

# Atlas and Fortis Railcar Project Updates

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**Nuclear Waste Technical Review Board**  
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This is a technical presentation that does not take into account the contractual limitations or obligations under the Standard Contract for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste (Standard Contract) (10 CFR Part 961).

To the extent discussions or recommendations in this presentation conflict with the provisions of the Standard Contract, the Standard Contract governs the obligations of the parties, and this presentation in no manner supersedes, overrides, or amends the Standard Contract.

This presentation reflects ongoing work to design, fabricate and test prototype railcars. No inferences should be drawn from this presentation regarding future actions by the U.S. Department of Energy (DOE or Department), which are limited both by the terms of the Standard Contract and Congressional appropriations for the Department to fulfill its obligations under the Nuclear Waste Policy Act, including licensing and construction of a spent nuclear fuel repository.



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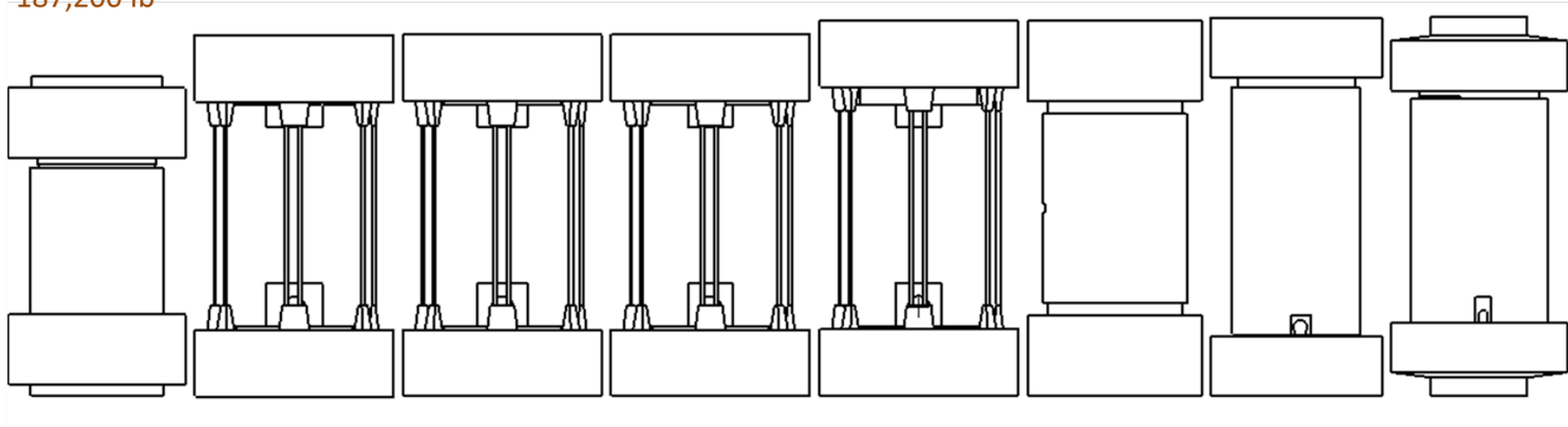
# Why Rail?

- **Loaded transportation casks for commercial spent nuclear fuel (SNF) will weigh 80 – 210 tons. The legal weight truck limit for highway transport is 40 tons gross.**
- **DOE and DoD have settlement agreements in place with three rail carriers agreeing to use railcars that comply with Association of American Railroads (AAR) Standard S-2043.**
- **Rail is the most suitable mode for large-scale transport of SNF in the US.**
  - The US Navy has been transporting SNF by rail since the 1950s

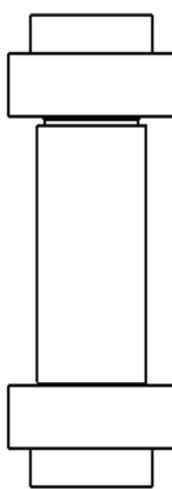
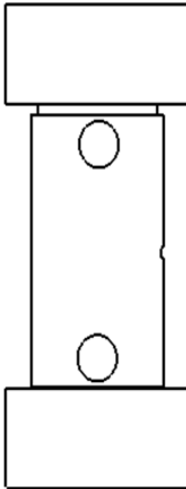
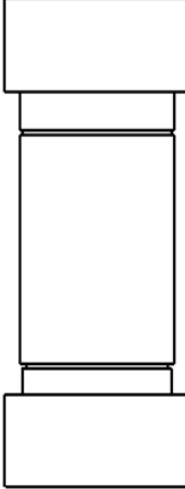
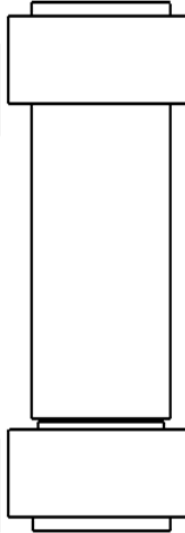
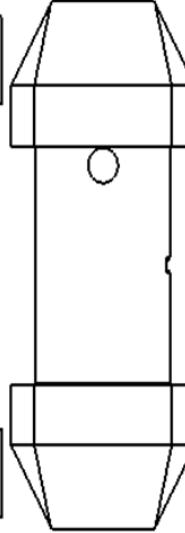


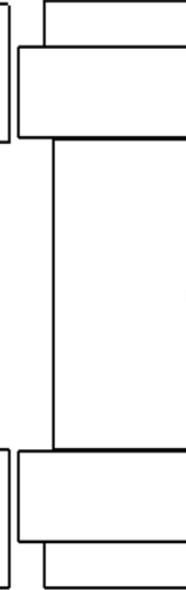



# Spent Fuel Transportation Casks (1 of 2)

| <u>HI-STAR HB</u> | <u>TN-40HT</u> | <u>TN-40</u> | <u>TN-32B</u> | <u>TN-68</u> | <u>MP197HB</u> | <u>NAC-UMS</u> | <u>NAC-STC</u> |
|-------------------|----------------|--------------|---------------|--------------|----------------|----------------|----------------|
| 128" dia          | 144" dia       | 144" dia     | 144" dia      | 144" dia     | 126" dia       | 124" dia       | 128" dia       |
| 230.8" long       | 260.9" long    | 261.0" long  | 261.0" long   | 271.0" long  | 271.25" long   | 273.3" long    | 273.7" long    |
| 187,200 lb        | 242,343 lb     | 271,500 lb   | 263,000 lb    | 272,000 lb   | 303,600 lb     | 255,022 lb     | 254,589 lb     |

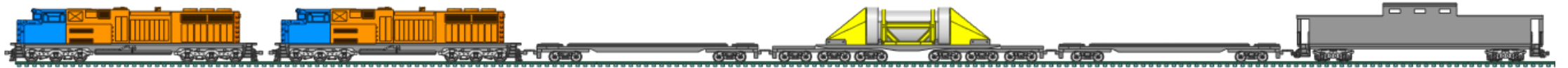


# Spent Fuel Transportation Casks (2 of 2)

| <u>HI-STAR 60</u>  | <u>MP197</u>   | <u>HI-STAR 180</u>   | <u>HI-STAR 100</u>  | <u>MP187</u>   | <u>NAC<br/>MAGNATRAN</u>   | <u>HI-STAR 190 SL</u>  | <u>TS125</u>   | <u>HI-STAR 190 XL</u>  |
|--|--|--|---|--|--|--|--|--|
| 128" dia<br>274.37" long<br>164,000 lb   | 122" dia<br>281.25" long<br>265,100 lb   | 128" dia<br>285.04" long<br>308,647 lb   | 128" dia<br>307.5" long<br>279,893 lb   | 126.75" dia<br>308.0" long<br>271,300 lb   | 128" dia<br>322.0" long<br>312,000 lb  | 128" dia<br>339.56" long<br>382,746 lb   | 143.5" dia<br>342.4" long<br>285,000 lb  | 128" dia<br>362.06" long<br>420,769 lb   |
|  |  |  |  |  |  |  |  |  |



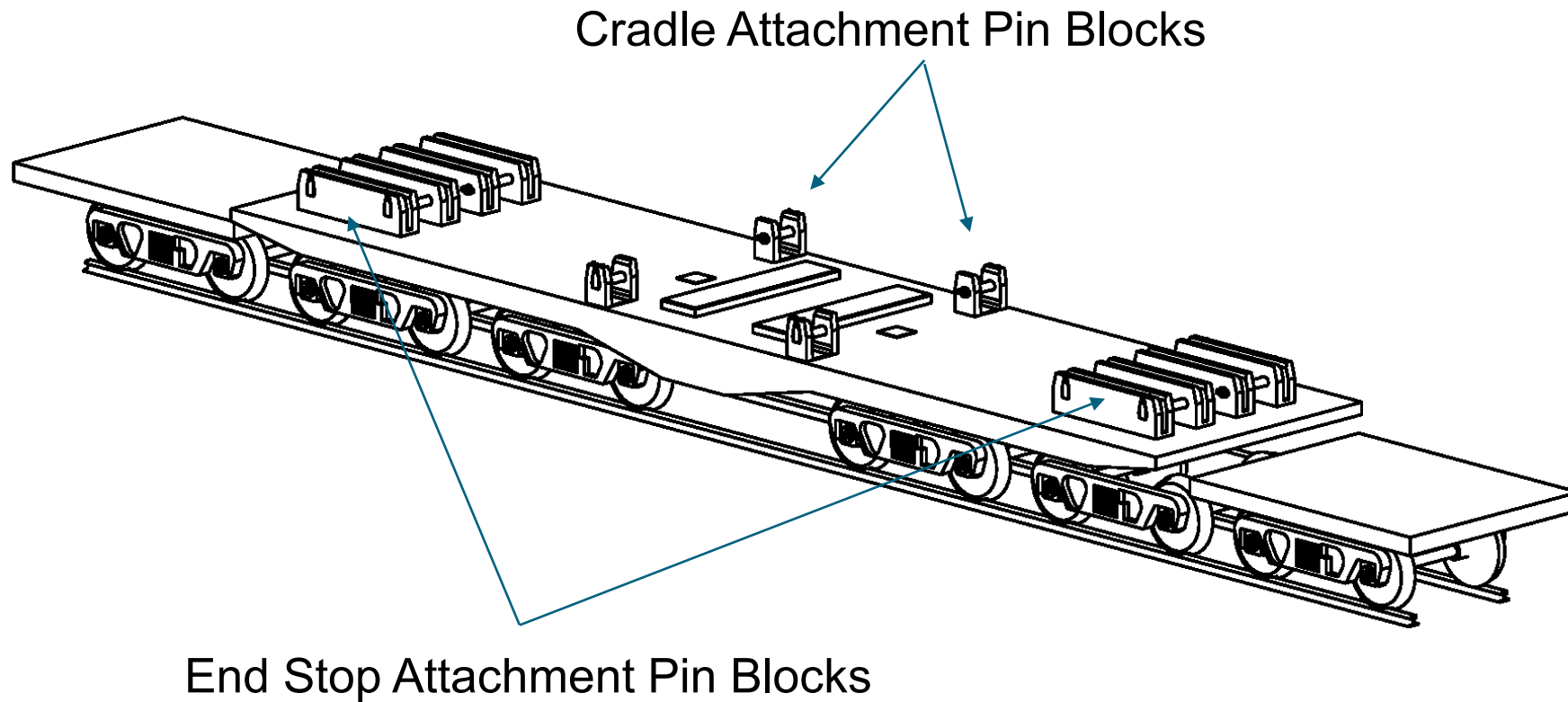
# AAR Standard S-2043



- The Association of American Railroads (AAR) is the standard-setting organization for railroads in North America.
- AAR Standard S-2043, *Performance Specification for Trains Used to Carry High-Level Radioactive Material*, was developed specifically for the transportation of spent nuclear fuel and high-level radioactive waste.
- Standard is intended to reduce risks of derailment.

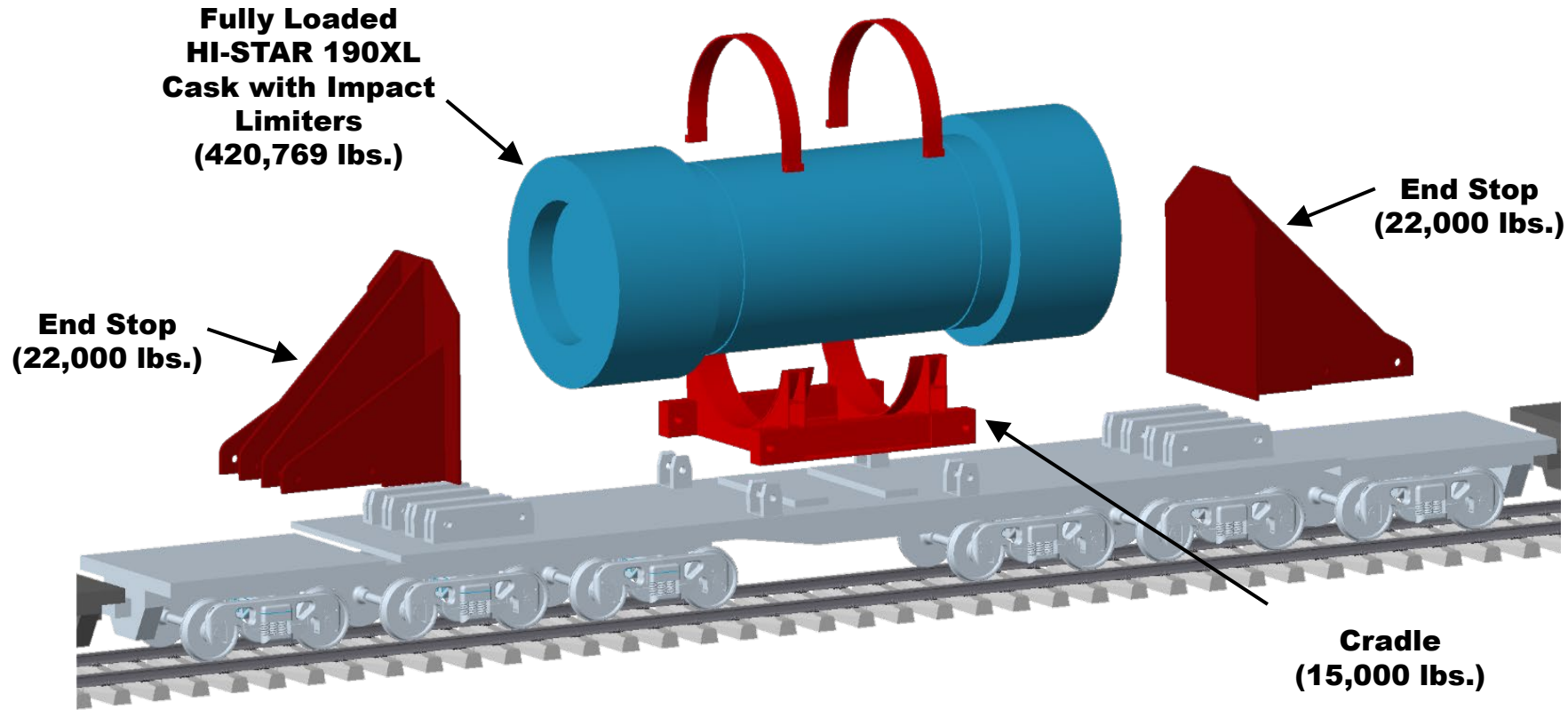


# Atlas Railcar Design: Attachment System





# Atlas Railcar Design: Heaviest Load



**Total Load: Approximately 480,000 lbs.  
Center of Gravity: 96.08 inches above the top of the rail**



# Railcar Photos: Atlas Railcar with Minimum Test Load



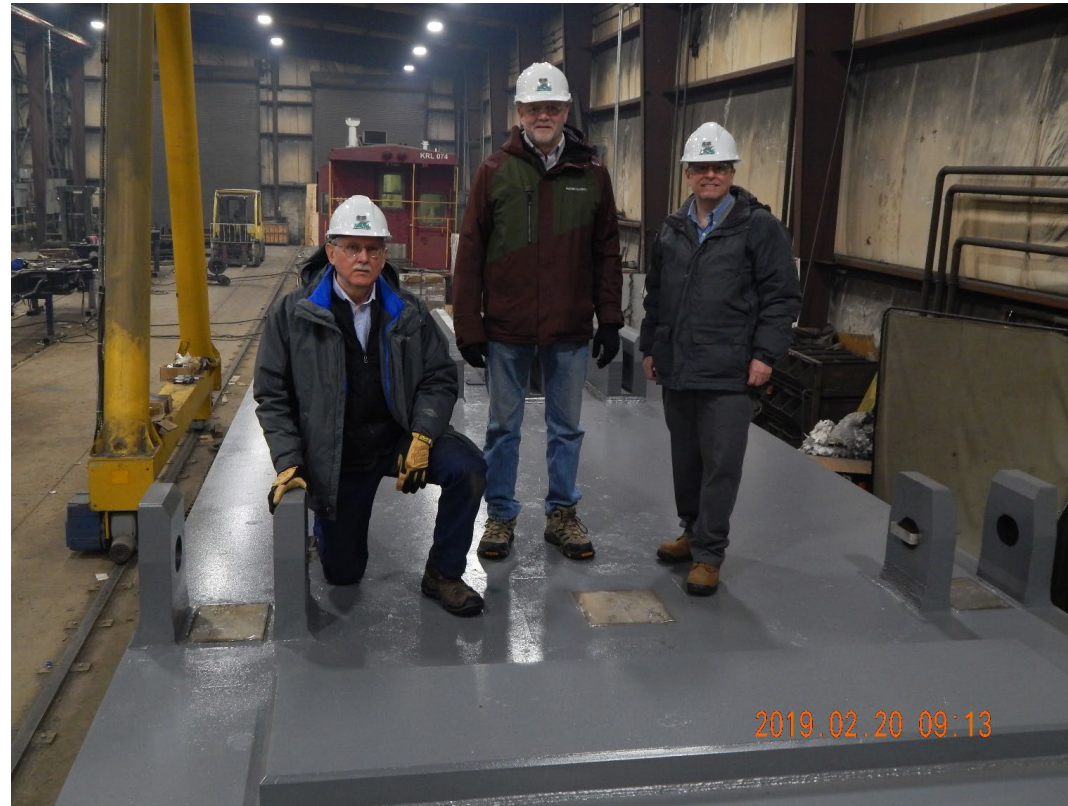
# Railcar Photos: Atlas Railcar with Maximum Test Load



# Railcar Photos: Cradle in Pin Block



# Railcar Photos: Pin Block



# Railcar Photos: Buffer Railcar



# Railcar Photos: Rail Escort Vehicle



# Accomplishments

- Atlas and Buffer railcars completed single-car testing and AAR approved each for multiple-car testing.
- DOE's Rail Escort Vehicle (REV) was fabricated and delivered to the Transportation Technology Center (TTC) in February 2022.
- AAR approved the REV for multiple-car testing.
  - US Navy conducted single-car testing for the REV
- Multiple-car testing underway for Atlas, REV, and Buffer railcars.





# Atlas Railcar Path Forward to Completion

- **Multiple-car testing of the complete spent fuel train:**
  - Off-site Revenue Service re-test scheduled for April/May 2023
  - Demonstration Test Run (Avondale, CO, to Scoville, ID, and return) scheduled for September 2023
- **Write-up the testing documentation and results to submit to the AAR.**
- **Multiple-car testing approval expected from AAR in late 2023 or early 2024.**



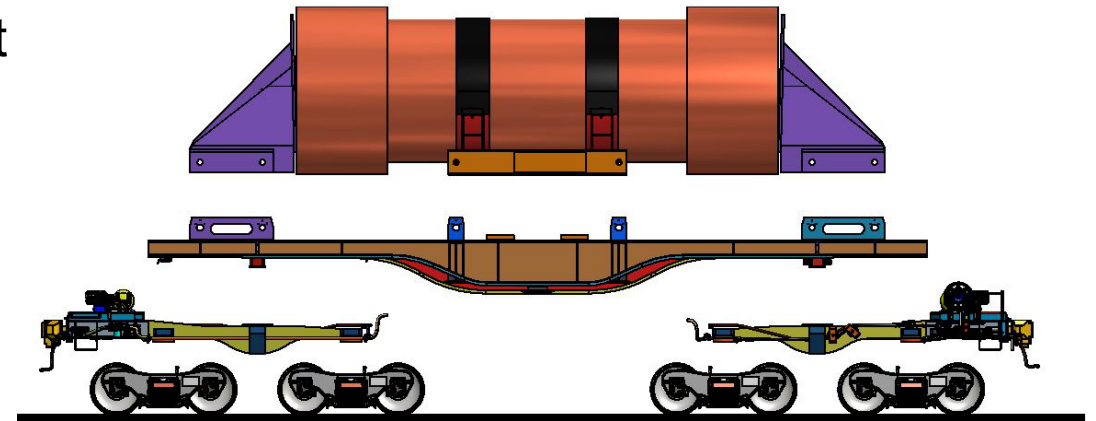
# Atlas Railcar Project Documentation

- **DOE has published reports on each phase of the railcar project. The Atlas and Buffer railcar designs are also available to the public.**
  - Phase 1: Conceptual Design
    - <https://www.energy.gov/ne/downloads/atlas-railcar-phase-1-final-report>
  - Phase 2: Preliminary Design
    - <https://www.energy.gov/ne/downloads/atlas-railcar-phase-2-final-report>
  - Phase 3: As-Built Design
    - <https://www.energy.gov/ne/downloads/atlas-railcar-phase-3-final-report>
  - Atlas Railcar Interface Control Document
    - <https://www.energy.gov/sites/prod/files/2019/12/f69/ne-atlas-railcar-report-120519.pdf>



# Railcar Design: DOE Fortis Railcar

- **Design phase of the Fortis railcar is complete**
  - Sharma and Associates led the design effort
    - 8-axle railcar
    - Uses the same payload attachment system as the Atlas railcar
    - Designed to be compatible with the Buffer railcar and the REV
  - AAR EEC approved the initial design in February 2021 and instructed DOE to begin the testing process.



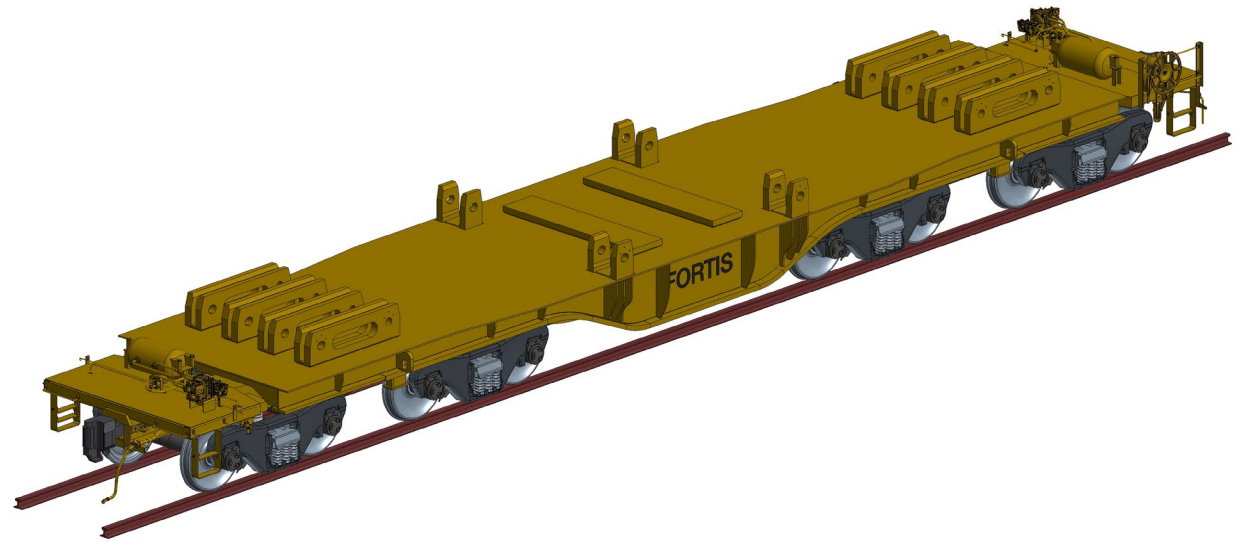
# Railcar Design: DOE Fortis Railcar

- **Fabrication and Testing Phase**

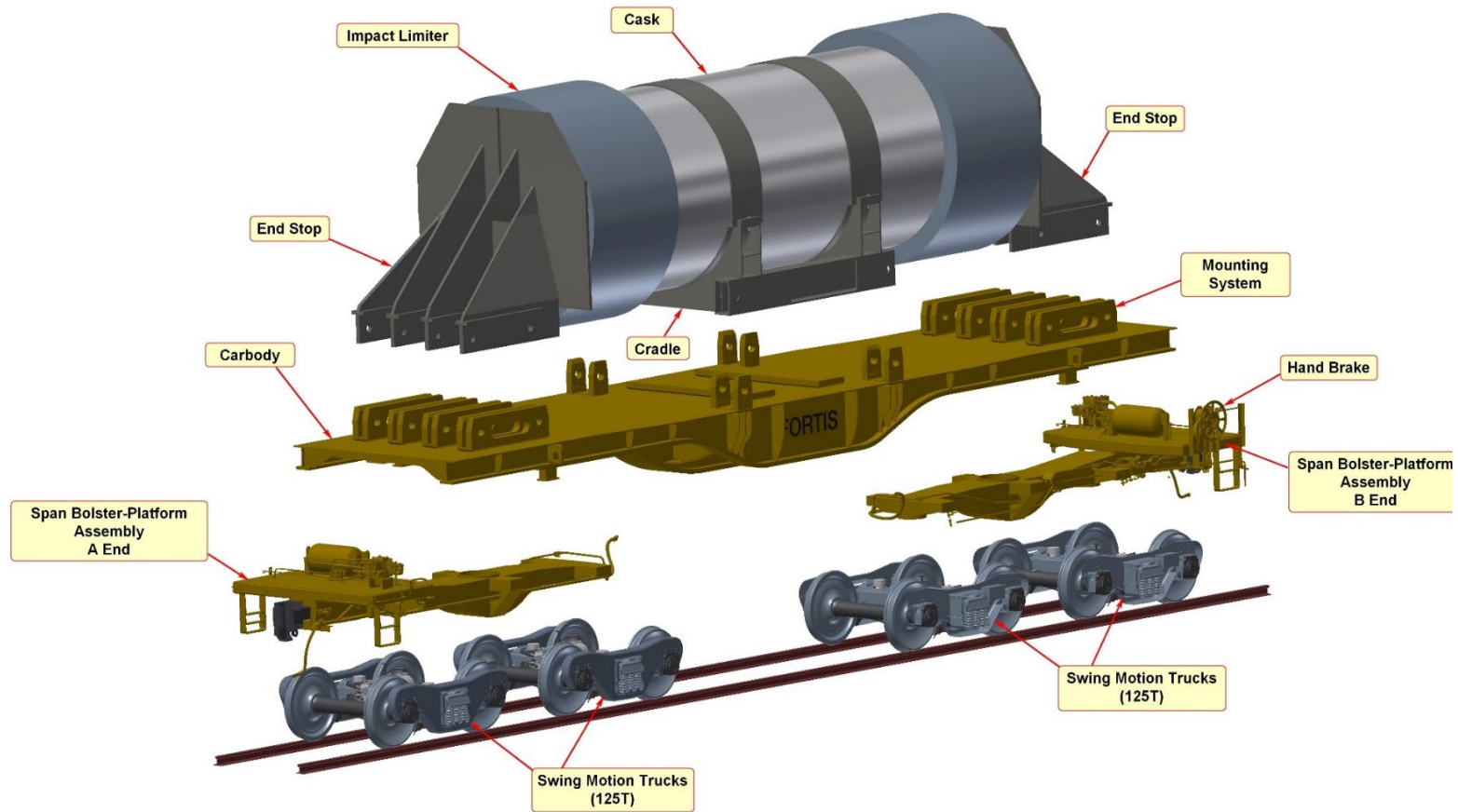
- Contract placed in late July 2022
- Contractor is ENSCO, Inc. with Kasgro Rail and other subcontractors
- Project kick-off in September 2022

- **Agreed to design adjustments with contractor prior to starting fabrication**

- Deck plate thickness changed from  $\frac{3}{4}$  inch to  $1\frac{1}{2}$  inch
- Some weld types were changed/updated



# Fortis Railcar



# Fortis: Path Forward to Completion

- **Fabricating Fortis prototype**
  - Procuring long-lead time components
- **Fabricating instrumented wheelsets**
  - Needed for testing
- **Railcar testing**
  - Testing will be done at the Transportation Technology Center in Pueblo, CO
  - Fortis will use the same test weights as the Atlas railcar
  - Fortis will use the buffer railcar and REV for multiple-car testing
  - Fortis is planned to be ready to use by 2026



Transportation Technology Center Rail Test Track in Pueblo, CO.  
Photo credit: ENSCO, Inc.

# Integrated Security and Safety Monitoring System (ISSMS)

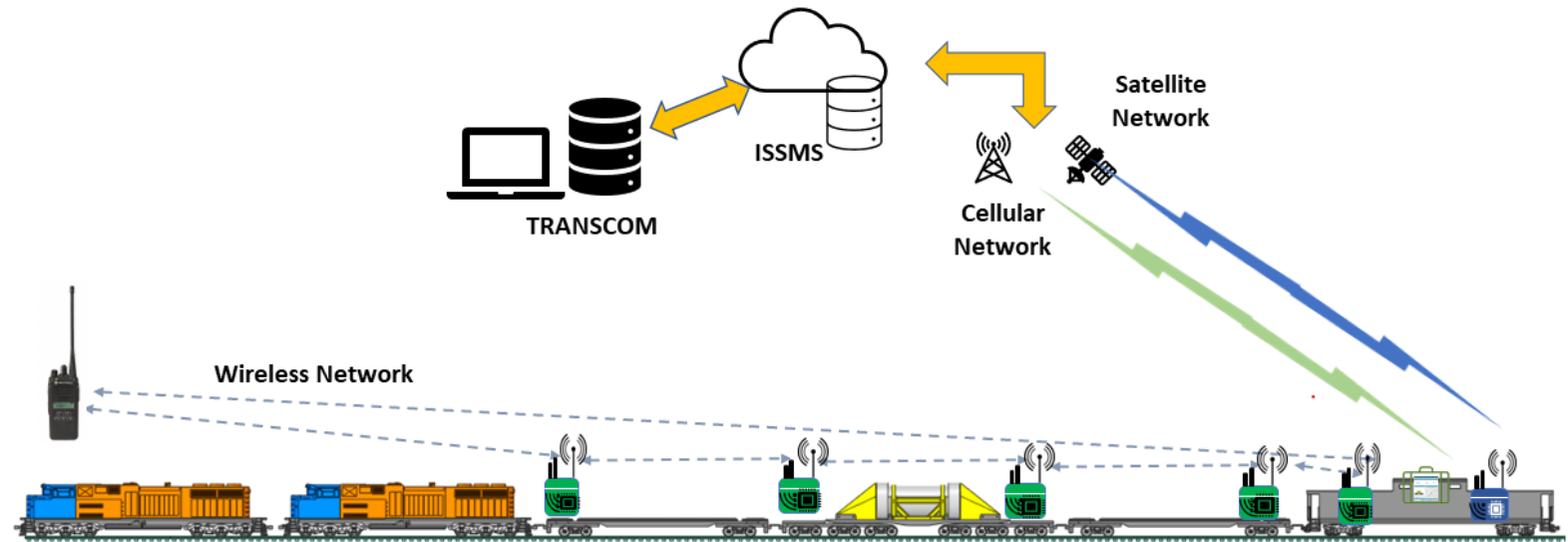
- System will meet DOE requirements for security and AAR S-2043 requirements for safety.
- Project kicked off in late 2020 to develop a DOE-owned ISSMS for use on S-2043 railcars.
- Conceptual design was completed in 2021.
- Prototype design and fabrication is in process for testing during the Atlas multiple-car test program in 2022 and 2023. The ISSMS will also be used on Fortis.
  - Intended to integrate with DOE's existing TRANSCOM system for tracking DOE shipments



# System Description

- **ISSMS is comprised of three subsystems:**

- On-Car Subsystem
- REV (Rail Escort Vehicle) Subsystem
- Cloud Subsystem





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