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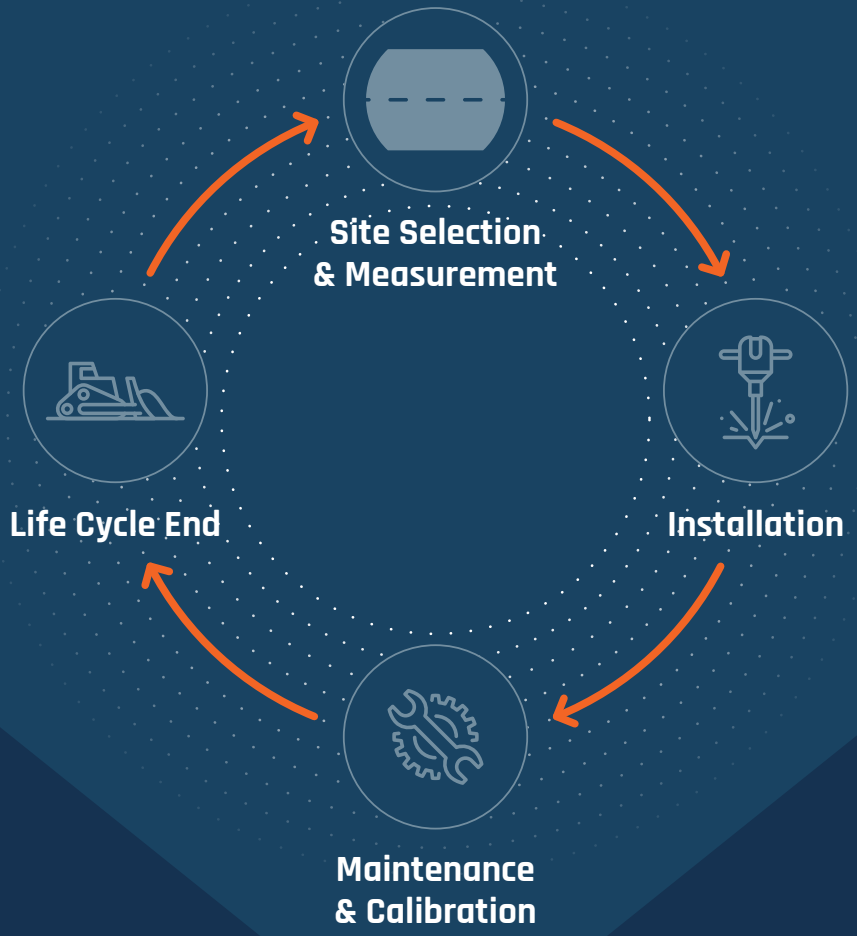
Site and Road Selection for WEIGH-IN-MOTION

WIM System Life Cycle



WIM Site Selection

Proper site selection protects infrastructure and reduces dynamic effects that compromise measurements.

1. Choose a site where weighing makes sense
2. Choose a section where weighing is possible
3. Choose a section with suitable geometry
4. Choose a section with high-quality pavement
5. Choose lanes where weighing will take place
6. Carry out regular pavement inspection & maintenance

Site Where Weighing Makes Sense

A traffic survey is recommended to identify locations with a high volume of heavy or potentially overloaded vehicles, where infrastructure protection measures are most needed.

Mines & Industrial Areas

Vehicle loads vary significantly with material type, fill level, and loading practices. Continuous load measurement is needed to control payload consistency, manage haul efficiency, and align vehicle use with site-specific operational limits.

International Freight Routes

Long-distance corridors require weight data collected at cruising speed to support harmonized control across borders, handle very high traffic volumes, and enable large-scale traffic analytics without interrupting international transport chains.

Logistic Centers & Ports

High volumes of heavily loaded vehicles enter and leave these hubs in short time windows. Monitoring vehicle weights at network access points helps manage the impact of concentrated freight flows on surrounding roads and supports planning for peak logistics movements.

Section Where Weighing Is Possible

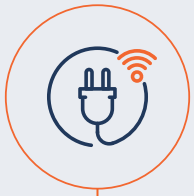
The selected section must allow smooth vehicle passage, have suitable environmental conditions, and provide the necessary infrastructure.

Traffic Flow Disruptions

Areas that cause braking, acceleration, or turning should be avoided. These are typically merging or exit lanes, intersections, roundabouts, crosswalks, bus stops, rest areas, gas stations, or areas with frequent congestion.

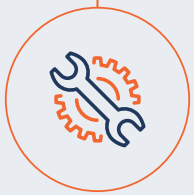
Power Supply and Connectivity

Failure to ensure the necessary infrastructure may result in power or data shortages. The equipment is designed to withstand potential power loss, but the occurrences should not be frequent. Longer connectivity outage periods may result in permanent data loss.



Unsuitable Surrounding Conditions

Areas that could cause swaying, skidding, or other unpredictable movement should be avoided. Some locations have frequent strong winds, debris, snow drifts, or flooding.



Safe Access

It is necessary to secure convenient access for servicing the installed system components. Road closures may be necessary in order to carry out pavement maintenance.

Section with Suitable Geometry

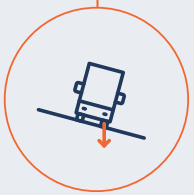
The selected section must have suitable geometry over a sufficient length to ensure that weighing accuracy is not systematically affected by centrifugal forces, gravity, acceleration, or uneven load distribution.

Longitudinal Slope

On uphill or downhill segments, the vehicle's center of gravity shifts forward or backward, altering axle load distribution and causing systematic weighing errors, often amplified by acceleration or braking to maintain speed.

Transverse Slope

Excessive cross slope shifts the vehicle's center of gravity sideways, creating uneven left-to-right wheel load distribution and systematic weighing errors. Although slight slope is necessary for drainage, it should be minimized to maintain accuracy.



Curvature Radius

In bends, the centrifugal forces cause the outer wheels to carry more weight, creating an asymmetrical load distribution that leads to systematic weighing errors, with the effect becoming more pronounced at higher vehicle speeds and weights.

Measurement Section Length

The recommended minimum length of the suitable site is typically two vehicle lengths in front of and one vehicle length behind the sensors, allowing the vehicle to stabilize and minimizing the influence of pavement irregularities.

Section with a High-Quality Pavement

It is necessary to select a section with a high-quality pavement that is sufficiently rigid and stable in terms of temperature and time, without local irregularities, and with a low and constant transverse and longitudinal slope.

Deflection

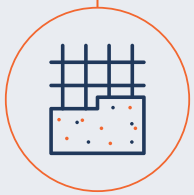
The pavement temporarily bends under load. Excessive flexibility generates dynamic effects which affect the accuracy of the measurements. Stiffness differences before and after the measurement section must be minimal.

Unevenness

Surface irregularities like potholes, ruts, slope changes or terrain waves generate dynamic effects. A smooth, even pavement ensures stable vehicle movement without vibration or swaying.

Slab Movement

Individual concrete slabs may move under load or due to temperature changes, generating dynamic effects. Slabs must be firmly coupled, and sensors installed within a single slab away from expansion joints.



Pavement Type

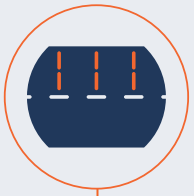
Flexible pavements have short curing time and easy maintenance but are temperature-dependent and prone to deflection and rutting. Rigid ones offer high stiffness and long service life but higher cost, longer setting time, potential slab movement, and lower skid resistance.

Lanes Where Weighing Will Take Place

It is necessary to define in which lanes weighing will take place and ensure that any driving outside these lanes is monitored to prevent deliberate avoidance.

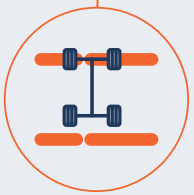
Number of Weighing Lanes

Installing sensors across the entire pavement width prevents avoidance (free-flow weighing) but increases installation complexity and cost. Typically, sensors are only installed in selected lanes. This creates a risk of deliberate avoidance and requires monitoring of traffic outside the weighing lane.



Shoulder Lane Control

Shoulder lanes often offer the drivers a means to bypass the system. Common practice is to physically restrict access in the weighing area; however, this can be a dangerous hazard. The best solution is to equip the shoulder with weighing sensors or other monitoring technologies.



Continuous Sensor Coverage

Sensors must be installed without gaps to cover the whole width of the lane. Otherwise, drivers may deliberately position wheels outside the weighing area causing invalid measurements.

Documentation

Proper documentation is a must not only for lanes without sensors but also to address driver's maneuvers. be monitored using camera systems or other means to detect, document, and penalize deliberate avoidance.

Pavement Inspection & Maintenance

The pavement must be inspected regularly while the WIM site is in operation and maintained when necessary to prevent deterioration that could compromise measurement reliability.

Timely Maintenance

The formation of ruts, cracks, potholes, and other local irregularities should be monitored regularly. Corrective actions should be carried out before pavement degradation starts to affect measurement accuracy. Advanced traffic management is necessary to determine a suitable repair period in order to minimize costs.

Proper Site Selection

- Site with a high presence of heavy vehicle traffic
- Road section with smooth traffic flow and suitable surroundings
- Necessary infrastructure and maintenance access should be available
- Sufficiently long section with road geometry with minimal influence on load distribution
- Pavement with adequate stiffness, stability and evenness
- Clearly defined weighing lanes with effective avoidance prevention
- Regular inspection and maintenance during WIM station operation

WEIGH-IN-MOTION

WIM DIRECT ENFORCEMENT

SPEED ENFORCEMENT

ITS WORLDWIDE

www.cameatechnology.com

Developed in #BRNOREGION

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