

CASEStudy from Meadow Burke

All Aboard Florida – Meadow Burke's Double Shear Dowel



Rendering courtesy of Brightline

PROJECT SUMMARY

Historically, public transportation between Miami, Ft. Lauderdale and West Palm Beach has been minimal. Up until now a safe, reliable intercity travel method has not existed. All Aboard Railroad is the first phase of the Brightline Express Train Service that will connect passengers from Miami to Ft. Lauderdale all the way through West Palm Beach, transporting passengers at speeds between 80 and 125 miles per hour. The Miami portion of the \$3+ billion project began in early 2015 as part of the first phase of construction on the entire railway system. The project will take several years to complete and station construction projects at the four destination cities are at various stages. Skidmore, Owings and Merrill (SOM) is responsible for the design of the three South Florida stations.

The service between Miami and West Palm Beach launched in 2017 and service from Miami to Orlando will follow. Suffolk Construction was the general contractor for the Miami portion of the project working alongside Baker Concrete who was responsible for the concrete base of the railway system.

THE CHALLENGE

When designing a railway structure, it is mandatory that certain load requirements are met and exceeded for safety and long-term performance. The shear loading transfer requirement for the deck slab superstructure at the Miami Station was greater than 330 kips. Meadow Burke's Double Shear Dowel is designed to accommodate lateral movement in elevated slabs in buildings, making this a viable solution for the shear loading requirements. Additional fatigue testing for the Double Shear Dowels was required by AECOM, the company tasked with the Structural Engineering for the All Aboard Florida railroad track system, in order to demonstrate that the system would meet the expected loading requirements for the lifetime of railway superstructure. To demonstrate the superior performance of the Double Shear Dowels, laboratory testing was developed by ANCON due to their global and varied experience using the product. The testing subjected the dowel bars to an alternated load range of 25 kips per device with a minimum load of 3 kips; the maximum applied stress range at the extreme fiber (i.e. at the farthest point from the neutral axis) of the dowel pin being 24 ksi. The tests were conducted over 10 million cycles, corresponding to a service life requirement of 75 years. The Double Shear Dowel easily exceeded the acceptance criteria.

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THE SOLUTION

For the All Aboard Florida Brightline project, the Meadow Burke Double Shear Dowel was chosen due to its unique ability to transmit high shear loads in concrete from the elevated rail superstructure to the pier foundations below. To ensure optimum performance under cyclic dynamic loads, a modified version of the standard Double Shear Dowel was supplied. Welds between web plates and dowel bars were eliminated to avoid stress raisers that could potentially cause premature system failure. Clamps were fitted at the extremities of the dowel bar and tubular sleeves to guarantee parallelism.

Manufactured from duplex stainless steel to ensure a high degree of corrosion resistance with no requirement for additional protection, the two-part assembly provided All Aboard Florida and their engineering and construction teams with a simple, maintenance-free solution to control the longitudinal movement in the rail viaduct superstructure's concrete construction joints while transferring significant shear loading.

THE RESULT

Professional Engineering sealed designs conforming to ACI 318-11 specifications were provided to AECOM and the All Aboard Florida team to demonstrate that the dowels would meet the expected loading requirements for the lifetime of the railway superstructure. The innovative collaboration of Meadow Burke, Eriksson Technologies and ANCON produced a viable solution for the high-speed rail system that will provide transportation to millions of people. The All Aboard Florida project has a safe, cost-effective solution to withstand shear and moment loadings that will enable the project to continue towards completion.

TECHNICAL INSIGHT FOR THE DOUBLE SHEAR DOWEL

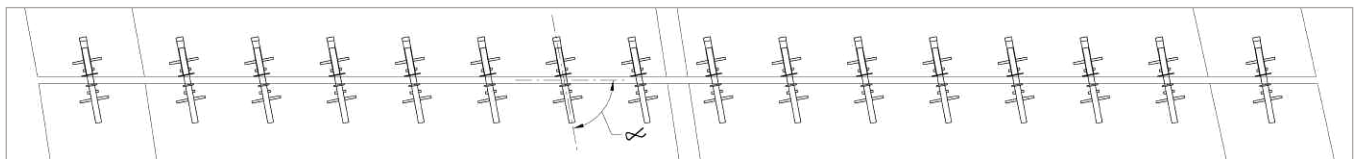
- Available in 10 unique sizes
- Manufactured from high-strength duplex stainless steel to ensure high degree of corrosion resistance
- A permanent movement joint solution with load carrying capacity up to 215 kips
- Two-part system including end plate with nail holes for attachment allows for simple, efficient installation
- FQ option allows for lateral and longitudinal movement
- Can be oriented horizontally to resist diaphragm shear forces
- Engineered solutions for slab-to-slab and slab-to-column permanent movement joints



Installation of the DSD and local reinforcement for high shear load transfer



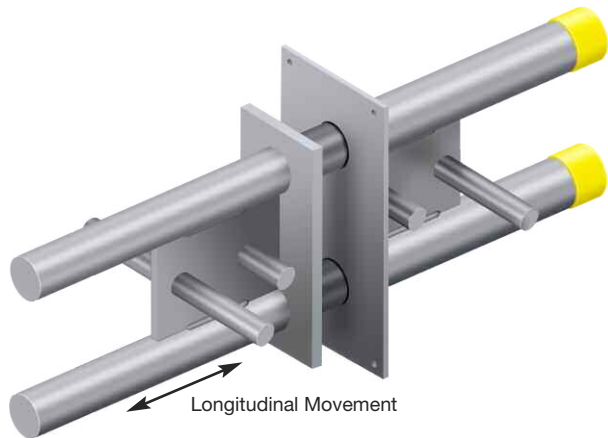
Two-part system including end plate with nail holes provides easy and accurate installation



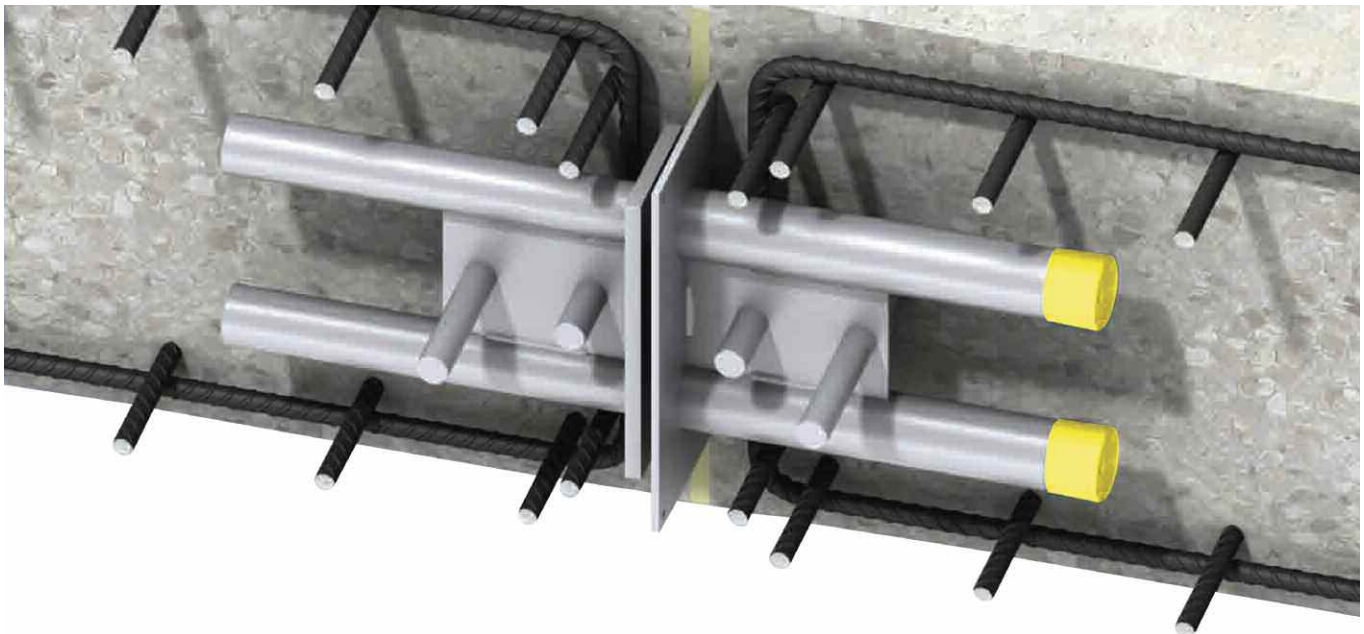
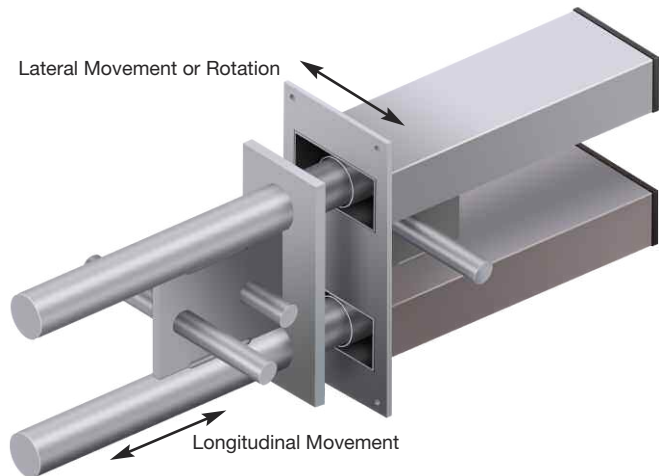
Design of DSD's to transfer shear loads and accommodate permanent movement in the rail platform superstructure

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DOUBLE SHEAR DOWEL



DOUBLE SHEAR DOWEL-FQ



For more information regarding the Double Shear Dowel or other Meadow Burke products, call us at 877-518-7665 or visit MeadowBurke.com

About Meadow Burke

Meadow Burke is a leading manufacturer and supplier of accessories used to connect, lift, reinforce and form within concrete construction. Our products and engineering enable safe, rapid and cost-effective construction, allowing you to deliver your projects on time and budget.