Bentley
Advancing Infrastructure

Project Summary

Organization
Illinois Department of Transportation

Solution
Road Asset Performance

Location
Springfield, Illinois, United States

Project Objectives

- To distribute transportation permits for oversize/overweight trucks through an automated, digital system to hasten the permit issuing process.
- To improve roadway safety and extend the life of infrastructure by ensuring oversize/overweight trucks drive on the optimal route.

Products Used
SUPERLOAD® Bridge Analysis

Fast Facts

- Bentley's SUPERLOAD decreased the amount of manually analyzed permits, enabling staff to focus on the analysis of complex permit applications.
- SUPERLOAD Bridge Analysis increased the weight limit for permit auto-issuance up to 299,999 pounds.

ROI

- IDOT lessened the average monthly time required for manual permit analysis by 91.5%, saving USD 11,400 per month.
- The permit office now issues more than 230,000 permits annually, 99.2% of which are digitally automated; this generates USD 21 million for the Illinois General Road Fund.

Illinois DOT Improves Bridge Analysis; Increases Auto-issuance of OS/OW Vehicle Permits

Bentley's SUPERLOAD Application Automates 99% of Permit Issuance

Upgrading an Outdated System

Illinois is a hub for grain, corn, and soybeans, all of which are transported internationally. These agricultural goods are transported from their starting point to their destination by truck. Often, the produce forms an oversize and overweight load and the transportaion company requires a specific permit to travel on state highways. It is the job of the Illinois Department of Transportation (IDOT) to find a route for these trucks to travel safely in the state and issue an oversize/overweight permit for the trucks to begin their journey.

Because its manual permitting processes took a lot of time, IDOT sought to update and automate its permitting system to rely on digital components and processes. Using manual processes to issue permits for oversize/overweight loads could take up to two weeks, which was unacceptable.

Establishing an Automated Permit System

To facilitate the process, in 2012 IDOT began a plan to switch from its manual permit-issuing process and maps to a fully automated system by implementing the Illinois Transportation Automated Permits (ITAP) system. The ITAP application auto-issues permits for trucks traveling on roads and highways maintained by the state. Individuals submitting the application enter their truck and load information, point of origin, point of destination, axle spacing, dimensions, and weights. Then, the application searches for a feasible route that would support the weight and size of the truck. Lastly, ITAP suggests a viable route based on origin and destination that considers restrictions, vertical clearances, posted legal weight, and ton-restricted structures.

In this initial phase of the automation rollout, ITAP determined that permit applications that did not exceed practical maximum weights of 120,000 pounds with dimensions that were less than or equal to 16 feet wide, 17 feet high, and 200 feet long, were auto-issued. When an application came through that exceeded the practical maximum weight of 120,000 pounds and the dimensions, the application was sent to the permit office to have the route evaluated by a permit technician, who would manually determine the viability of the submitted route. The creation of ITAP during Phase I of this project automated about 60% of the permits submitted to the permit office.

Going Digital by Integrating SUPERLOAD with the ITAP System

When Illinois was planning for the next phase of ITAP, which included Bentley SUPERLOAD Bridge Analysis, it wanted a solution that would provide consistency, automation, and digitalization. Applying a digital context to the road network enables IDOT to see evolving conditions or unexpected changes occur in real-time that may affect a truck route. Providing an easy-to-use, automated system that relies on digitally connected processes leads to improved safety, better compliance, and reduced costs.

Phase II began in 2015, and IDOT increased the weight limit for auto-issued permits to any load less than 250,000 pounds. Bentley's SUPERLOAD Bridge Analysis software was used to provide structural analysis. When a successful route is found within the ITAP system, all roadway structures on the route are analyzed by SUPERLOAD for the specific truck and load configurations provided. This analysis is important to determine the optimal route for oversize/overweight loads. The ITAP application submitted a list of these structures to the Bentley SUPERLOAD Bridge Analysis web service, which applies ratings to each structure based on the load and the structure's characteristics. If these structures do not support the weight of the load or are too small for the load's measurements, another route is determined. If the service doesn't find failed structures, a permit is automatically issued.

"When you first try to get a route, you will see some of the obstructions that you have too much weight on," Geno Koehler, permit office unit chief at IDOT, explained. "The software tells you that the truck cannot pass over a bridge and specifies what that reason is, such as a bridge weight conflict and reduced speed sections of the bridge."

In Phase II, the system searched up to four times for an appropriate route before sending the application to a technician within the permit office. Alternatively, the driver

"There have been many benefits that have come from adding SUPERLOAD software to ITAP and going digital. We have improved the consistency of routing and permitting across structures and increased our efficiency tremendously. By going digital and by being automated it's safer, it's more efficient, and it's extremely fast."

– Geno Koehler
Permit Office Unit Chief,
Illinois Department of Transportation

could go back into the system and search for a different route, such as using all state roads or all local roads. After adding Bentley SUPERLOAD software and digitalizing the ITAP application system, IDOT jumped from 74% auto-issuance for oversize/overweight loads to 98.75%.

Bentley's Digital Solution Further Enhances Automated System

In 2017, IDOT rolled out the third phase of this project, and the state's bridge engineers were confident with SUPERLOAD's digital analyses. The department replaced its Silverlight interface with updated .NET technology, which dramatically improved the response times and enabled the application to be used within most modern browsers. The updated routing application was developed using a responsive design so that users can apply, pay for, and receive a permit on a smart phone, increasing accessibility for the users. In Phase III, another SUPERLOAD analysis for ITAP increased the oversize/overweight permit weights up to 299,999 pounds and for dimensions that are less than or equal to 16 feet wide, 17 feet high, and 200 feet long. Now, for all loads that meet these requirements, permits are 99.2% automated. If the load weighs more than 299,999 pounds, the application is routed to a permit technician for review and approval prior to issuance. The increase in the weights reduced the number of bridge engineers that had to manually analyze structures for permit requests at a significant savings to the state, which also reduced the time it takes to obtain a permit. By going to the latest weight, IDOT saved 54,600 analyses being manually done each year. Also, the system searched for viable routes eight times before sending the user to the permit office for assistance.

Another improvement was the allowance of nighttime travel for oversize/overweight trucks. Previously, transporting overweight and oversize loads at night was prohibited. However, given the reliability of the digital ITAP system incorporating SUPERLOAD, IDOT opened nighttime travel for trucks that are up to 12 feet wide. This capability has reduced traffic congestion during the day.

Facing All Challenges, Enhancing Public Safety

Throughout each phase of development on this project, the design team was challenged to increase the number of permits auto-issued annually by providing real-time structural analysis for sizable loads. Those seeking permits also received new map layers, providing them with more information about their route, as well as new ways to find a route. For instance, the system now allows the driver to enter latitude and longitude coordinates for origin, destination, and way-point locations. This capability enables a more exact indication of drivers' starting and ending positions, and supplementary map layers increase safety and accuracy.

Public safety was enhanced as a result of this automated system. Calculations were conducted on structures and rated based on the precise load and truck configurations applicable to that specific load. This capability enables the IDOT Bridge Office to regularly monitor infrastructure on frequently traveled routes and proactively schedule maintenance, increasing public safety, and reducing emergency repairs.

Digitally Automating Permit Issuance Saves Time and Costs

IDOT is now doing 250,000 analyses per month, or 3 million analyses per year, using Bentley software. Bentley's digital automation processes supported IDOT's goals of improving safety and efficiency, growing the economy, preserving existing infrastructure, strategically expanding infrastructure, and supporting freight multimodal transportation.

"Automation is very important for the Midwest region of the United States and automation is going to be the key when it comes to moving goods and services," stated Koehler. "If you don't have automation, you are behind the curve ball, and you're going to get beat."

SUPERLOAD is an easier routing application to use for the trucking industry and the IDOT staff. IDOT has lessened the average monthly time required for manual permit analysis by 91.5%, saving USD 11,400 per month. With SUPERLOAD, IDOT also raised the automated issuance of oversize/overweight permits to 99% for a total of 54,600 additional permits annually since 2015.

Ease of Use Encourages Compliance

The ITAP system auto-issues permits that can be displayed on mobile phones, laptops, and tablets. The permitting application system is available for use 24 hours per day, 365 days per year. This capability allows drivers to receive automated permit issuance with full structural analysis for most loads. The feature promotes efficient interstate and intrastate commerce for oversize/overweight loads under 300,000 pounds with acceptable dimensions. "The easier you make it for the public to use, the more in compliance they are," Koehler explained.

The Federal Highway Administration recognized the ITAP application as a best practice for permit issuance. Furthermore, the design team at IDOT partnered with Illinois Truck Weight Inspectors (TWI) and the Illinois State Police to improve compliance and permit monitoring. Now, the TWI has access to ITAP so they can track where a permit is used and how often. The police use data from ITAP to know which loads are traveling through the state daily. Ultimately, the more that all trucks are complying on the roadways, the safer the roads are for the public.

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