HEAVY MOVABLE STRUCTURES, INC.
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Miter Rail Improvements – Union Pacific "I" Street and Martinez Bridges

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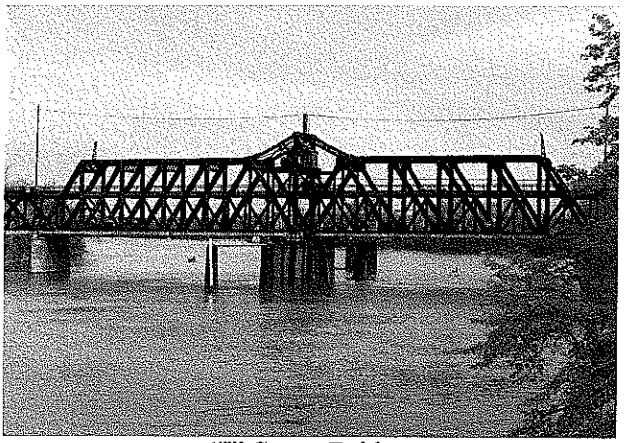
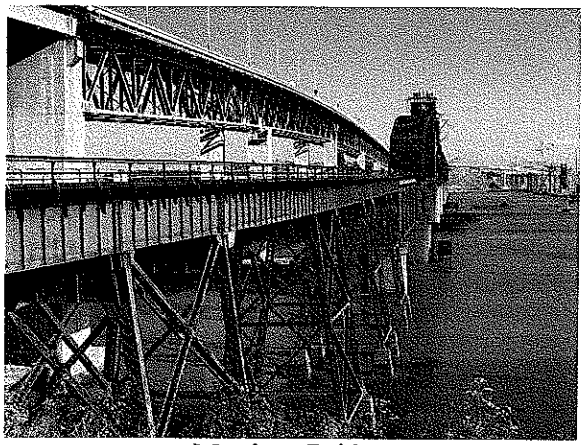
Abstract

The "I" Swing Bridge and Martinez Lift Bridge are on a busy northern California railroad corridor used by freight trains and Amtrak passenger trains. Over time the miter rails and tie decks deteriorated to the point that train speeds were reduced and excessive maintenance was required. These projects to replace the miter rails and upgrade to a steel tie deck were undertaken to improve bridge performance.



"I" Street Bridge



Martinez Bridge

Rail traffic is heavy and frequent on these bridges. The project objectives were to make improvements with minimal impact on rail traffic. With that in mind, all components were preassembled into panels to speed the installation. Holes for bolts were predrilled and machinery mounts were installed ahead of the track work. This made for a speedy installation with a minimum of down time.

The miter rails that existed on both bridges were of the cast manganese design. They were worn and had been field welded numerous times. Due to the wear and limitations of the miter style of the rails, there was excessive pounding that was damaging to the rail and bridge structure.

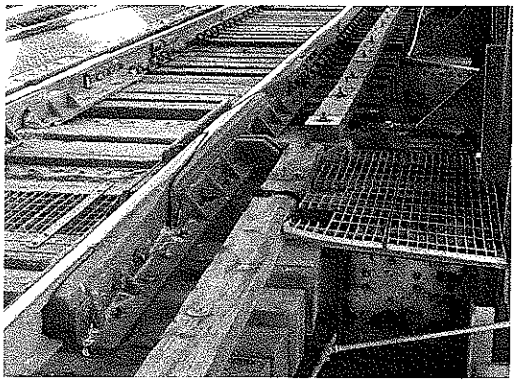
The replacement miter rails were the RIDEX® brand by CMI-Promex, Inc. that feature a rider rail alongside the running rails to carry the wheel over the gap. This design significantly reduces pounding and has replaceable parts for wear.

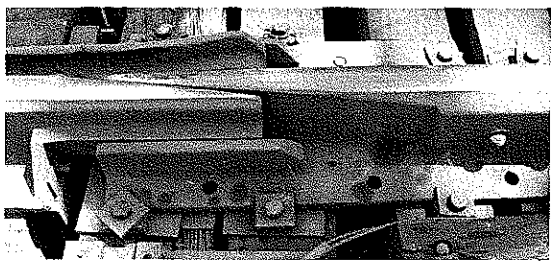
An improvement to the miter rail support structure was required to improve the ride and longevity of the new miter rails. Steel ties custom manufactured for each bridge were used to provide a stable, sturdy platform for the new trackwork.

Upon completion of the project, ride quality improved noticeably and the maintenance requirements were significantly reduced.

Bridge Descriptions

The "I" Street Bridge is a swing span across the Sacramento River just south of the Amtrak station in Sacramento, California. The bridge was constructed in 1911 by the Southern Pacific Railroad. It is 833 ft long with a 390 ft swing span. At the time of construction this was the heaviest swing span in the country. The bridge has a unique configuration with a 2-lane highway on the upper deck and two-track railroad on the lower deck. Prior to the project, the miter rails were three piece cast manganese design on a wood tie deck. The miter rails were in poor condition having been weld repaired in the field many times.





The Martinez Bridge is a vertical lift bridge across Suisun Bay between Martinez and Benicia, CA. Constructed in 1929 by the Southern Pacific, it is a 5603 feet long, two track bridge with a 328 ft long lift span in the middle. It also had cast manganese miter rails in poor condition on a timber deck.

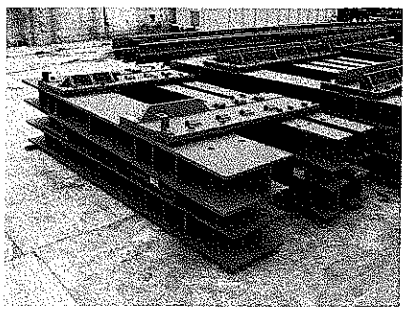
Project Description

Initially, the bridges were surveyed to measure the existing elevations of the bridge steel and rails. The existing tie plan and other significant features such as floor beams, lateral supports and bridge machinery were recorded.

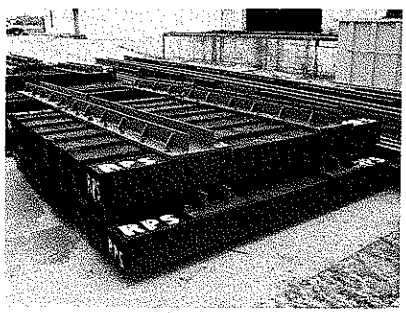
The design effort included layout of the new tie plan, superimposing rail plates on the tie plan and application of the rail in the rail plates. Rail lift machinery was required on the "I" Street Bridge. A hydraulic system with return spring was used to lift the rails up and then hold them in the down position.

The plans were reviewed by the railroad and then manufacturing proceeded.

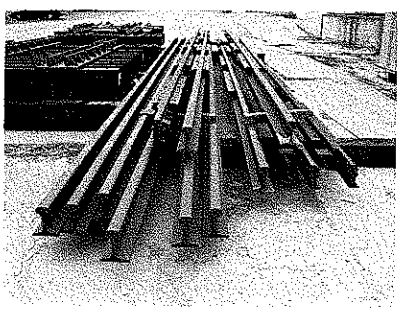
Upon completion of the manufacturing, the rail plates and ties were assembled into prefabricated panels to speed the installation. The head block ties (steel ties) were assembled with the rail plates and impact to help cushion the rails. Adjacent timber ties were also assembled into panels.



Steel Tie Panels

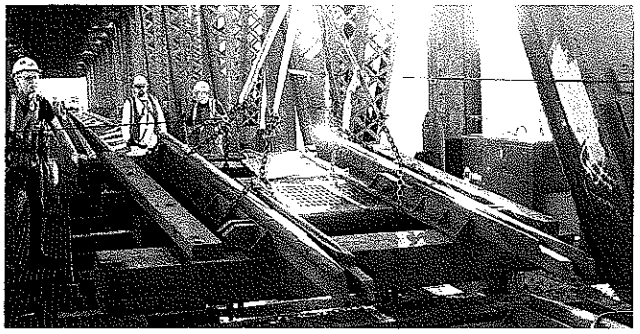


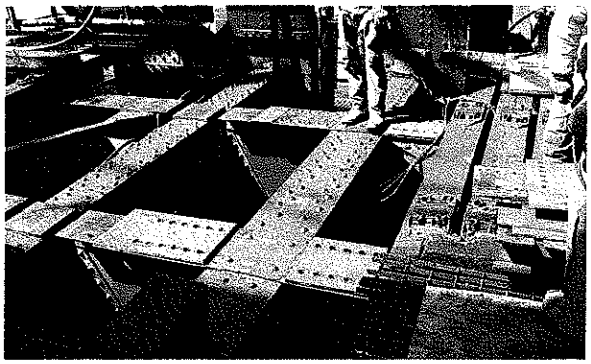
Wood Tie Panels



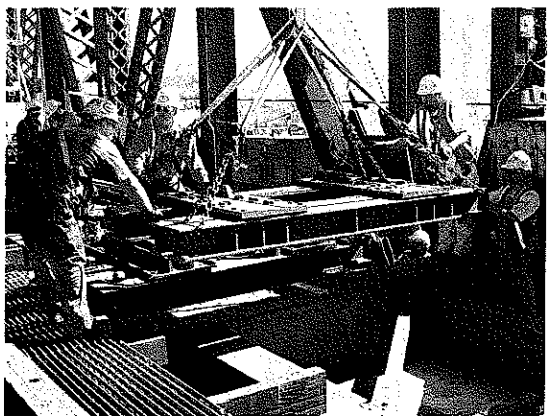
Rails

Installation began with the removal of the existing miter rails and tie deck. The running rails were cut in the approximate locations of the new joints and the rails unclipped. The track segments were then cut into sections and removed in panels to save time.

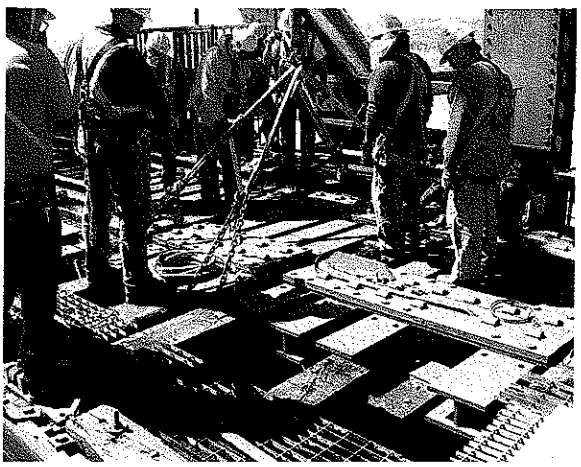




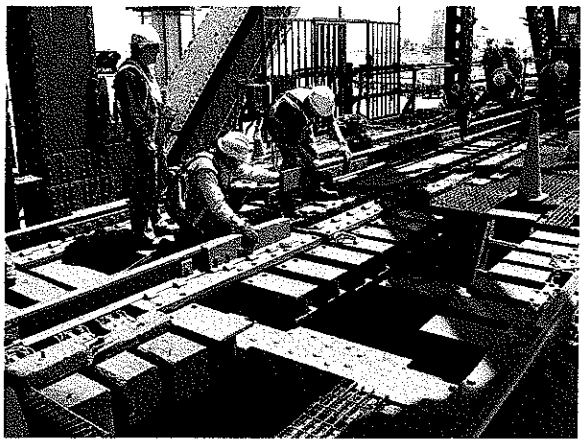
The stringers and floor beams were inspected and cleaned prior to placements of the panels. Rivet spacer plates were positioned where necessary.

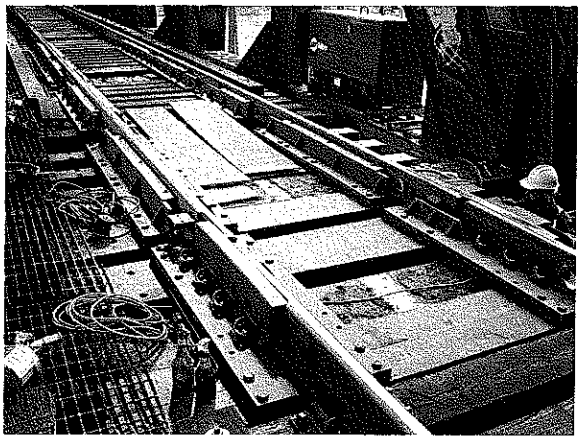


New panels were installed in reverse order. They were placed, shimmed to the correct elevation, rough aligned to the existing rails and then clamped into position. Since the ties had been individually made to suit the variances in the bridge steel, only minor shimming was required.



The miter rails were placed and adjusted for the proper projection lengths and gaps. Final adjustments were made to the plates to line up with existing rails and establish proper gauge throughout the miter rails. The rails were then cut to final length, attached to existing rails and clipped into the rail plates. Holes for fastening the steel ties to the bridge were drilled into the bridge stringers. Bolts were installed and tightened. Pilot holes had been pre-drilled in the steel ties to reduce the amount of field work required in bolting the ties to the bridge.





Signal circuits were connected and rail down sensors installed so that train operations could begin. Initially trains were allowed to pass at slow speed to settle the panels. Minor adjustments were then made and all bolting was checked for tightness. Normally train operations were resumed shortly thereafter.

Conclusion

The projects were a complete success. Normal speeds across the Martinez and "I" Street bridges were restored with a few days after installation. Pounding from miter rails has been virtually eliminated and miter rail maintenance has been significantly reduced. Through careful planning and engineering design, installation was accomplished with minimal interruption to railroad operations. Additional features of the new miter rails such as replaceable wear parts will benefit the railroad as time goes on.