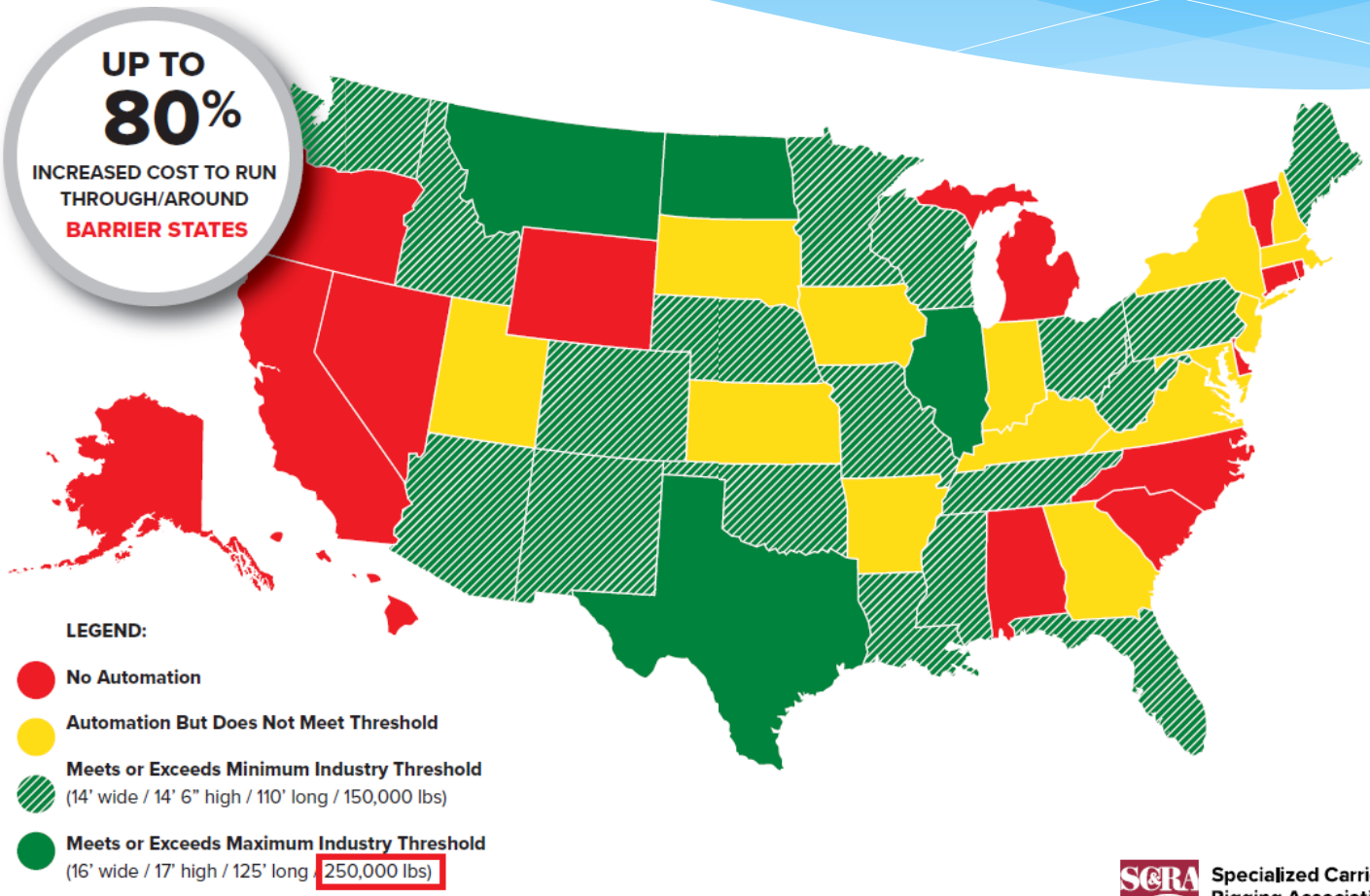
Using BrR with an Automated OS/OW Permitting & Routing System

RADBUG 2022

August 2, 2022

The AASHTOWare BrR system is a powerful tool that can be used for load rating heavy trucks as part of an automated permitting and routing process.

The Oversize/Overweight trucking industry expects state permit offices to be able to self-issue permits that weigh as much as 250,000 pounds.



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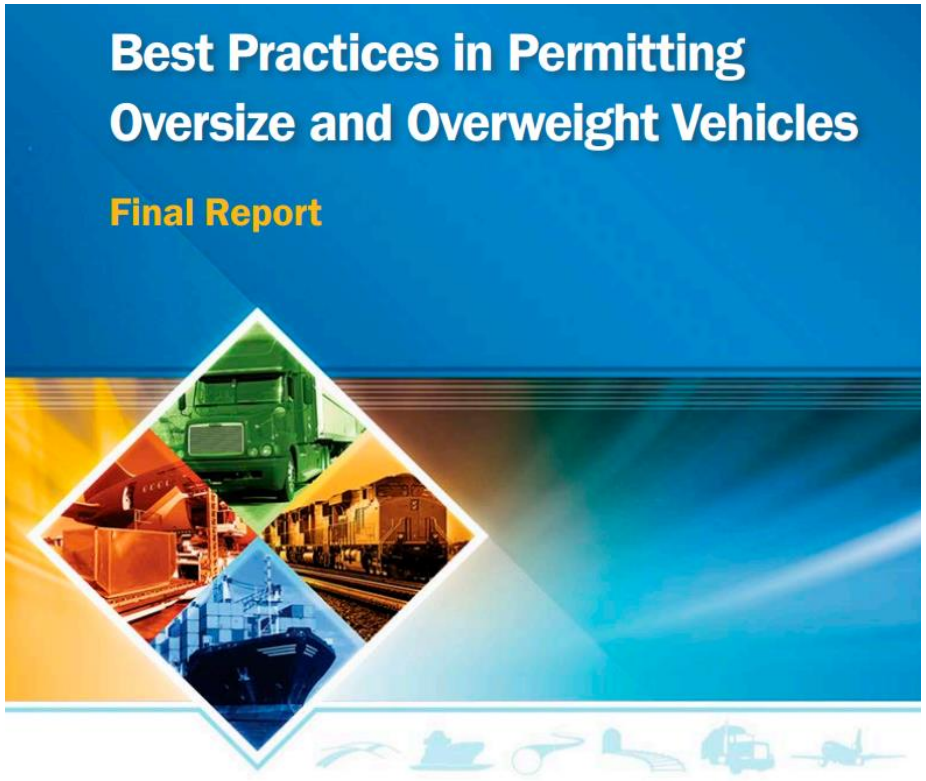
The FHWA recommends state permitting offices adopt automated OS/OW permitting and routing systems to improve highway safety and protect infrastructure.



Summary of Findings

As States implement and enhance automated permitting systems at an increasing rate nationwide, a consensus regarding the safety and efficiency benefits has also grown. These benefits, as described by both government officials and industry leaders, include:

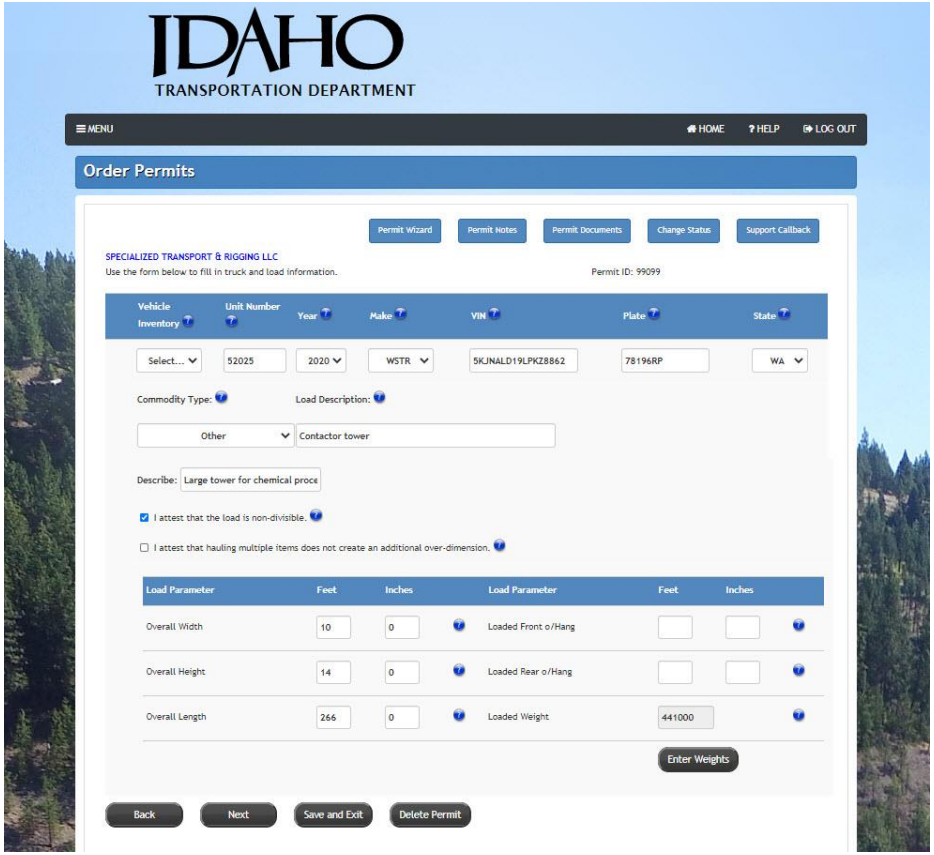
- The average permit turnaround time (PTA) decreased from several days and hours to just minutes for most routine and some OS/OW permits.
- Nearly all States (30+) that have implemented automated systems report a moderate increase in total permits applications and issuance.
- Increased automated permit volume has proportionally increased revenues.
- Accuracy of permits has dramatically improved.
- A higher percentage of carriers have ordered, obtained, and traveled on State-issued permits following implementation of automated permit systems.
- Roadway safety for all motorists has improved.
- The infrastructure integrity, including the maintaining of bridges and overhead structures, has improved.
- As a result of moving to automated permitted, States are able to achieve staff efficiencies and reduce costs. Fewer people or less time is needed to review and process OS/OW permits, freeing up employees to handle customer service inquiries.
- States have more flexibility with internal headcount issues.

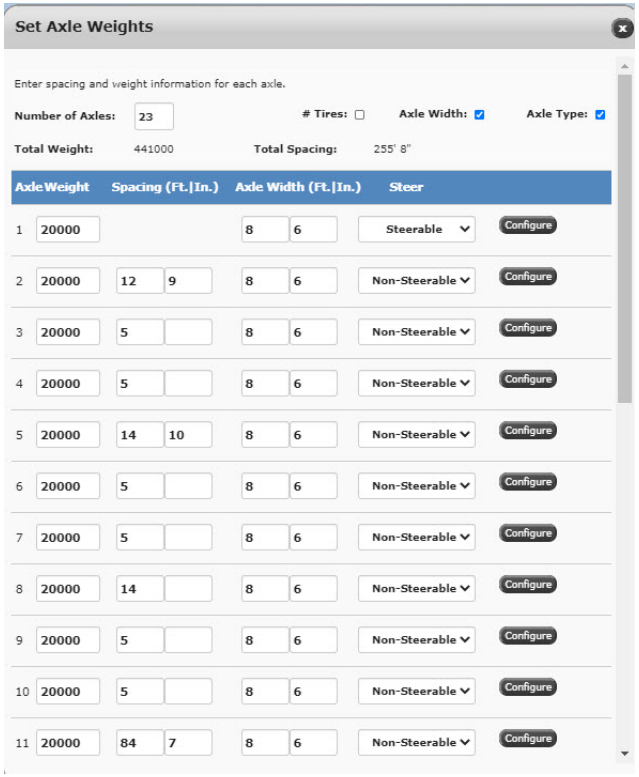
Using the AASHTOWare BrR product DOTs have provided safe, automated OS/OW routing and permitting for these heavy loads.

* BrR is able to load rate 90% or more of the typical DOT's Bridge Inventory
* The vast majority of these bridges can be rated in less than a second with the Load Rating Tool

This presentation describes how to use the AASHTOWare BrR system with automated OS/OW permitting and routing systems.

Most OS/OW systems have a permit order process where the industry user enters permit information such as permit type, dimensions, and axle weights and spacings before selecting their route.





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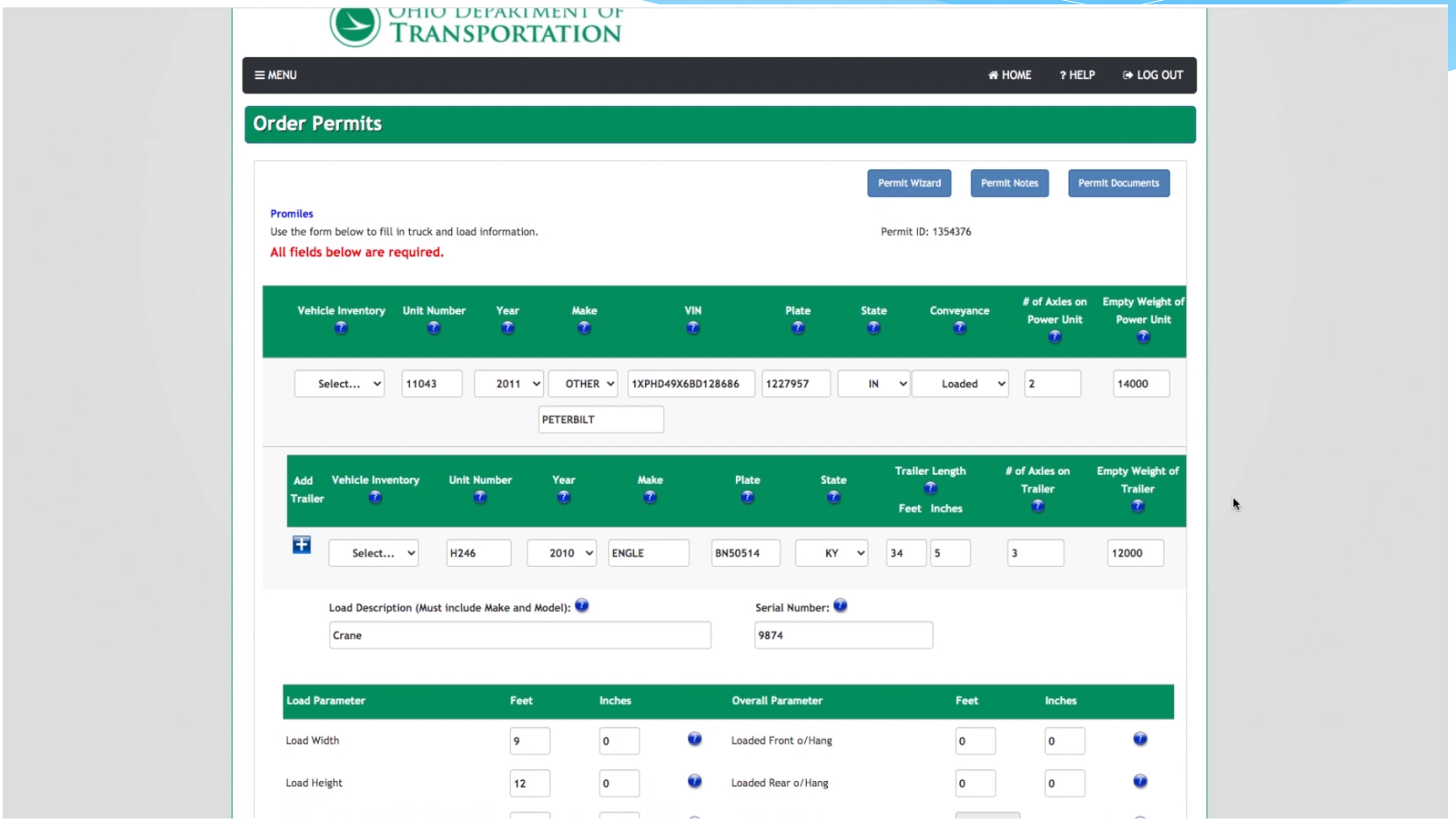
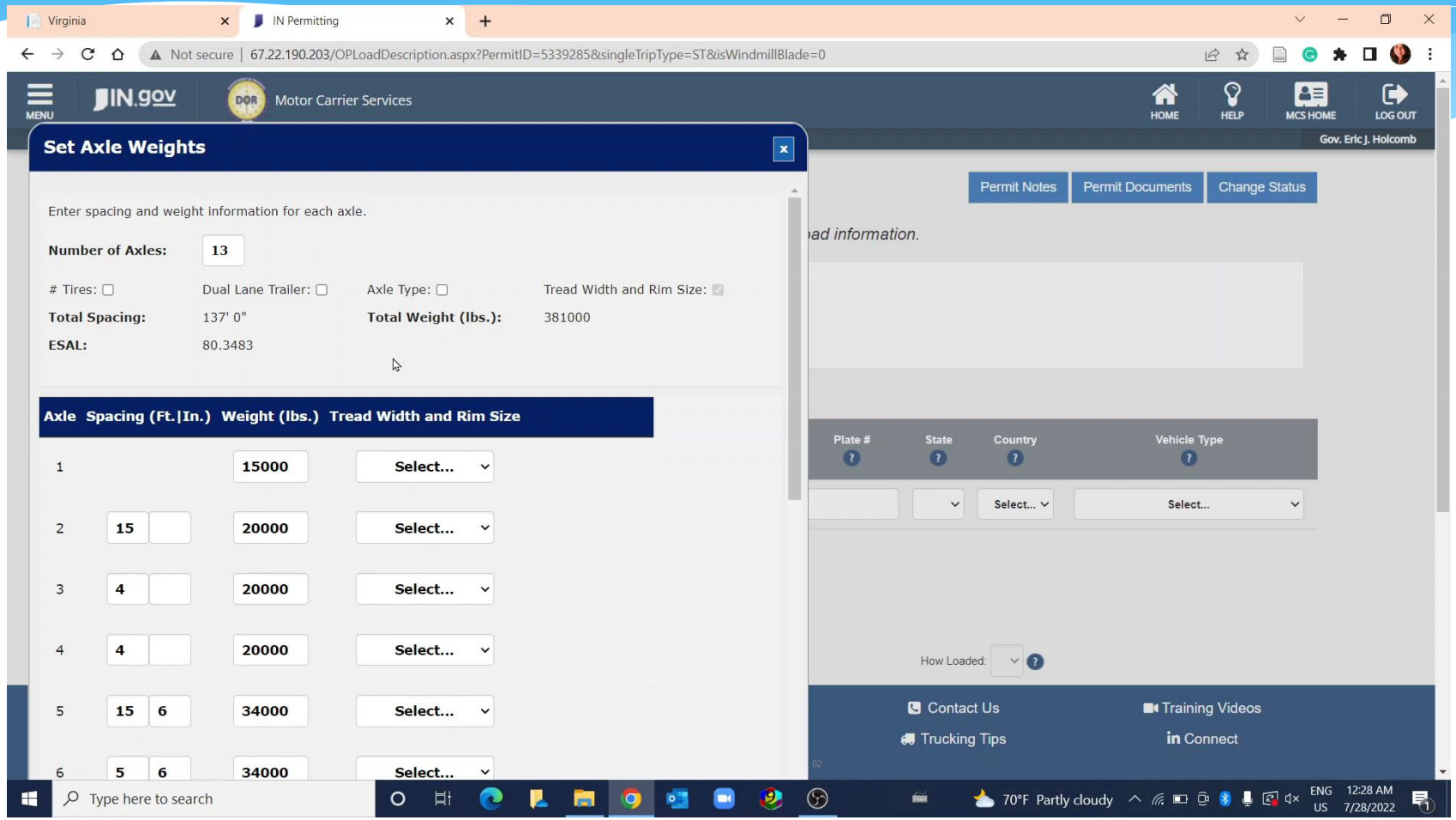
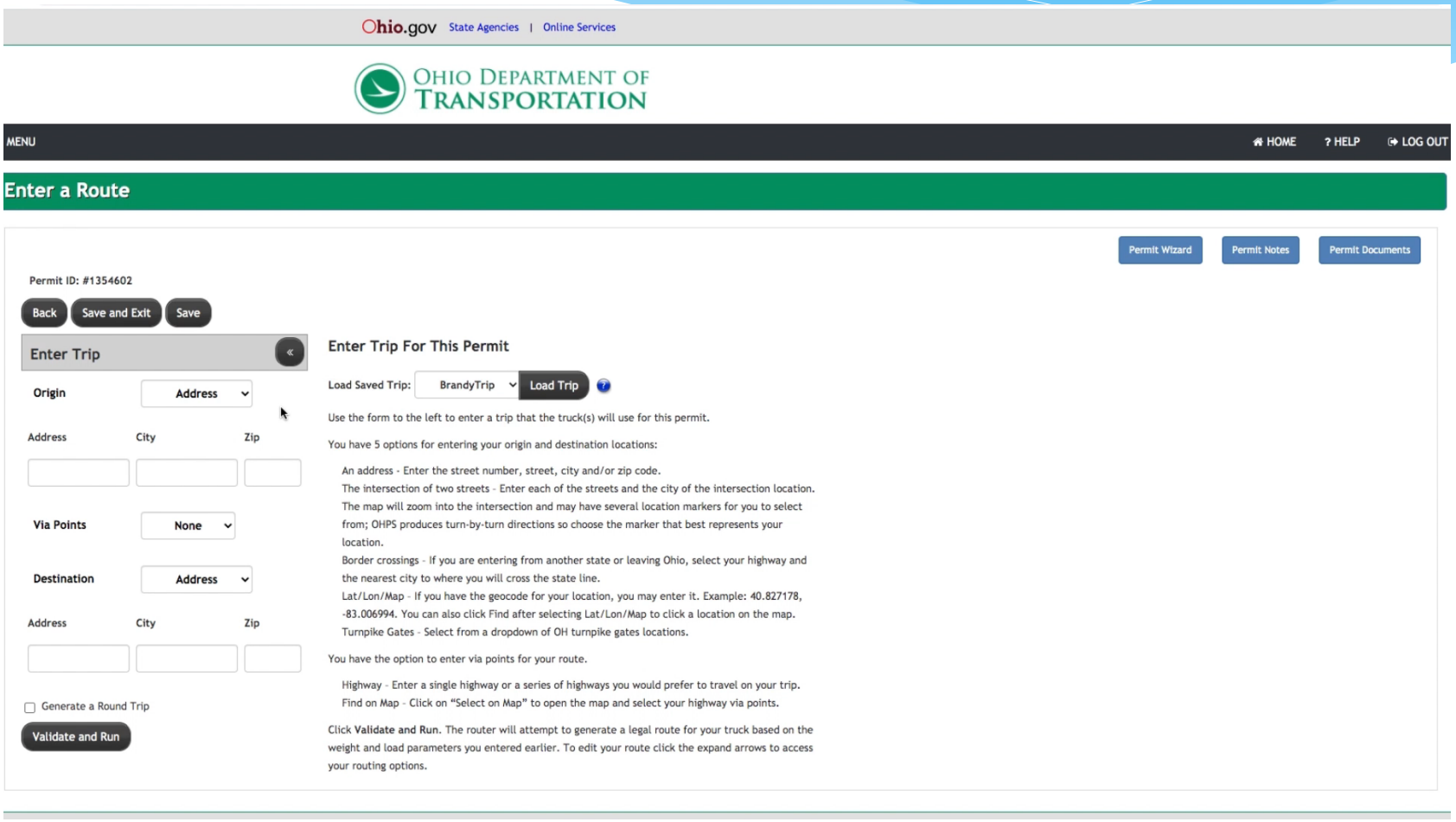


Can include NSG Axle Weights and Spacings



The user will select the start and end point for the route.
User addresses, intersections, click on the map
Route calculation performed while the user is waiting



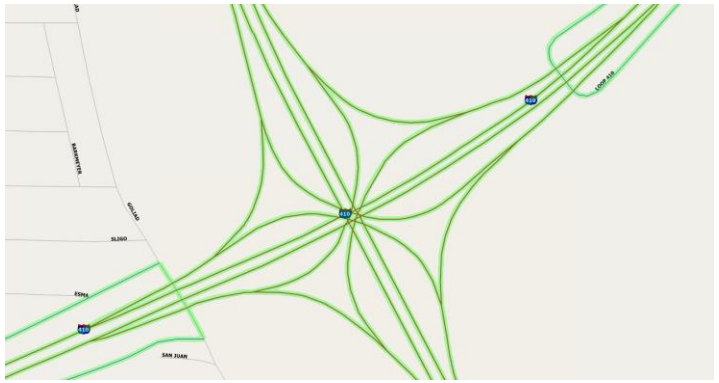
The automated permitting and routing system will calculate a route that is safe for the permit.

* Route calculation performed while the user is waiting
* Generally needs to be done in a minute or less

* It is this time constraint that drives how load rating is performed in these systems

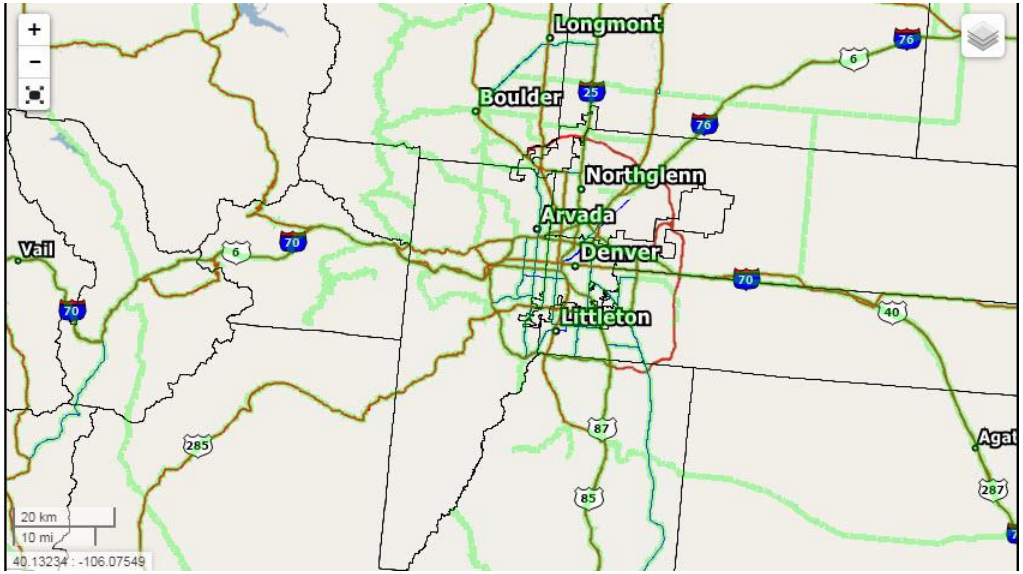
Automated OS/OW Routing Overview

* First step: Build a routable GIS dataset for all roads under the Permit Office authority
* The dataset must be at the roadbed level: dual carriageway roads need to be represented as two separate one-way road segments
* Must include ramps, fly-overs, turnarounds, etc.



Automated OS/OW Routing Overview

* This GIS dataset describes where permit vehicles can be permitted



Automated OS/OW Routing Overview

* Second step: Identify where the vehicles cannot travel. These are described as Oversize/Overweight restrictions.

Automated OS/OW Routing Overview

* The most common restrictions are:

Automated OS/OW Routing Overview
Common Oversize/Overweight Restrictions

Vertical clearance

Automated OS/OW Routing Overview
Common Oversize/Overweight Restrictions

Construction

Automated OS/OW Routing Overview
Common Oversize/Overweight Restrictions

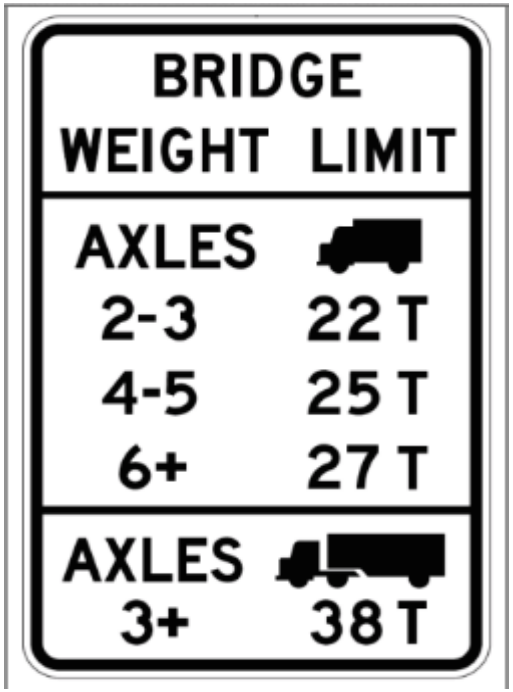
No permits

Automated OS/OW Routing Overview
Common Oversize/Overweight Restrictions

Turn restrictions

Automated OS/OW Routing Overview
Common Oversize/Overweight Restrictions

Posted weight bridges



Automated OS/OW Routing Overview
Common Oversize/Overweight Restrictions

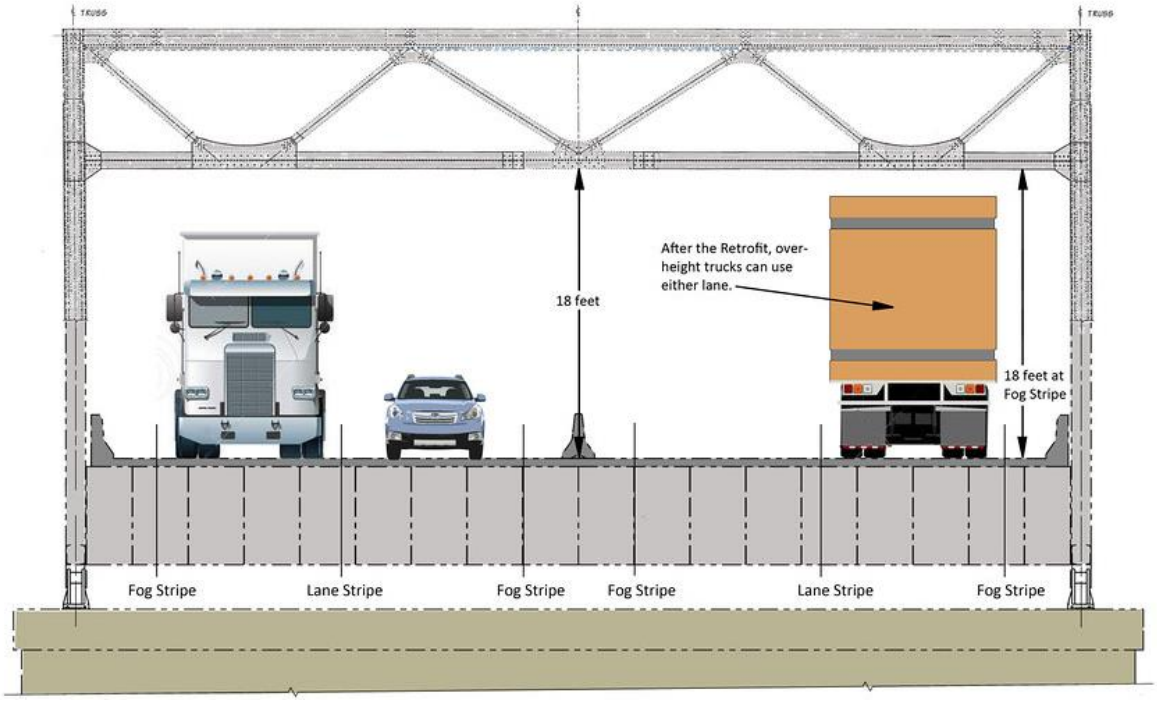
Bridge that fails load rating

Automated OS/OW Routing Overview

* Each of these restrictions can be calculated virtually instantly:
  * Vertical clearance
  * Construction
  * No permits
  * Turn restrictions
  * Posted weight bridges

Automated OS/OW Routing Overview

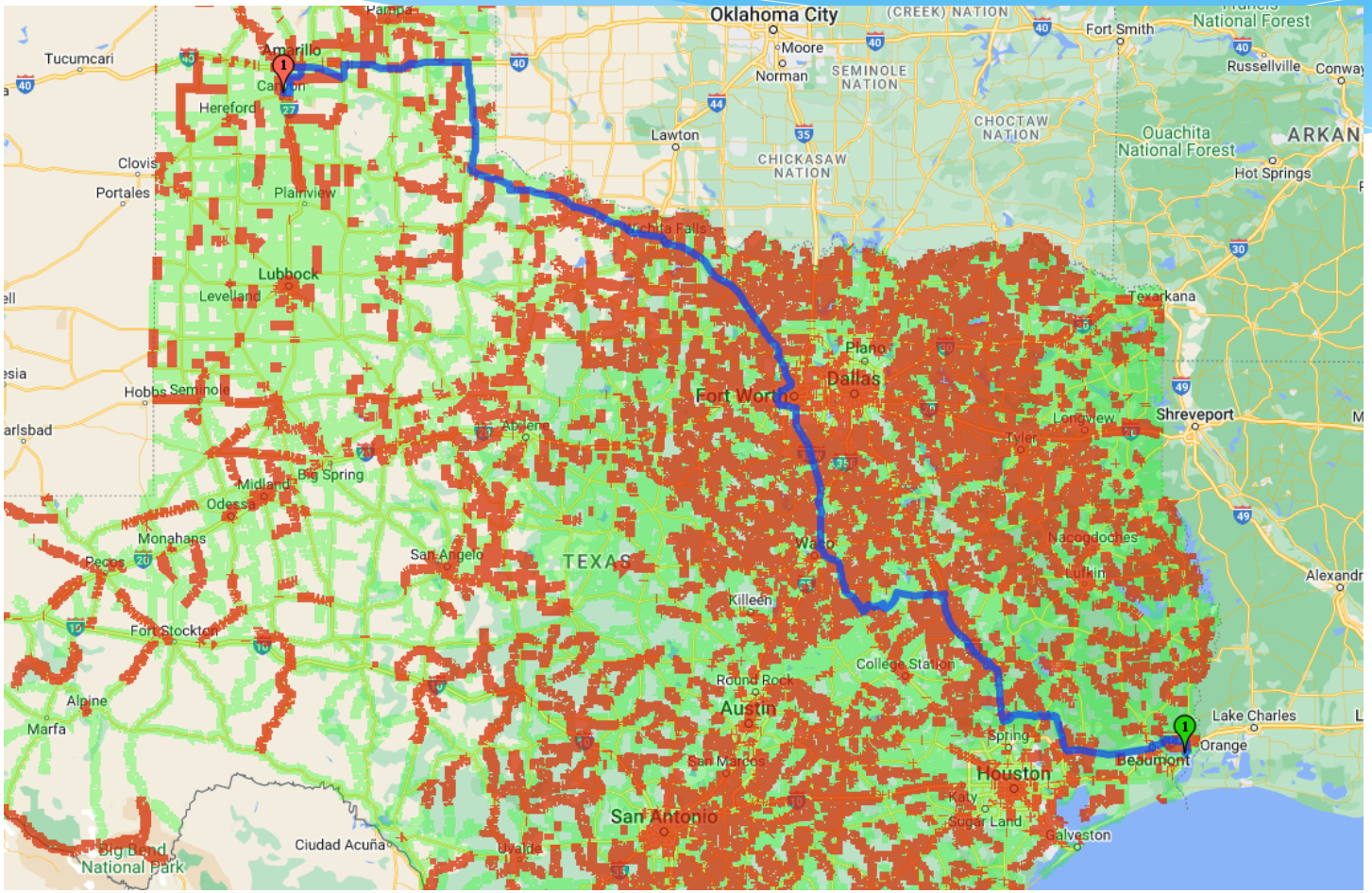
17’ High truck < 18’ clearance. So this clearance restriction does not apply to this load.



Automated OS/OW Routing Overview

* The routing system can generally identify all of these restrictions applicable to a particular permit in the state in less than a second.
* The optimal route can be calculated from the origin to the destination around all restrictions in less than a second.

Automated OS/OW Routing Overview

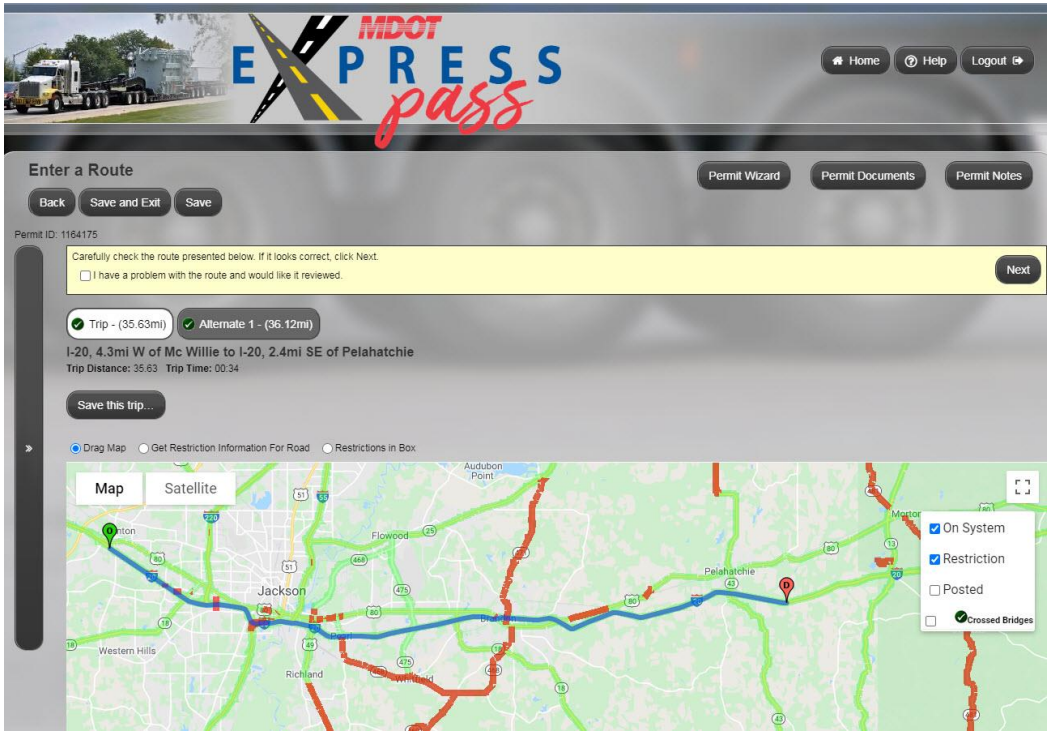


Automated OS/OW Routing Overview

* High quality load rating
  * More computationally analysis required
  * Takes more time
* Fastest high quality load rating
  * 40 – 50 bridges/second with relatively simple models using a single multi-core server
  * For complex bridge models this can drop to 4 – 5 bridges/second
* Rating all bridges in a state for a particular permit is not feasible

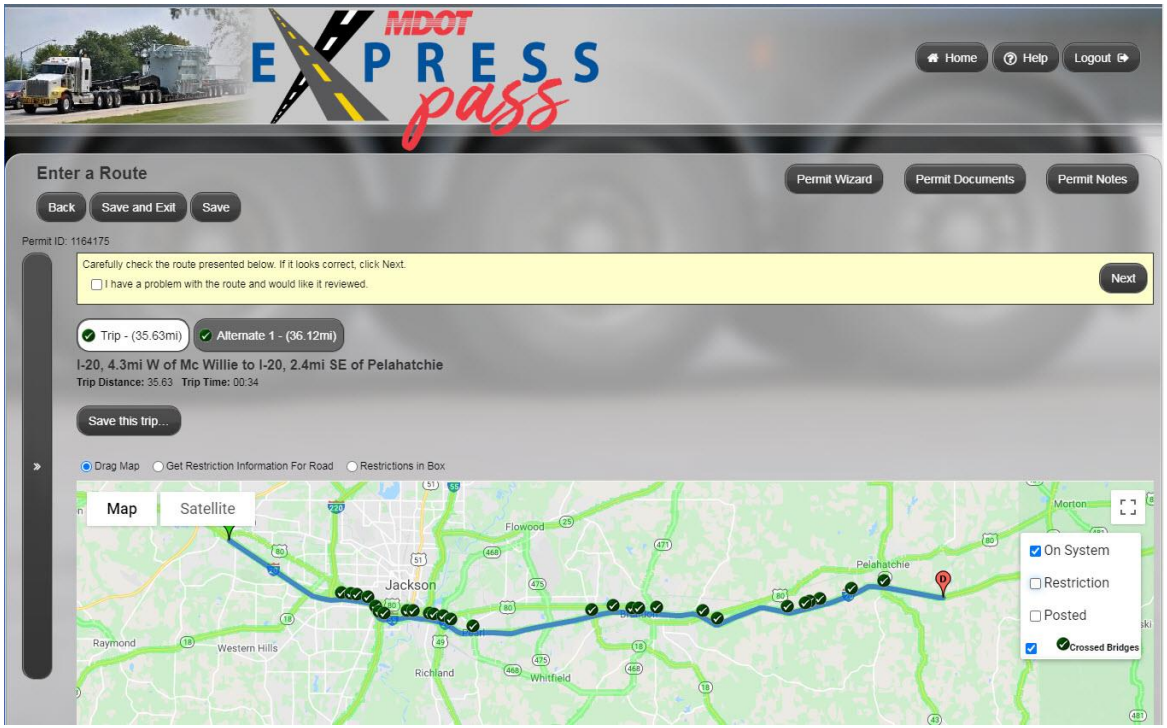
Load Rating During Routing

* A good solution is to first find a route using only dimension restrictions
* This will take only a second or two.



Load Rating During Routing

* Identify the bridges along the route

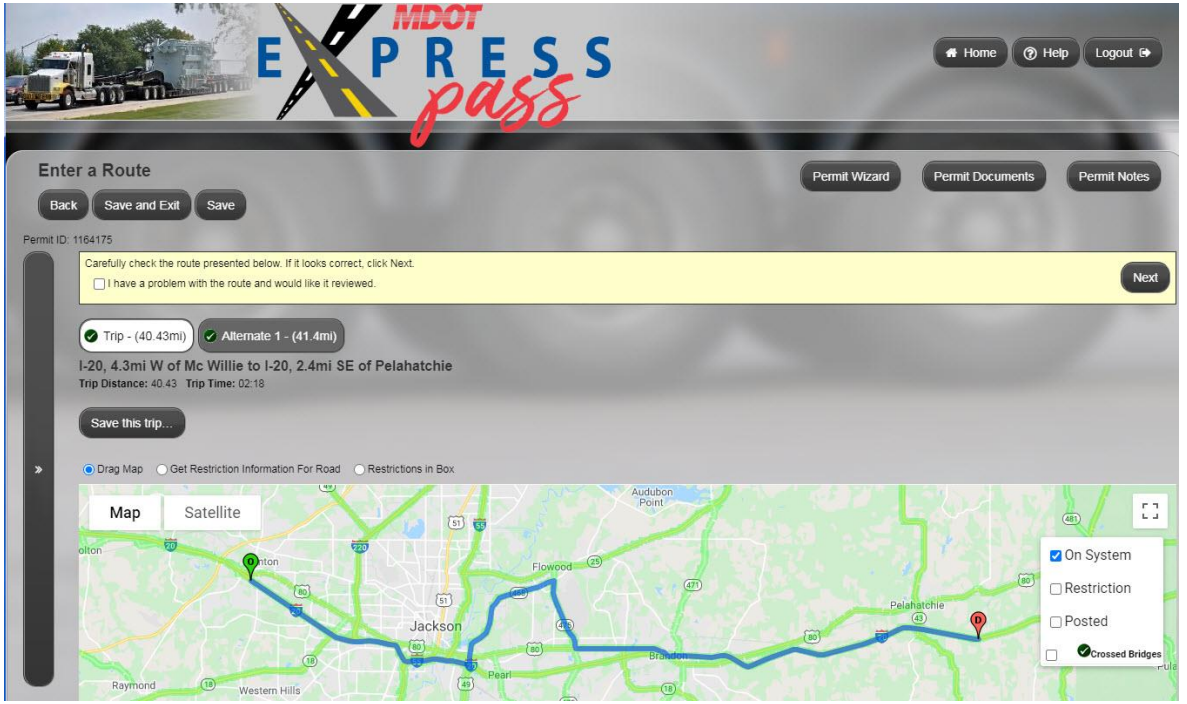


Load Rating During Routing

* This will reduce the list of bridges from thousands to a few hundred at most
* Rate all of these bridges that can be rated using the Load Rating Tool. Generally this will take from a few seconds to maybe 15 seconds

Load Rating During Routing

* If any bridge fails, then add the roads carried on the bridge to the restrictions, and route again.

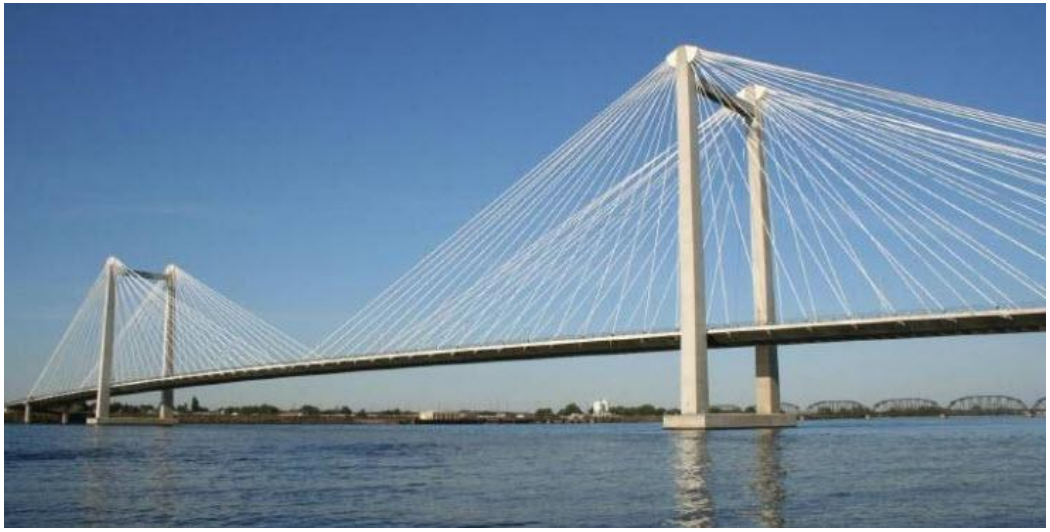


Load Rating During Routing

* Repeat this process until a route is found or the system determines no route can be found

Load Rating During Routing

* Limitations to this process:
  * Bridge types that cannot be rated by BrR or the Load Rating Tool will not be rated for this load



Load Rating During Routing

- Options for these Omissions:
  - Identify which bridges do not need to be reviewed until super heavy criteria is met
  - Alternative fast options:
    - Simple moment comparison
    - Axle weight limits or axle group limits
    - Table rules
  - Prioritizing bridges – implement models for bridges with known lesser capacity. Assume a bridge is sufficient for a non-super load if it does not have a model

Load Rating During Routing Summary

* Several states have successfully utilized the Load Rating Tool to perform load rating on heavy but less than super heavy loads during the routing process.

Load Rating Super Heavy Loads

Load Rating Super Heavy Loads

* Generally almost all bridges crossed must be analyzed
* Frequently uses non-standard gauge configurations
* Often will require crawl and single lane conditions to pass bridges
* Industry understands these permits require additional time

Load Rating Super Heavy Loads

* PSDC has seen two options for NSG:
  * Running NSG vehicles using full BrR
  * Identifying applicable weight reductions based on the vehicle

Load Rating Super Heavy Loads

* Typical Super Heavy workflow
  * Run route using only dimensional and posted bridge restrictions
    * Optionally use Load Rating Tool to identify bridges that cannot pass
  * Create a Bridge Study to store the results of the analysis and to apply conditions to particular bridges
  * Wait for full BrR to finish analyzing bridges that LRT cannot
  * Review results in the Bridge Study and identify bridges that need additional or alternative review

Load Rating Super Heavy Loads

* Load Rating Tool options when routing a super heavy permit – standard gauge loads
  * LRT can be used to identify bridge failures during routing to get a better route
  * However, the system should allow the LRT analysis to be turned off – frequently the ideal route for a super load cannot be found with the LRT analysis
  * The results of the LRT can be stored in the Bridge Study
  * LRT can be configured with scenarios to identify crawl and single lane conditions that can allow loads to pass bridges

Load Rating Super Heavy Loads

* Load Rating Tool options when routing a super heavy permit – non-standard gauge loads
  * LRT generally should not be used when identifying the initial route
  * LRT cannot perform a NSG analysis
  * Frequently the NSG analysis will be required to pass bridges

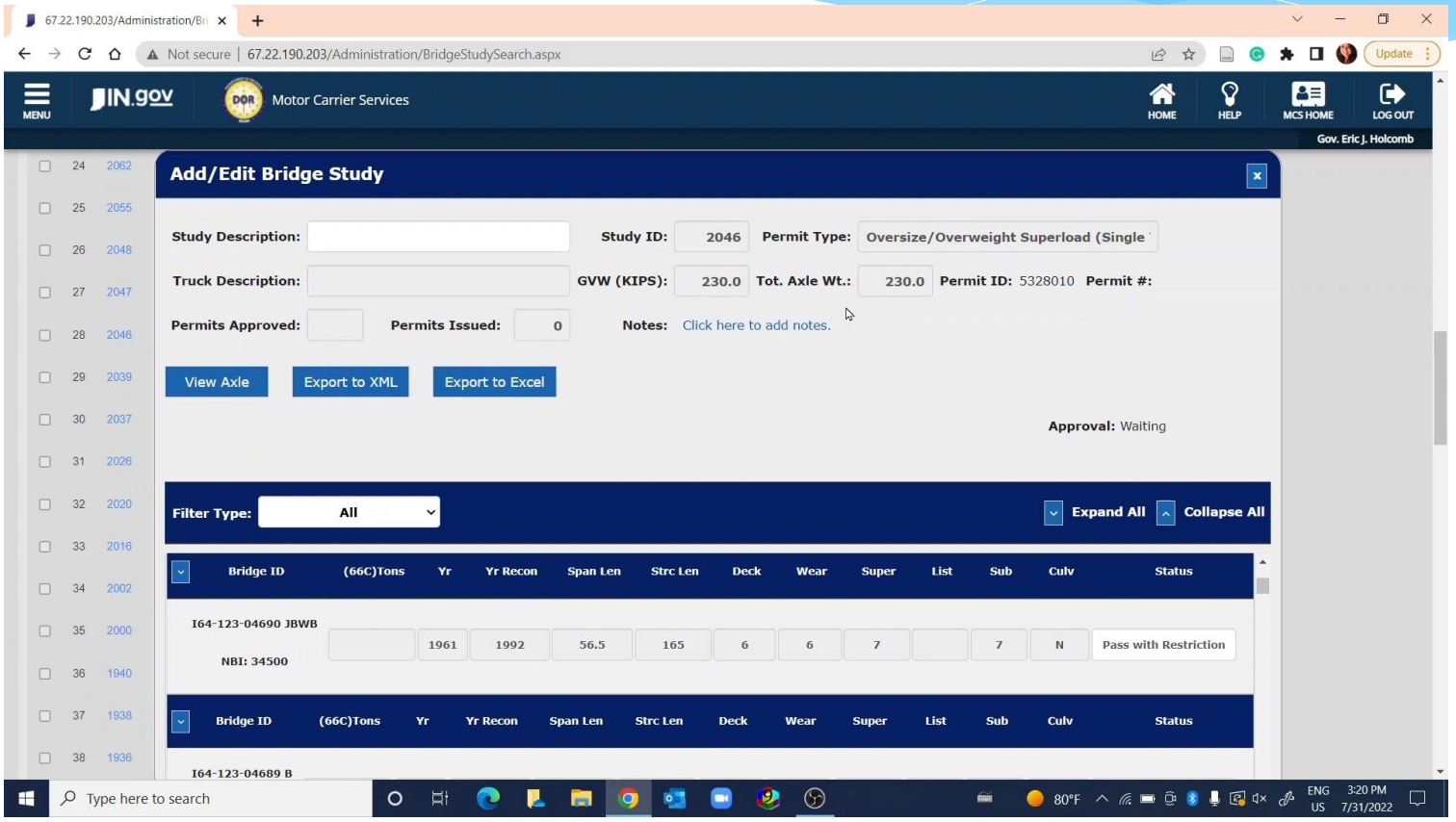
Load Rating Super Heavy Loads

* Full BrR analysis using the Bridge Study
  * Once the Bridge Study record is created, all bridge along the route have been identified, the full BrR analysis can start
  * If the vehicle is not NSG then the LRT results can be used for the analysis for those bridges that LRT can analyze
  * If the vehicle is NSG then the full BrR analysis should be run on all bridges

Load Rating Super Heavy Loads

* When the Bridge Study is complete
  * Bridge engineer reviews all results
  * Identifies crawls and other conditions
  * Identifies bridges that cannot be analyzed with BrR
  * BrR version 7.0 and above can run all BrR bridge type using the automation

Load Rating Super Heavy Loads – Bridge Study Screenshot



New Configuration Capabilities in 7.X and Higher

* Following configurations are available to the permitting system load ratings (can be set by bridge or scenario):
  * Analysis Type
  * Rating Method
  * Preference Settings
  * Scale factor
  * Frequency
  * Loading Condition
* Providing additional configuration through the automated system. Get exactly the rating you need

Using AASHTOWare BrR System with Automated OS/OW Permitting and Routing Systems – Summary

* Many State Permit Offices have successfully routed heavy but not super heavy loads using the Load Rating Tool as part of the routing process
  * Generate a route using restrictions but not load rating
  * Identify the bridges along the route and rate using LRT
  * If any bridge fails reroute around the bridge
  * Continue until a route is found
  * In most instances the permit can be auto-issued
* Items to keep in mind: Bridges that cannot be rated with LRT

Using AASHTOWare BrR System with Automated OS/OW Permitting and Routing Systems – Summary

* Many State Permit Offices have successfully routed super heavy loads using the full BrR analysis using a Bridge Study
  * Generate a route using restrictions and optionally LRT
  * Full BrR will analyze bridges not analyzed with LRT
  * Full BrR analysis used for NSG loads
  * Review bridges that cannot be analyzed with BrR

Using AASHTOWare BrR System with Automated OS/OW Permitting and Routing Systems – Summary

* Virtually all configuration capabilities found in BrR can now be incorporated into the automation with a permitting system

Questions

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