

# Advanced Engineering

Testing Solutions

## MAE-MRAP-EOL-4000

Heavy-Duty Military End of Line Test System





# Military Vehicle Testing Experts

Mustang Advanced Engineering (MAE) has been a leading provider of comprehensive testing solutions for the development and testing of military engines, powertrain systems and complete military vehicles since its founding in 1975. A division of Mustang International, MAE has long been known as a trusted source of expertise in measurement and testing technologies for military application. World-class product offerings, custom design support and technical assistance, all backed by a dedicated factory customer service team has positioned MAE among the world leaders in providing advanced testing solutions for military applications.

## “Custom Solutions” Approach

MAE’s “custom solutions” approach focuses all of our product, application and automation experience on your specific heavy-duty military testing requirements. Our goal is to provide a tailored solution that optimize our customer’s testing and development operations by providing intelligent system designs coupled with outstanding technical expertise and world-class customer support.

MAE provides specialized testing solutions designed to meet your exact testing requirements for engine, transmission, powertrain, or component and sub-assembly testing applications. MAE’s modular design concept allows for a high degree of scalability, from simple durability testing to highly sophisticated and complex powertrain development test cells.

*Engine Dynamometers*



*Chassis Dynamometers*



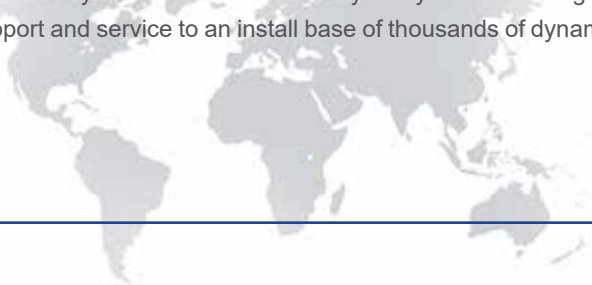
*Transmission Dynamometers*



*Tow Dynamometers*

## Global Market Leader

MAE offers a wide range of testing and measurement solutions, custom-tailored to fit your specific testing application. MAE has systems installed in virtually every corner of the globe and provides ongoing technical support and service to an install base of thousands of dynamometer systems worldwide.





**Heavy Duty Military End of Line Test System (Chassis Dynamometer/ABS Brake Tester) for MRAP vehicle production validation supplied to General Dynamics.**

## Heavy-Duty Military End of Line Testing System

MAE has designed and built some of the world's largest and most sophisticated heavy-duty chassis dynamometers for testing multi-axle all-terrain military vehicles. The MAE-MRAP-EOL-4000 is designed to carry out testing for medium-duty and heavy-duty vehicles with drive axles ranging from one to five, including 10x10, 8x8, 6x6, 6x4, 6x2, 4x4, and 4x2 configurations.

The system features roll sets that can all be operated independent of one another, cross-coupled, and configured to follow the feedback or command of any roll in the system. The system performs chassis dynamometer performance/functionality tests and ABS brake testing (optional) in a single position. The dyne provides axle weight capacity of 35,000 lbs. (15,875 kg), and the maximum wheel speed can be up to an impressive 100 mph (160kph).

### Configurations:

- One (1) axle
- Two (2) axle
- Three (3) axle
- Four (4) axle
- Five (5) axle
- Custom track widths
- Custom wheelbase accommodations



# System Software Package

The software package for the system is in use by a multitude of customers for end of line, and R&D applications. The original configuration of the MAE-MRAP-EOL-4000 was developed for General Dynamics and is in use currently. The package performs a multitude of tests (based upon configuration selected) including, but not limited to:

- ECM Connection Test
- ECM Fault Code Check
- Pre-test Visual Inspections
- Road Load Simulation
- Vehicle Warm-up
- Front Heat Reading Test
- Rear Heat Reading Test
- Parasitic Drag Test
- Exhaust Brake Test
- Percent Grade Test
- Full Acceleration to Governed Speed Test
- Maximum Power Lugdown Test
- Downshift Test
- Off Road Test
- Front AC Reading Test
- Rear AC Reading Test



- Post-test Visual Inspections
- Post-test ECM Fault Code Check
- ABS Speed Sensor Validation (optional)
- ABS Valve Activation Sequence (optional)



# Control System

To provide reliable, deterministic performance, the control of the test system is based on an Allen Bradley MicroLogix PLC . The PLC will be connected to a Windows® based operator interface PC via Ethernet. The MicroLogix controller is a world-class programmable logic control platform with advanced features and performance.

The computer system consists of a standard Personal Computer (PC) with minimum 22" flat panel LED monitor for interfacing with control room operator, 40" flat panel LED monitor for interfacing with vehicle operator mounted on a height adjustable, mobile stand.

The control system accomodates many different types of power absorbers:

- AC motors
- DC motors
- Water brakes
- Hydraulic shear brakes
- Eddy current power absorbers



1 2 3 4 5 6 7 8 9 10



# Vehicle Restraints

The test vehicle will be restrained using the supplied adjustable chains and ratchet binders which attach to either heavy duty D-rings integrated into the frame or floor anchors. The system includes the necessary hardware to anchor the vehicles from the front and rear during testing.



## Frame/Decking

Structural steel frame housing three separate roller sets, one for each axle. The middle roller set is fixed while the front and the rear are moveable to accommodate various wheelbases. An lock/brake holds the movable roller sets in place during testing. Steel diamond plate decking covers the top of the test system so the vehicle has easy ingress and egress. The decking system includes sliding plates to cover all gaps regardless of testing configuration. The test system can accommodate vehicles having axle weights up to 35,000 lbs.

# Vehicle Cooling Fan

The test system includes a portable vehicle cooling fan with 10,800 CFM output.

The fan is mounted in a steel frame with two (2) fixed 3" casters and two (2) swivelling 3" casters, and allows vertical adjustment. The fan is a 24" diameter tube axial fan with aluminum propeller directly driven by a 3 HP TEFC motor rated at 1,750 RPM and has integral wire inlet and outlet guards.



# Exhaust Extraction System

An exhaust collection/extraction system can be supplied with the test system. A typical exhaust extraction system consists of 5 HP, 3,000 CFM exhaust fan mounted in a platform with integral vibration isolation, shaft cooler, high temperature bearings, high temperature paint, back draft damper, weatherproof cover and drain connection. A 12" high temperature flexible hose with inlet tee, adaptors, handles, couplings, etc.





# Design & Engineering Support

Much more than the typical dynamometer manufacturer, Mustang has slowly and steadily grown into a highly-diversified, vertically integrated, technology-based engineering firm with world-class design, manufacturing, software, controls, and integration capabilities that position Mustang as a very unique supplier to the industry. In addition to a team of experienced software engineers, mechanical engineers, and electrical engineers who develop all of the company's products and systems in-house, Mustang's versatility and speed are its best strengths.

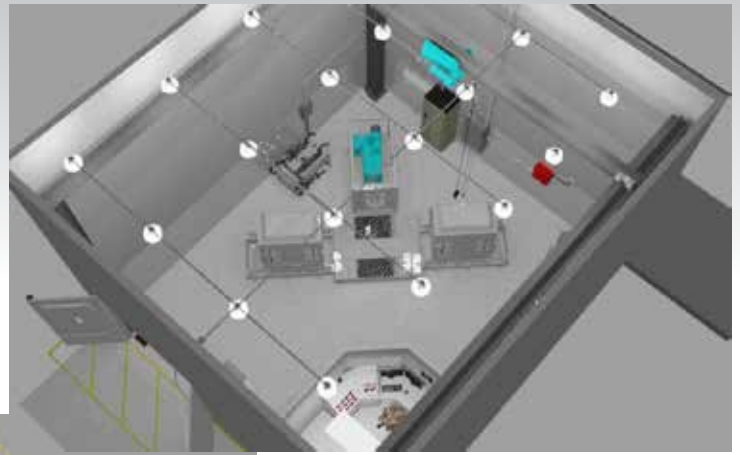
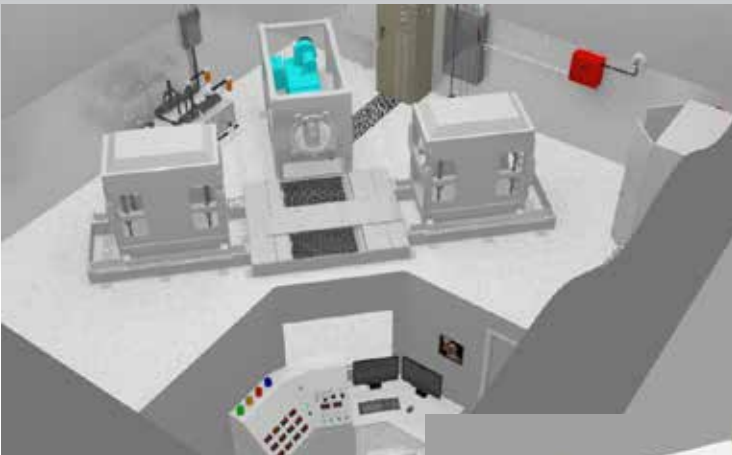
MAE offers a wide array of services to customers all over the world. Our experienced team of engineers use the latest solid modeling CAD and CAE software and offers a comprehensive resource for your testing design and development needs. Whether your application is fully conceived or you need a design partner, the engineers at Mustang Advanced Engineering invite you to tap into their decades of experience in testing and measurement systems development.



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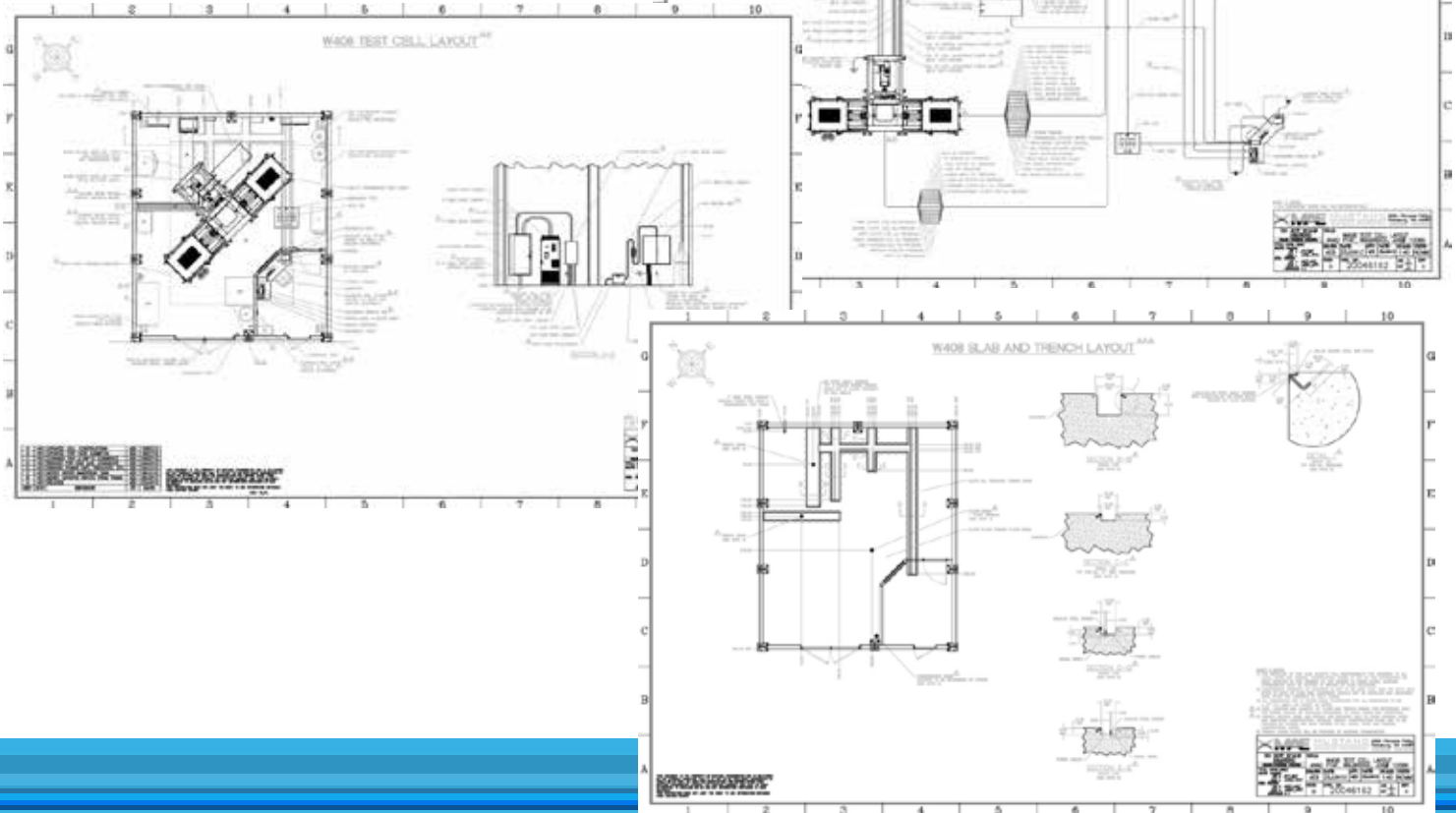


## From Concept

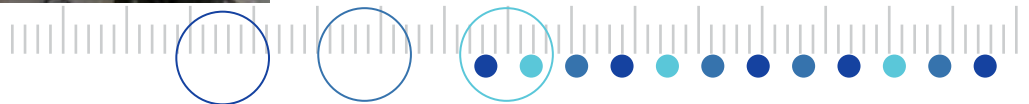




# To Engineering



# To Project Completion



# Acceptance Testing

Mustang's corporate headquarters located in Twinsburg, Ohio is equipped with the utilities and floor space to perform full acceptance testing of all products prior to shipment.

## Documentation

All products delivered by Mustang include a full documentation package. A typical documentation package includes:

- Electrical Schematics
- As-built Mechanical Drawings
- Operator's Manual
- Software Manual
- Spare Parts List
- Maintenance Schedule
- Calibration Procedures
- Submittals as Required



## Turn-key Installation Services

Mustang's project management team leaders are experienced in managing extremely large projects where multiple discipline trades and engineering knowledge are required. MAE has a very successful track record when it comes to installing complete testing labs including; bed plates, cranes, control rooms, water cooling tower, pump house system, supply power transformer, power switch gear, construction drawings, and as-built drawings. MAE installation teams have successfully performed countless large scale operations. One such project required 350 test systems in 110 different locations across multiple state lines and country borders. Each test system consisted of an electric emissions chassis dynamometer with lab grade emission analyzers, controls, and plumbing. These installations were evenly distributed across whole states. When your project requires a supplier that has experience and a proven track record for managing large-scale projects, you can count on Mustang Advanced Engineering.

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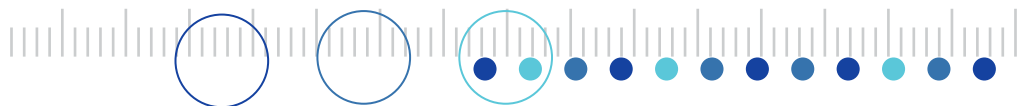
*Three (3) Heavy Duty Military End of Line Test Systems (Chassis Dynamometers/ABS Brake Testers) for MRAP vehicle production validation supplied to Red River Army Depot.*

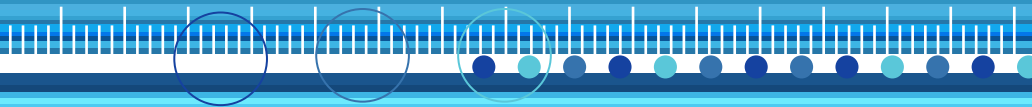


## Our Mission

Our mission is to achieve the highest possible level of customer satisfaction by providing innovative technical solutions and product designs and by striving to achieve perfection in product quality, delivery and service.

At Mustang, our customers are our highest priority - We do everything in our power to satisfy our customers. Our entire organization understands that the customer comes first and nothing else is more important.





## About MAE

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