



Photos courtesy of the Michigan Department of Transportation



## Product

## Custom Heavy-Duty Speed Reducers

## Application

## Single-Leaf Bascule Lift Bridge

## Highlights

- Massive single-leaf bascule design replaced original double-leaf configuration
- Custom-designed gearboxes to meet specifications
- Three different drives were manufactured
- 150% load testing required at 75-degree incline for all reducers
- All manufacturing and testing performed in-house

Originally built in 1922, the Fort Street fixed-trunnion bascule bridge in Detroit, Michigan allows large cargo ships to travel the Rouge River while transporting material to the nearby Ford Motor plant. The double-leaf bascule design utilized below-deck counterweights to raise and lower the two roadway leaf/sections.

The busy 278 ft. long, five-lane bridge carries approximately 10,500 vehicles per day and averages eight to ten daily openings to accommodate marine traffic. After more than 90 years of service, the Michigan Dept. of Transportation approved the construction of an entirely new bridge, which was completed in 2016.

The new bridge design replaced the original double-leaf configuration with a massive single-leaf bascule (the largest in the U.S.) that included an overhead counterweight. Working closely with the bridge's engineering team and mechanical contractor, Nuttall Gear contributed to the development of the bridge's gearboxes, which needed to drive the new single-leaf bascule lift. Nuttall manufactured three enclosed drives featuring custom lubrication systems to ensure gearing immersion during the 75-degree rotation of the bascule leaf. Per specification, all steel materials were of U.S. origin. All units featured fabricated steel housings.

The drives met a 150% load test requirement, and all welds were inspected by an Independent Certified Weld Inspector (CWI).

- Primary Reducer (WDS13-SPC):  
Input rating: 300 HP @ 875 RPM, Reduction ratio: 7.57:1,  
Output torque rating: 246,000 lb.in.
- Secondary Reducers (WDS28-SPC):  
Input rating: 150 HP @ 115 RPM, Reduction ratio: 15:1,  
Output torque rating: 1,840,000 lb.in.

See back for more details.



Photos show Nuttall's massive in-house custom-built test stand with two of the 15,000 lb. Fort Street bridge reducers mounted and being tested on a 75-degree incline per specification.



## In-house Testing

To meet demanding moveable bridge drive customer load-test requirements, Nuttall Gear has invested in the expansion of its in-house gearbox testing capabilities. As the recognized leader in moveable bridge drives, Nuttall provides comprehensive, cost-effective and convenient load testing in-house.

Moveable bridge reducers can be quite large and need to be tested to very high torque loads. The bridges also have differential style gearboxes that require load equalizing on each output shaft.

Nuttall technicians utilize the latest testing techniques and technology, including laser alignment of all drivetrain components, twin dynamometers, and massive, custom-built test stands which allow two 15,000 lb. gearboxes to be mounted and tested back-to-back on inclines up to 75-degrees. The rotating stand tests for proper gearing lubrication while reducers are inclined.

*Nuttall customers enjoy significant benefits with its in-house testing capability including:*

- Complete control of the test schedule.
- Elimination of transportation costs to an outside test facility (which can be significant for a 15,000 lb. gearbox).
- Initial run and diagnostic challenges can be quickly overcome by Nuttall gear technicians without having to remove the gearbox from the test floor, saving considerable setup time.
- Nuttall Gear can be significantly more cost-effective vs. competitors that outsource testing at an off-site facility.

### **In-house testing capabilities include:**

- Test loads up to 500 HP
- Test loads up to 6 million lb.in.
- Differential gearbox testing
- Incline testing (up to 75-degrees)
- Temperature monitoring
- Sound monitoring
- Vibration monitoring
- Comprehensive test reports to customer specifications
- Many customized testing options available

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