperability is the cornerstone of Bentley's technology and the key to your successful enterprise asset information management solution. Information within AssetWise can be accessed by third-party systems, while information from any number of external systems can be leveraged within AssetWise via a single, managed interoperable connection.

Minimize the need for customized integrations and accelerate integration projects for faster returns on investment and reduced risk with AssetWise. Ensure that information quality, security, and integrity are maintained and gain a common view of asset information through certified system connectors that offer standardized integrations to third-party ERP/EAM/CMMS systems, geographic information systems (GIS), and online data collection systems.



AssetWise ALIM Features

ASSET REGISTRY Organizations have significant numbers of assets, equipment, structures, systems, and components that need to be managed, tracked, and maintained for ongoing operations. AssetWise ALIM gives you the ability to manage assets and their features, including the ability to track changes to this information over time. Insight and transparency can only occur by tracking changes in this way.

CHANGE MANAGEMENT Change management cannot happen without the ability to create relationships between relevant information, which is key to identifying the impact or effects of change. AssetWise ALIM gives you powerful features for varying levels of change management and monitors the progress of a change request by providing status details for each information asset, and it traces the lifecycle of changes made with revision history.

CONFIGURATION MANAGEMENT Configuration management ensures that asset configurations conform to their requirements. It provides the ability to identify and retain the context of information and its relationship to projects, processes, equipment, organizations, and users throughout their lifecycles. AssetWise ALIM gives you information integrity and consistency through closed-loop change management.

DOCUMENT CONTROL Effective document control must blend four key functional areas: document control, change management, records management, and distribution. AssetWise ALIM integrates this functionality to effectively, efficiently, and accurately capture, manage, control, retrieve, distribute, and archive all types of infrastructure asset information throughout the enterprise.

RECORDS MANAGEMENT Effective records management provides evidence for transactions, compliance audits, legal discovery, and more. AssetWise ALIM provides advanced file plan and disposition functionality, delivering a powerful records management system for complete lifecycle management of all corporate records and associated information. AssetWise ALIM helps you comply with your organization's corporate record-keeping policies to meet regulatory compliance and reduce the risks associated with audits and litigation.

REQUIREMENTS MANAGEMENT Requirements management is a continuous process critical to meeting design specifications as well as ensuring operational and regulatory compliance. With AssetWise ALIM, requirements information can be updated in real time, and the information is automatically propagated and accessible to your stakeholders everywhere it is needed.

Reduce Preparation Time for Government Reporting by up to 80%

AssetWise Transportation Intelligence Gateway is a powerful linear analysis capability used to significantly reduce preparation time for governmental submissions, including the U.S. Highway Performance Monitoring System (HPMS) submission, the World Bank's Highway Development and Management Model (HDM4) submission, and other transportation-based information requirements. You can access any linear-referenced transaction data set, perform any standard or custom aggregate and analytic function, generate extract data, and spatially enable the results for display on a map. Bentley Transportation Intelligence Gateway easily supports changing user reporting requirements without the need for custom programming or programming resources.



Asset Lifecycle Information Management (ALIM) Linear Network Management

Linear Referencing and Decision Support Capabilities to Manage Transportation Infrastructure

Spatially-Enabled Asset Information

AssetWise Lifecycle Information Management (ALIM) provides a spatially-enabled approach to managing your business data. A spatial approach is essential for managing the topology of a linear network while the business data approach supports capabilities such as multiple linear referencing and complex decision support. AssetWise ALIM delivers business capabilities that a GIS alone cannot. Through this spatially-enabled approach AssetWise ALIM delivers spatially-enabled network editing and dynamic segmentation capabilities that allow you to address the complex and diverse needs of asset lifecycle management in a linear asset business environment. AssetWise ALIM provides a single source of truth for all network and associated information in a linear, spatial, and data-driven approach.

AssetWise Linear Network Management Features

Address Complex Road Network Management Requirements

AssetWise provides specialized linear referencing network management capabilities to manage network centerlines and linear offsets while tracking the lifecycle of changes made with revision history. You can create and update the network spatially to reflect the ongoing changes that occur during construction, improvement, and maintenance. AssetWise ALIM offers a business data-driven approach rather than depending on traditional GIS spatial geometries to drive the business. It helps maintain an accurate enterprise network model against which all associated network information across the enterprise can be located,

reported on, and displayed. AssetWise ALIM supports the critical business functions of the organization and delivers relevant data when and where it is needed.

Optimized Approach to Network Management

AssetWise ALIM automatically maintains location information as network changes occur and provides a single integrated approach to network and location management. It offers a single point of data entry so users are not required to independently update multiple data types. Changes made to the network automatically update any associated asset or event location information. This approach ensures that all associated network location information remains consistent through the lifecycle of the road.

Complete Historical Record

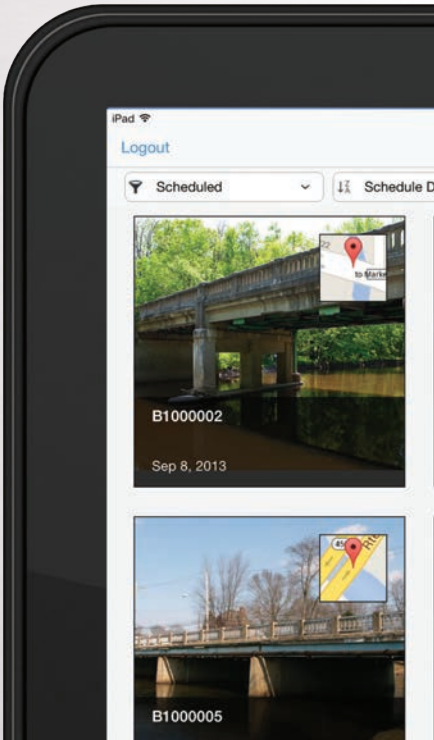
AssetWise ALIM provides the ability to query and analyze all historical information. The date-stamping approach used within AssetWise ALIM allows you to view the network and related assets based on any date. A complete historical record of the network and assets is maintained in the database, facilitating time-related studies and the input of field data months after it is collected. This capability enables users to analyze performance trends of assets and networks over a period of time to improve decision making and transparency.

Streamline the Data Analysis and Reporting Process

Eliminate the mountain of custom-developed code previously required to consolidate and analyze transportation data for regulatory reporting requirements. AssetWise ALIM reduces the time and effort required to extract, assemble, and analyze data to prepare for and meet legislative or mandated reporting submissions (including HPMS, HDM4, or other regulatory reporting requirements around the world). Perform complex analysis and spatial reporting without having to rely on GIS or IT resources to collect, consolidate, and analyze the extent, condition, performance, and operating characteristics of the roadway or highway. Data analysts can produce extracts without help and use the product as a productivity tool to easily and quickly perform many of the most difficult linear referencing tasks.

AssetWise ALIM provides Network Event Management (NEM) through a cloud-based platform to plan and manage road closures and events. NEM enables asset managers to ensure that agreed service levels for lane availability are met. NEM is an integral part of the entire asset lifecycle information management solution and strategy, and it allows asset management teams to directly access and examine planned road closure events, reducing worker risk, cost, traffic disruption, and more.





AssetWise Asset Reliability

Reliability Strategy, Inspection, and Maintenance Management for Transportation Infrastructure Assets

Delivers Accurate Element-Level Reliability and Decision Support

AssetWise Asset Reliability provides comprehensive capabilities for mandatory and risk-based reliability program development and management, as well as the inspection, maintenance, and management of transportation infrastructure assets. These proven capabilities give



users universal access to road, bridge, and tunnel asset data — from the field, road, or office. AssetWise Asset Reliability integrates asset data that is useful for multiple operational needs, from inspecting and reporting to capital-project planning and decision making.

Maximize Use of Transportation Asset Information

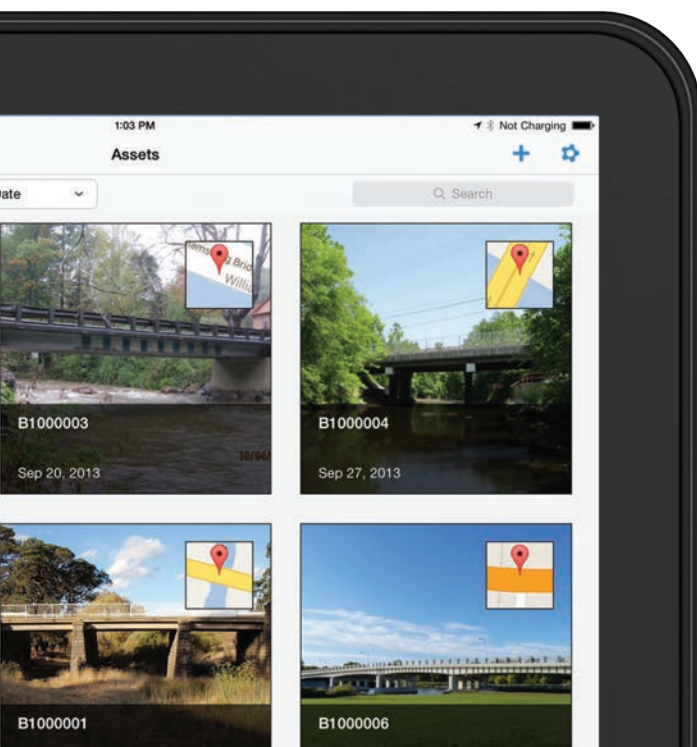
AssetWise enables asset owners and maintainers to maximize the use of transportation asset information for on-site inspection, reporting, maintenance planning, project prioritization, and work scheduling. Quick access to all information allows organizations to turn needs into actionable plans. Comply fully with government and industry regulations, including those from the U.S. Federal Highway Administration (FHWA). AssetWise helps you to meet requirements for the Fixing America's Surface Transportation Act (FAST Act) and Moving Ahead for Progress in the 21st Century Act (MAP-21). AssetWise integrates with other Bentley applications for easy data exchange. The application also works in combination with AASHTOWare's Bridge Management Solution, which gives transportation agencies a comprehensive system providing options that span advanced bridge inspection to capital planning, and it features an unprecedented level of information mobility and integrity across bridge management.

Supports All Types of Transportation Infrastructure

AssetWise is the industry's preferred software for the inspection and inventory of all types of transportation infrastructure assets, including bridges, culverts, signs, light poles, antenna towers, stormwater, guardrails, retaining walls, and other ancillary structures. Deployed in a secure cloud-computing environment and monitored 24/7 by Bentley managed services, AssetWise provides an off-the-shelf offering that meets all FHWA, National Bridge Inventory (NBI), and FAST Act/MAP-21 requirements that allows for rapid implementation of the system.

Streamlines the Entire Inspection, Data Management, and Decision-Making Process

Inspectors can quickly and effectively collect, analyze, manage, and report inspection data using AssetWise while working in the field, the office, or anywhere in between using mobile tablets. The software significantly improves the quality, usability, and amount of data available to make key decisions while preventing errors and avoiding mistakes. Integrated collection, management, and maintenance capabilities make sharing asset information across an organization easy and efficient.



Nevada Department of Transportation performed bridge inspections 30 percent more efficiently.



AssetWise Asset Reliability Features

ASSET RELIABILITY STRATEGY DEVELOPMENT With AssetWise you can identify assets that pose the greatest risk to your operation and rank assets by failure consequence and probability of failure to calculate relative risk. Develop proactive strategies that improve long-term asset reliability and performance. Optimize processes for the day-to-day operations of assets to minimize operational costs and maximize service levels. Moving to a risk-based approach to inspections and managing assets can help you develop high-quality reliability strategies and programs that ensure your assets and asset investments deliver optimal value, maximize safety, and enhance regulatory compliance.

ASSET RELIABILITY PROGRAM MANAGEMENT A documented and systematic reliability program that is technically sound and based on proven reliability strategy methodologies provides proof of regulatory compliance, exhibiting that you've taken the appropriate steps to prevent asset failure. Conduct root cause analyses and employ defect elimination methods; then, easily update the reliability program. AssetWise is a living program with continuous improvement built into the process.

IMMERSIVE VISUAL OPERATION By leveraging Bentley's industry-leading asset performance management capabilities, AssetWise is able to link 2D and 3D representations of a site with data from other operational systems to support common asset performance and integrity management process workflows. Use handheld data collectors to standardize inspection indicator readings. For situations where assets are spread across a wide geographic area, the AssetWise mobile capabilities allow users to work disconnected from the network for extended periods of time. Support for rich data (pictures, video, audio, and other PDF files) and capabilities, such as direct in-context access to inspection manuals and historical data, add to the overall quality of asset inventory information and reports.

Cloud or On-Premise Deployment

Deploy AssetWise fast and easily as a cloud-hosted managed service that includes all capabilities installed, configured, and ready to use. No server hardware is required. Start with a few users and roll out to more users as data is populated. On-premise deployments are available with support plans to help achieve success.



AssetWise Work Management

Efficient Planning and Scheduling of Maintenance Work

Manage the entire maintenance program for your assets, including work planning, work execution, and historical record keeping and costing.

Inspection and Defect Recording

Establishing an effective regime of inspections and defect recording is an important component of highway maintenance. AssetWise enables flexible definition of inspection protocols that include inspection frequency, defect types, priorities, treatment types, and repair timescales. By applying these criteria systematically and consistently, it is possible to monitor network safety and serviceability, while also maintaining information that may become crucial during legal disputes and proceedings. The complete defect lifecycle is recorded – from discovery through to repair – with a full audit history.

Manage Maintenance Activities

AssetWise Work Management capabilities are proactive and reliability-focused, which help you improve the efficiency of your maintenance business and also ensure the effectiveness of your process and organization. AssetWise ensures that you are proactively executing the right work on the right asset at the right time. For most assets and failure modes, the current health of the asset determines what maintenance work to do and when.

Effective Work Order Management

Once defects have been recorded, either from an inspection or from third-party sources such as the public, it is important to undertake repairs within the target timescales set by the relevant code of practice. As defects are recorded in the system, work orders can be automatically generated and issued based on a flexible rule set. Urgent repairs can

be assigned immediately; less urgent responses can be built into work programs to enable more cost-effective use of repair teams or contractors. Additionally, the software provides an option to complete defects corrected by scheduled maintenance activities. Standard jobs can be set up so that generated work orders are automatically scheduled. Automatic scheduling reduces the effort required to develop your maintenance timelines.

Manage Resources and Inventory

Manage an unlimited inventory size, supporting multiple locations and sublocations. Resources are assigned a unique customizable identification number along with a unique resource category and class to aid inventory analysis. Manage a full range of services (labor, rentals, cleaning) and track tools and specialized equipment, stocked and nonstocked.

Control Purchasing Costs

AssetWise purchasing management capabilities enable you to efficiently and effectively support the maintenance function. With an understanding of why assets fail and the correct timing on when to act, AssetWise supports the operation to help you improve the efficiency of your maintenance, lower overall maintenance costs, and enhance your purchasing business.

Plan and Track Projects

Comprehensive project tracking and costing helps management make the best decisions. AssetWise allows you to track both capital and operating projects in your organization and helps you to understand the costs, hierarchy relationships, and status of your projects. The project hierarchy enables you to roll up costs to determine the value of the project for approval purposes and to push approval statuses down the hierarchy to subprojects if required. AssetWise provides visibility with accurate information that is critical to making the right decisions at the right time.





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Operational Analytics

OPERATIONAL PERFORMANCE WITH CLARITY, CONTEXT, AND CONFIDENCE AssetWise displays your operation in real time and provides insights for informed decision support by converging operational and IT data with digital engineering models for right-time predictions and informed actions that can then be automated for dynamic management of asset performance.

DATA TREND ANALYSIS Harness your asset and operations-related data, including sensor data captured by the Industrial Internet of Things (IIoT). Perform analytics to reveal patterns in interactive dashboards and reports and combine it with other relevant information, including digital engineering models. Customize key performance indicators (KPIs) in a centralized dashboard for informed decision support.

PREDICTIVE OPERATIONAL ANALYSIS Forecast performance and develop strategies for maintenance that result in minimal disruption to service. Simulate operational scenarios to evaluate variations that reduce costs, increase uptime, or improve service during demand fluctuations and improve your overall operational performance.

DATA SCIENCE AND MACHINE LEARNING Make the most of your data and gain even more insights by leveraging the power of Microsoft Azure machine learning and AssetWise advanced analytics. Discover otherwise hard-to-see patterns or behaviors in multiple and complex information data sets. Detect anomalies and events in advance with data-driven, self-learning models that require little or no human interaction. Apply different techniques, like predictive maintenance and demand forecasting, to significantly reduce costs and improve performance with smarter decision making.

Public Enquiry Management

Dynamic Information Management for Highway Agencies and Customers

Public Enquiry Management helps organizations to efficiently manage and respond to communications from their customers and the public. It allows for the creation and display of enquiries via a map; the association of documents such as letters, photographs, and drawings; and the generation of defects based on the enquiry information. Enquiries can be recorded against a network location, an asset, or independently.

When implemented with the AssetWise ALIM, new enquiries can be raised and maintained directly from a map. This provides a simple-to-use spatial interface allowing you to locate issues more accurately, leading to better information gathering and dissemination to interested parties. You can use nationally published gazetteers to check postal addresses when entering new enquiries. This capability speeds up data entry and minimizes typographical errors.

Compliance with Traffic Management Act

Support for organizations performing and coordinating work on UK highways

The Traffic Management Act places a responsibility on organizations in the UK to ensure accurate noticing and timely works completion. Any planned and random activity on the road network needs to be monitored to ensure minimal impact on traffic movements. AssetWise enables transportation authorities to conduct data analysis to determine where there are conflicts so action can be taken to ensure highway access is not adversely affected. AssetWise provides a configurable set of rules to ensure that the correct permit requests are raised in a timely manner. Then, configurable workflows manage the lifecycle of the request through to completion for both the originating and approving organizations.

Automated Oversize/Overweight Vehicle Permitting and Optimized Routing

Integrates Bridge Load Rating and Restrictions Management to Improve Safety and Reliability of Road Infrastructure

Best Practice Routing and Permitting

SUPERLOAD[®] offers a best-practices approach to permit processing that delivers substantial cost savings to the permitting agency. The software streamlines permit applications in conformance with agency rules and regulations, performing intelligent routing, real-time live-load bridge analysis, secure payment processing, and permit issuance. Powerful administration capabilities support the back-office requirements of the permit administration team.

Automates Processing and Payment

SUPERLOAD makes online permitting safe and secure. When processing applications, the software automatically checks applicant information, including account balances, insurance coverage, permitting violations, registration, and other background information. A built-in accounting system works independently or along with other accounting and finance systems to handle electronic payment transactions, billing, and account management. The permitting agency can custom tailor the system to handle unique permit operations. A complete audit trail of all financial transactions is maintained automatically.

Maximizes the Value of Data Integration

SUPERLOAD provides distinct advantages to the permitting agency when linked with other systems or mined for detailed information. Agencies can choose to implement SUPERLOAD to work with Commercial Vehicle Information Systems and Networks (CVISN) and other agency programs to perform checks and share data for roadside monitoring.

Permit routing data provides detailed information on the movement of all carriers. The agency can query specific routing data such as vehicle dimensions and permit timeframes. Mined permitting data can help establish transportation improvement plans that alleviate highway system constraints that adversely impact effective movement of motor vehicles.

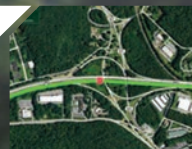


Protection for Infrastructure and the Traveling Public

With its built-in knowledge of the roadway network, SUPERLOAD provides the capabilities to maintain a digital model of the highway system. This includes the location of all structures, detailed interchange configurations, bidirectional clearances, and all temporary restrictions. SUPERLOAD processes all structures and other appurtenances involved in the route and delivers a split-second analysis of vertical and horizontal clearances. All bridge analysis is performed for the specific permit vehicle configuration over each specific structure. An integrated live-load bridge analysis of each structure on the route determines safe passage feasibility and any speed or lane restrictions.



The Maryland SHA OS/OW permit system **saves carriers USD 24.6 million per year.**



New Jersey DOT OS/OW systems **save the truck industry USD 16 million per year in idle time.**

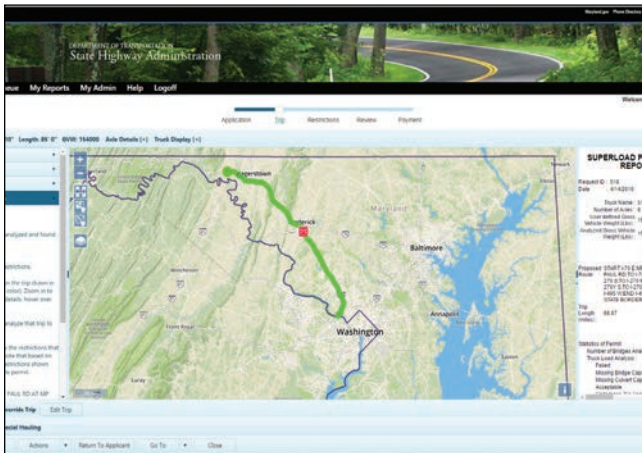
Routing and Permitting Features

Streamlines Permit Process

With the ability to directly apply for a permit and request a route from virtually any location, carriers can save hours, even days, in the permitting process. Most permits can be issued online without agency intervention. SUPERLOAD automates the full workflow, from requesting a route and payment by credit card to permit issuance. A dynamic map and other features quicken the routing process. Users can speedily analyze their trip as they work interactively through the route selection.

Determines Routing Feasibility

SUPERLOAD performs real-time route validation based on the size/weight of the permit vehicle and the constraints and conditions of specified routes. Bridge clearances, bridge live-load analyses, and temporary restrictions help determine routing feasibility. SUPERLOAD automatically generates a route to the destination for the particular permit vehicle. Users can also select a specific route via an interactive map or textual input. SUPERLOAD will analyze the route and display results.



Maryland State Highway Administration (MDSHA)

Manages Restriction Events

Restriction Manager is a SUPERLOAD module that enables organizations to apply restriction information to the roadway network as a factor in individual permit trip analysis. For most regulating agencies, Restriction Manager is a vital piece of the overall OS/OW routing solution that helps them manage restriction events, from full route closure to limited access and route advisories. This augments infrastructure project planning, notification, and construction management. Restriction Manager can share data with other agency systems. If changing conditions affect an issued permit, SUPERLOAD automatically notifies the permit requestor and the agency.

Provides Live-Load Bridge Analysis

SUPERLOAD Bridge Analysis performs bridge analysis for the specific permit vehicle configuration over each specific structure. An integrated live-load bridge analysis of each structure on the route determines safe passage feasibility and any speed or lane restrictions. Automate your live-load bridge analysis with real-time route validation based on the size and weight of the permit vehicle and the constraints and conditions of specified routes. SUPERLOAD Bridge Analysis utilizes bridge data from multiple sources including LARS Bridge and AASHTOWare Bridge Management software to ensure complete and accurate information.

Issues Multi-Agency Permits

The SUPERLOAD system is designed to provide direct electronic communication with Bentley's GotPermits.com, a one-stop source for acquiring permits from multiple agencies. GotPermits.com is the growing choice of permitting points-of-issuance by transportation departments. Using GotPermits.com's advanced permit application process, transport professionals can complete a single permit application for permitting by several state systems. The website requests only the specific information needed by relevant states and provides multistate routing to resolve cross-boundary routing issues. This uniform processing not only simplifies data entry but also ensures conformance with all state laws, routing requirements, and processes.





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