

# Vehicle Scales

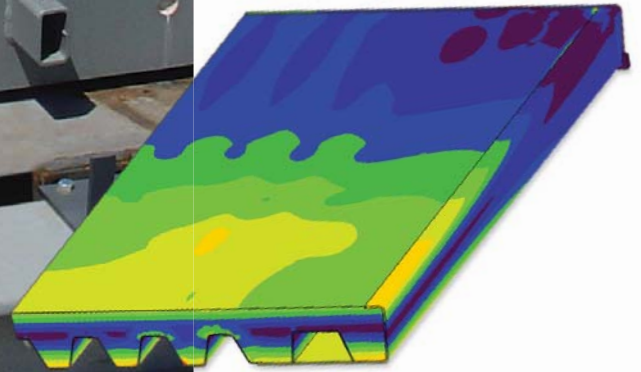


## Product Development

Design Process

Life-cycle Testing

Proven Performance



**Designed and Tested**

There is a Difference

**METTLER TOLEDO**

# Designed, Tested and Proven to Last

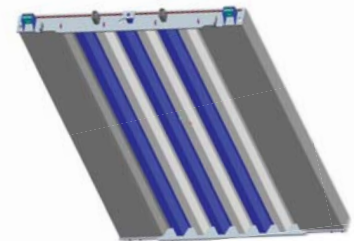
How can you ensure that your vehicle scale will provide years of trouble-free performance? Select one that has been designed and tested to the highest standards. A complete vehicle scale development process is critical for providing the peace of mind that comes with knowing your truck scale will meet the demanding requirements of your application and save you money over the life of the scale. The **six step** development process used by METTLER TOLEDO is the most comprehensive in the industry.

## DESIGN PROCESS

1.

### Design Modeling

The first step in METTLER TOLEDO's product development process is designing each model using a three-dimensional computer-aided design (CAD) package to ensure every element of the product meets our rigorous design standards. CAD modeling has been part of METTLER TOLEDO's design process for over 20 years and each new model builds on the engineering expertise we have gained from previous designs.

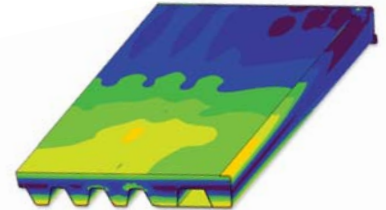


New Design Modeled in CAD

2.

### Finite Element Analysis

Each design undergoes extensive Finite Element Analysis (FEA) to determine high and low stress areas. The virtual testing shows how the design should perform under various loading conditions. All areas of the weighbridge undergo this FEA process, including individual analyses on critical components. This provides initial feedback on the structure and allows for changes to the design before a full-size prototype is built.



Design after the FEA Results

## TESTING PROCESS

3.

### Stress Level Testing

METTLER TOLEDO tests every new truck scale design with its unique full-size weighbridge tester, known as the Module Masher. The Module Masher can replicate 20 years of truck weightings in 6 to 8 weeks, operating 24 hours a day. **This simulates millions of weighing cycles at the full design load, which is well above the maximum legal truck axle weights defined by local regulations.**

To test a design, we place a module in the test system where it is supported exactly as it would be in a full-length truck scale. Four hydraulically operated "feet" cycle up and down to apply the full design load at any position selected on the module. The rubber pads on the feet apply a load in the exact pattern that would be applied by the tires of a truck's dual tandem axle (DTA). Actual stress levels in the critical design areas that were identified by FEA are then monitored and compared with the expected results. METTLER TOLEDO understands that calculations and computer analysis cannot take into account every factor that effects the real-life performance of a structure. In addition to manual engineering calculations and FEA, only METTLER TOLEDO performs actual life-cycle testing to ensure optimum performance.



Standard Truck Dual Tandem Axle



Dual Tandem Axle Pattern Loading on Actual Module

**METTLER TOLEDO is the only manufacturer performing Steps 3 and 4.**

## TESTING PROCESS (continued)

### 4. Life-cycle Testing

You may have heard of Life Cycle Testing. In other industries, such as the automotive industry, life cycle testing is used to test a vehicle to see how it survives the stress of real road conditions by running the engine for thousands of miles, maneuvering through road courses, and traversing adverse driving surfaces. The Module Masher is our tool for fully understanding the real life stresses that the weighbridge will see in every day use. This is the only way to confirm that a design will indeed provide the long lasting, rugged performance that METTLER TOLEDO customers have always come to expect from our Truck Scales.

In our Life Cycle Testing, the hydraulic feet of the Module Masher apply repeated cycles to the scale until a failure occurs. Knowing where these first failures may occur is crucial to understanding the life expectancy for the scale and aids in making design improvements long before a product is ever introduced to the market. With this information we can improve the design to ensure your scale will not fail prematurely. Designing to a standard is one thing, testing a prototype fully takes that validation process to an entirely new level, which is not replicated anywhere else in the truck scale industry.



Module being accurately loaded at the rated capacity

## WEIGHTS & MEASURES CERTIFICATION

### 5. Regulatory Testing

During the NTEP or OIML certification process of a new truck scale design, the concentrated load capacity (CLC) submitted by the manufacturer is tested by placing 90% of the value of the CLC on the weighbridge in a pattern 4' Long x 10' Wide. This load only goes across the scale **two times** during certification. Does this simple test show how the scale will handle an actual DTA truck load over millions of cycles for the life of the scale? No, and that is why steps 3 and 4 of the design process are so critical. Only METTLER TOLEDO performs actual lifecycle testing at the rated design load to ensure that your scale will last a lifetime.



NTEP testing of a scale's CLC using a large test pattern

## REAL-LIFE VALIDATION

### 6. Proven Performance – Unequaled Reliability

METTLER TOLEDO has manufactured truck scales for nearly 100 years and our orthotropic designs have been used successfully for over 25 years in applications that range from the extreme environments of McMurdo Station, Antarctica, to Death Valley, California. It is this experience which is the final step in the process. METTLER TOLEDO's proven track record for designing and building high-quality, rugged and long lasting vehicle scale weighbridges is unmatched in the industry and provides the most important verification of our design process.



METTLER TOLEDO truck scales are proven to meet the most demanding of applications

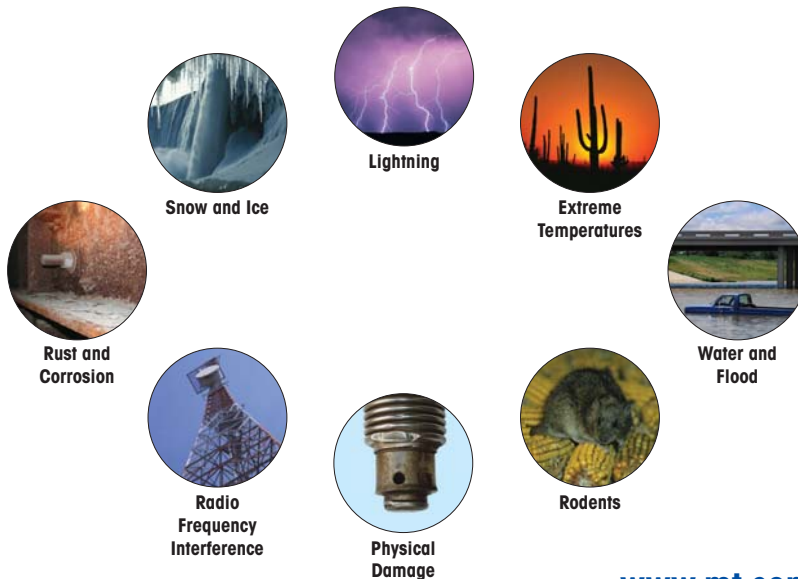
When you buy a truck scale it is important to select one that will provide the best return on your investment. Choosing one that has been proven to last for millions of weighments provides the peace of mind that your scale will be operating when you need it most. Let METTLER TOLEDO provide you the most accurate and reliable system in the industry. Design assumptions, FEA virtual proof, and theoretical life are no match for the peace of mind that comes with METTLER TOLEDO Truck Scales which have been through our demanding design and testing process. **METTLER TOLEDO...There is a difference!**

## 100% Protection

Your truck scale is one of the most important investments at your facility. It can be used as your cash register, your measure for inventory control, or for verification that you comply with local regulations. Regardless of how you use it, your vehicle scale should be accurate and reliable while offering you the lowest total cost of ownership. That is why METTLER TOLEDO vehicle scales are designed to protect you from unforeseen problems and unexpected downtime. Both of these can contribute to huge unplanned expenses from service calls.

Let METTLER TOLEDO help you eliminate unplanned expenses by providing an entire system that is built for 100% protection from the forces that are the leading cause of scale failure. Ask about how METTLER TOLEDO POWERCELL technology and weighbridge designs can help with:

- Scale Accuracy
- Lightning Protection
- EMI/RFI
- Load Cell Failures
- Cable/Junction Box Failures
- Rust and Corrosion
- Extreme Temperatures
- Improved Service



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