

Canadian Consulting Engineer Awards 2023

Historic Wooden Roller Coaster Restoration



Remediation of a historic landmark wooden roller coaster.

Company Information

**Company Name:**

Hedgehog Technologies

Project Owner

Pacific National Exhibition

Services Provided:

Functional Safety Engineering
Structural Engineering
Mechanical Engineering

Lead Project Engineers:

Dr. Michael Wrinch, P. Eng., FS. Eng.
Matthew Keeler, P. Eng., FS. Eng.
David Ryan, P. Eng.
Erin Martin-Serrano

Other Consultants:

Read Jones Christoffersen (RJC)
Metro Testing and Engineering

Other Contractors:

Martin and Vleminckx Rides (MVR)
Kumbak – The Amusement Engineers
Civionic Engineering and Consulting

Submitted for:

Canadian Consulting Engineer Awards 2023

Project Completion Date:

August 2022

Project Summary

SUMMARY

Playland's Wooden Roller Coaster is Canada's oldest operating wooden coaster built in 1958 and designed by the award-winning Carl Phare and Walker Leroy. The attraction is built from old-growth Douglas fir which in 2009 was given "Landmark" status by ACE (American Coaster Enthusiasts).

Hedgehog Technologies in collaboration with the PNE, supported the remediation construction of the coaster which became operational in 2022. The goal was to preserve the historic wooden design while incorporating newer materials.

Project Highlights

Complexity

The building science team at Read Jones Christofferson (RJC) conducted a thorough assessment of the wood condition. Strain gauges were then installed for analysis by the structural engineering team at RJC with on-site construction completed by Martin and Vleminckx Rides (MVR), a manufacturer of wooden roller coasters.

The project had expertise in functional safety and mechanical engineering from Hedgehog Technologies, as well as building science and structural engineering from RJC. This was in accordance with the requirements of the local regulator, Technical Safety BC.

A functional safety risk assessment was completed on the train cars and new safety-rated locked and monitored seatbelts, manufactured by Kumbak – The Amusement Engineers, were installed to meet updated safety standards.

Local regulator requirements were reviewed by Hedgehog Technologies with the appropriate BC P. Eng. assigned scope to successfully open the ride in 2022 following the previous operational year where it was not available to the public.



Project Highlights

Innovation Part I



The process of conducting a mass timber structural analysis for an historic structure while blending traditional techniques with modern approaches is a meticulous and thoughtful endeavor. It requires a deep understanding of the structure's historical significance, as well as the principles of structural engineering. This holistic approach ensured that the structural analysis not only met modern code requirements, but also preserved the integrity and authenticity of the historic coaster.

The initial step involved a comprehensive assessment of the coaster, including a thorough visual inspection to identify visible signs of deterioration and a review of historical records and documentation to understand the original construction techniques and materials used.

The original coaster design blueprints from the 50's were used with the strain gauge data and old growth timber strength testing to outline the construction requirements, maintaining the original design intent.

Strain gauge testing was completed in November, creating challenges as the coaster had never operated at this time of the year previously. The PNE maintenance team worked diligently to get it running for a month to gather data for the structural team's analysis.

Project Highlights

Innovation Part II



A structural analysis was then conducted, reviewing traditional construction techniques and design principles used during the time when the historic structure was built. This knowledge provided valuable insights into the load-carrying capacity of the original mass timber elements.

RJC conducted the structural analysis to simulate real-world conditions and assess the load-carrying capacity of the structure under different load scenarios. Based on the results of the structural analysis, remediation details were developed.

Once approved, the remediation upgrades were implemented with great care, following best practices and guidelines for working with historic structures. Regular monitoring and maintenance were then conducted to ensure the ongoing performance and structural integrity of the coaster, addressing any potential issues that would arise.

In conclusion, a comprehensive mass timber structural analysis for an historic roller coaster, blending old techniques with new, involves a meticulous process that considers the historical significance of the structure, utilizes modern tools and techniques for structural analysis, and incorporates remediation upgrades that respect the structure's authenticity. This approach ensured the load capability of the coaster while preserving its cultural and historical value.

Project Highlights

Environmental

Environmental sustainability is a key aspect of the restoration project of the historic wooden roller coaster. Unlike building a brand-new coaster from scratch, restoring an existing one has a significant positive impact on the environment.

By opting to restore the existing wooden roller coaster instead of constructing a new one, the project has avoided the negative environmental effects of manufacturing new materials such as wood, steel, concrete, and other resources that are commonly used in roller coaster construction.

The extraction, production, and transportation of these materials often result in carbon emissions, energy consumption, and other environmental impacts. However, by repurposing and restoring the existing coaster, the project has reduced the demand for these new materials, helping to conserve natural resources and lower carbon emissions associated with manufacturing and transportation.

By choosing to restore the historic wooden roller coaster instead of building a new one and incorporating strong remediation measures, the project has taken significant steps towards minimizing its environmental impact and promoting sustainability in the local community.



Project Highlights

Meeting Clients Needs

To meet the client's needs for the PNE Historic Wooden Roller Coaster Restoration project, Hedgehog Technologies collaborated with the PNE, RJC, MVR, and Kumbak to ensure a successful restoration while incorporating newer materials. The project was completed in August 2022, with the coaster becoming operational in the same year.

The restoration of the historic wooden roller coaster preserved its cultural heritage and nostalgic value, contributing to the community's sense of pride and identity. Additionally, the project promoted environmental sustainability by restoring the ride using newer materials with the old rather than constructing an entire ride from scratch.

In conclusion, Hedgehog Technologies, in collaboration with other stakeholders, met the client's needs for the PNE Historic Wooden Roller Coaster Restoration project by utilizing innovative methods, preserving cultural heritage, promoting environmental sustainability, and contributing to the social and economic well-being of the community.



Project Highlights

Social/Economic Benefit



Restoring a historic wooden roller coaster can bring about significant social and economic benefits. First and foremost, it preserves a piece of cultural heritage and nostalgia, providing a sense of community pride and identity. Roller coasters are often beloved symbols of amusement parks and recreational destinations, and restoring a historic wooden roller coaster can help to maintain and promote the history and character of the local area, attracting tourists and visitors who are interested in experiencing a piece of the past.

In summary, restoring a historic wooden roller coaster has social and economic benefits including preserving cultural heritage, boosting tourism, and instilling a sense of pride in the city. It enhances the sense of community, generates revenue, and contributes to the overall economic development of the area.

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Thank You



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