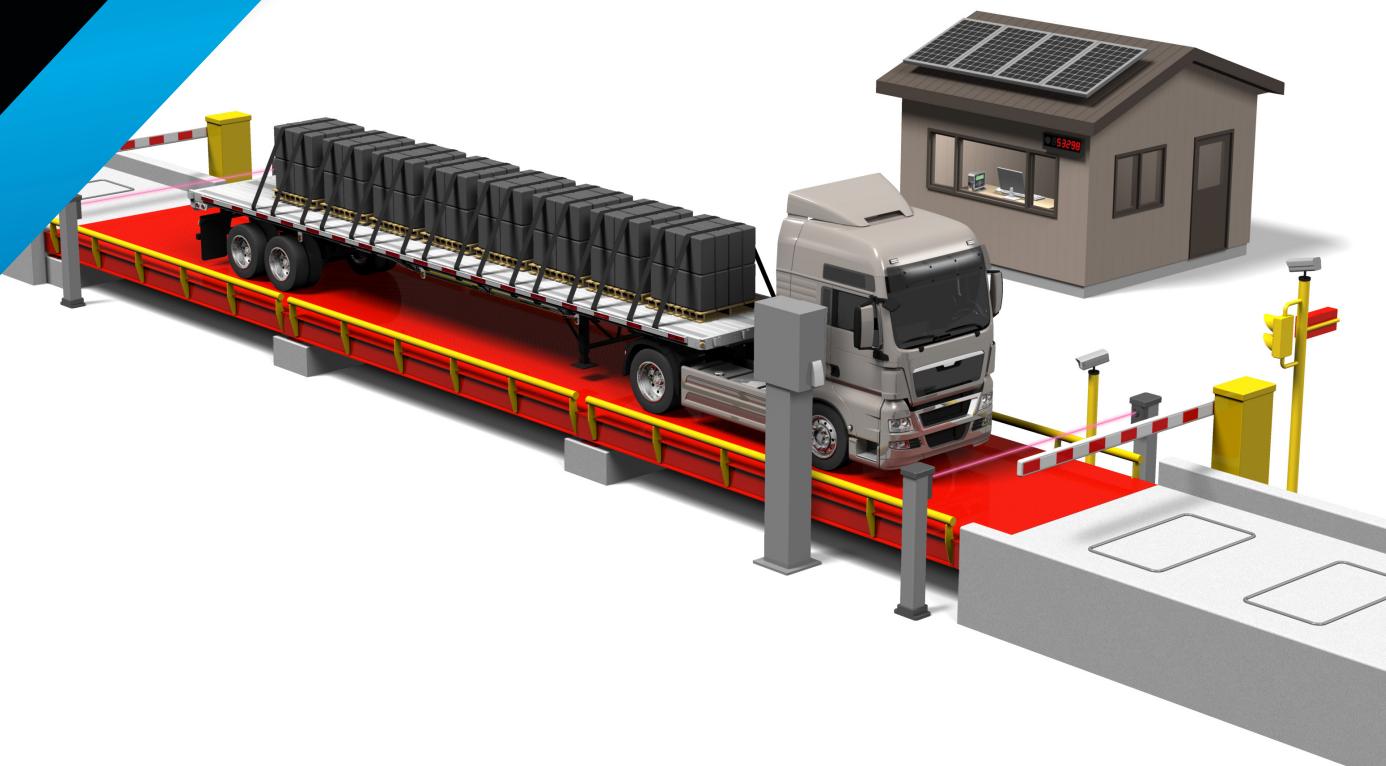


# WEIGHBRIDGES

## A Buyer's Guide

Key considerations when investing in a weighbridge





**Avery Weigh-Tronix**

*A weighbridge is a major capital investment. While it is vital to get a site survey and specify each weighbridge according to environment and use, there are common features across all weighbridges that it pays to understand. The Weighbridge Buyers Guide, from Avery Weigh-Tronix, helps to simplify the process by highlighting the key areas to consider when making a weighbridge purchase.*

## Capacity and Platform Size:

When selecting a new weighbridge, it is recommended that the foremost issue to be addressed should be the required platform size and maximum weighing capacity of the weighbridge – a decision which has direct financial implication on project cost.

Take into consideration the vehicles expected to be weighed on the proposed weighbridge, looking at overall size, longest wheel-base, width over tyres, maximum Gross Vehicular Weight, max. single axle / DTA loads as well as usage frequency. In most of the cases, changing the size and capacity of the weighbridge after purchase is not feasible practically and economically, so it pays to take these things into account at the outset. With modular design structures it may be feasible to extend the platform length by adding extra modules.

In the context of Indian market, the majority of 3-axle (10 wheeler) single body trucks can be easily accommodated on a 9m long weighbridge with 50/60 tonnes capacity. Most of the single trailer combinations can be accommodated on a 16m long weighbridge with 80/100 tonnes capacity.

Other common weighbridge lengths are 7.5m, 12m and 18m. Though most of the vehicles on Indian roads fit in 3m platform widths, in some cases a 3.5m width is required for ease of manoeuvrability.

Off-road vehicles like dump-trucks carry highly concentrated loads which require special configurations of size and capacity. Most established suppliers offer custom sizes and capacities to fit these specific needs but will normally involve higher cost and longer delivery times.

## Pit or surface mounted weighbridges?

Having arrived at a suitable size and capacity configuration, the next big decision is whether to go for a pit or surface mounted bridge. Let us understand these variants.

### Pit mounted weighbridge:

These weighbridges are installed in a pit, keeping them flush to the road surface. Because these bridges do not require ramps, they take up less surface area, making them ideal for smaller areas or sites where space is at a premium. Initial civil and foundation work can make pit installations a more expensive option. A pit is also prone to piling of debris and water logging, requiring provision of sump-pumps and manholes for maintenance purposes. Guide-rails are not required for pit mounted bridges.



### Surface mounted weighbridge:

This type of weighbridge sits above of the road surface, and requires ramps on either end to allow the vehicles to access the platform. The amount of civil foundations work required is reduced for surface mounted scales, but the overall space requirement is more. Before purchasing, check the overall height of the 'bridge'. Higher decks need longer ramps, which increase the overall footprint of the weighbridge as well as the turning circle for vehicles approaching the bridge. Generally, surface mounted weighbridges require guide rails fixed on the sides of the platform, which help vehicles to be aligned centrally on the bridge. This type of installation is better suited when the bridge may need to be shifted, or for temporary (sometimes called 'portable') installations.



In most cases the site conditions, such as availability of space, will dictate the type of weighbridge available to you. Both surface and pit mounted weighbridges require a firm surface with load bearing capacity, the details of which will be specified in the 'Plan of Foundation' drawings provided by the weighbridge supplier.

It may be advantageous to choose a weighbridge which has a common structural design for surface and pit mounting, this will allow future flexibility for changing the type of weighbridge.

## Weighbridge Platform: Steel or Concrete?

While the majority of weighbridges in the Indian market are of steel construction, some limited options are available with concrete construction as well.



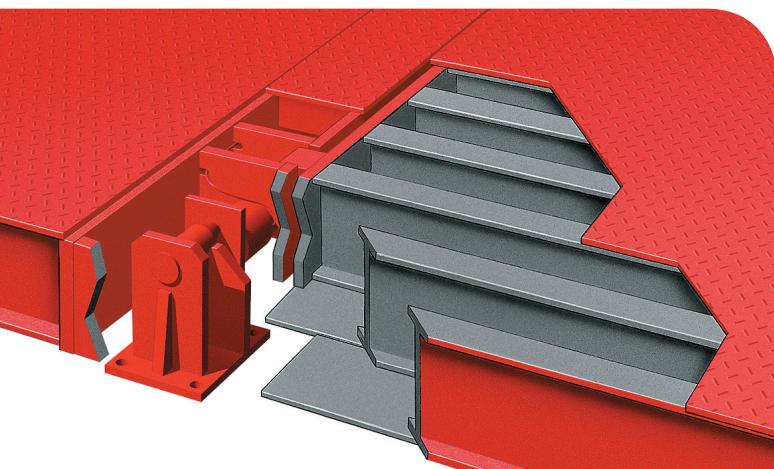
A weighbridge with steel fabricated structure is faster, easier and in most cases more cost effective to install. With a blast-cleaned surface and good quality painting, the steel structures can provide a hard wearing finish against corrosion and hence a longer life. These are also easier to relocate, if required.

In terms of maintaining product quality, steel structures should be fabricated under controlled factory conditions and can be shop-inspected prior to despatch.

When purchasing a weighbridge with a steel structure, ensure that you check that the deck is well designed and fabricated in a supplier's own controlled facility using prime quality steel sourced from reputed steel makers. Bear in mind that the "weight of structure" is not a marker of quality as it does not represent design and workmanship aspects. Innovatively designed and welded modular constructions can provide better durability with lesser weight.

In some extremely wet, frosty and potentially corrosive environments, a concrete structure may provide a durable solution with greater traction. Concrete structures require higher installation time and efforts as concrete needs time to pour, level, dry out and cure before use. For durability, concrete structures need to be adequately reinforced by high strength steel construction since concrete is extremely strong in compression (top of structure) but is known to be weaker in tension (bottom of structure).

**Ramps:** In the case of surface mounted weighbridges, approach ramps are required which can be of concrete or steel structure. Remember that ramps take the brute force of being hit by a vehicle as it mounts the ramp. Concrete can offer longevity, while steel is ideal if the weighbridge is likely to be moved.



## Types of load cell:

In basic terms, the load cell is the part of any scale that measures the weight or force being applied. The cells convert the force of the load into an electrical signal, which is then read and displayed by a weight indicator. Load cells come in a range of different sizes, shapes, capacities and performance parameters. However, in the context of truck weighbridges, the basic distinction is 'analogue' and 'digital' load cells. Generally speaking, both analogue and digital cells use the same strain-gauge technology – but differ in terms of output of the load cell and therefore offer different benefits depending on the usage.

**Analogue load cells:** Analogue load cells are the most common solution. The output of analogue load cell is a continuous millivolt (mV) signal proportional to the applied load. Further processing and Analogue-to-Digital (A-to-D) conversion is done in the indicator. Analogue load cells can easily be paired with a variety of digital indicators across multiple brands. The load cells are further differentiated by design e.g. Compression, Shear-beam type.

**Compression type:** Also known as canister type due to shape of its housing, these are the most popular choice for weighbridges in India. Compression type load cells using self-aligning (rocker) mounting enable the structure to float freely on the load cells. Excellent sealing and environmental protection is feasible. It is recommended to go for IP68 (immersion) and IP69K (pressure cleaning) certified products and with stainless steel construction for longer useful life.

**Shear-beam type:** Available as single or double ended shear beam (the latter being more common in weighbridges), this type of load cell can offer slightly lower profile and less sensitivity to side-loads, but often with poorer sealing (potted) and corrosion resistance (alloy steel). These load cells are more advantageous in silo/vessel weighing where rigid connections and head-room constraints are an issue as compared to a vehicle weighbridge where sealing and protection are very important.

**Digital load cells:** Digital canister load cells are a popular choice in weighbridges. Unlike conventional analogue load cells, which rely on external wiring, junction boxes and A to D circuitry, digital cells offer additional protection from the unwanted electrical interference that can affect analogue load cells.

Digital load cells can be pre-linearized, which allows faster installation and calibration, as well as featuring built in diagnostic tools. Generally speaking, with digital cells,

the information can be transferred more effectively over longer distances between load cells and the indicator. However, the in-built electronics that offer these benefits makes these cells more costly as well as more complicated to repair. It is therefore important to check that your service provider is able to deal with a cell before taking the plunge.

Despite A-to-D conversion inside the load cell itself, a digital indicator is still required for calibration, display and stamping aspects. Many weighbridges that use canister cells position the cell low in the 'bridge, close to the ground. Look for stainless-steel digital cells with a verified IP69K rating which offers protection against the dirt and water that can build up under the weighbridge.

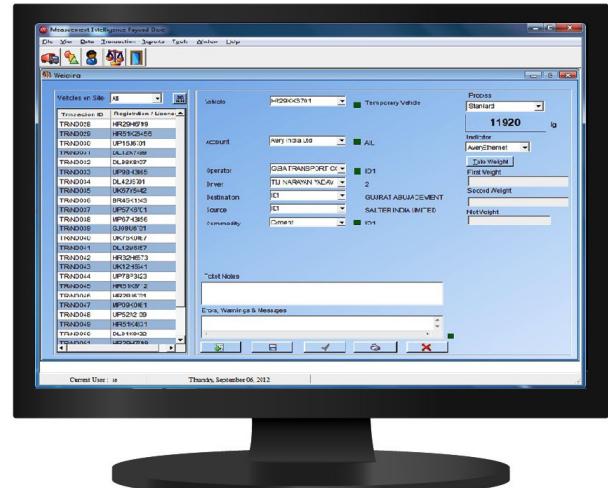
**Load cell accuracy:** Keep in mind that accuracy of a load cell has no relation to it being analogue or digital, compression or shear-beam type. All of these can offer an accurate and dependable solution, provided the load cell fulfils the accuracy criteria as set by the relevant certifying bodies (e.g. OIML R60 for India). Insist on approval certificates rather than conformance assertions.



## Data requirements and access:

Your weighbridge has the potential to provide a wealth of information that can help you to control wastage, monitor costs and improve efficiencies. Carefully consider what you need from your weighbridge – whether data transfer for invoicing and purchasing, added security and fraud protection, reporting for legislative purposes or sharing data across multiple sites.

It is vital that your software supplier understands the weighing industry and has a proven ability to develop software that seamlessly integrates with your business systems and requirements. Selecting the right peripherals - from software integrated with your back-office systems to intelligent weight indicators that can analyse and store date - can greatly increase the value of your weighbridge system. Ensure that your weighbridge software does not allow manipulation of weights.



## Weighbridge Automation and Unmanned Systems:

Unmanned weighbridge systems can automate processing of vehicles without the need for a dedicated operator, reducing operating costs and extending the hours of availability. Adding RFID (Radio Frequency Identification), boom barriers at entry / exit of weighbridge, sensors for truck positioning, camera surveillance with snapshot capture at weight recording, variable message displays / traffic lights and voice guidance can help in managing traffic flow and also improve security. This can help in combating weighbridge theft and fraud by providing important data about whom and what is entering and leaving the site.



## Weighbridges for Hazardous Environments:

In some applications where hazardous materials are used, such as chemical and petrochemical facilities, dust, gases and fumes can become trapped in the area beneath the weighbridge. This can cause a potentially explosive atmosphere and requires a weighbridge system that complies with PESO (Petroleum & Explosives Safety Organisation, Govt. of India). This certification is required for the hazardous zone, the gas group and the temperature classification. These specialist hazardous systems are designed to encompass the entire weighbridge and its component parts, it is not as simple as placing the digital indicator into a flame-proof enclosure. To ensure compliance and safety make sure you see the supplier's system certification from the Chief Controller of Explosives (CCoE).



## Choosing a Supplier:

Capital investment into items such as a Weighbridge requires additional support over the product's life to ensure continued accuracy and maximisation of product lifetime. For this reason there are other factors to consider when choosing a weighbridge supplier and service provider. It is advisable to check the supplier's experience, technical knowledge, manufacturing facility and service infrastructure including having the man power to support your weighbridge through its useful life.



## Glossary of Terms:

**Electronic Weighbridge:** A weighing scale to weigh road vehicles in static condition, consisting of a platform to accommodate the vehicle, supported on number of load cells, connected through a junction box to a digital weight indicator.

**Load cells:** The load cell is the part of any scale that measures the weight or force being applied. The cells convert the force of the load into an electrical signal, which is further processed by a digital indicator. A weighbridge can have 4 / 6 / 8 / 10 or even more load cells.

**Platform structure:** This part of weighbridge is the load receptor, where vehicle parks for measuring of weight. The top surface is roughened to provide traction to vehicles' tyres.

**Cornering:** Cornering refers to adjustment during calibration to ensure that a given load gives same weight indication regardless of where it is placed on the platform. This could be done using a junction box connected to the load cells or in the indicator itself.

**Digital Indicator / digitizer:** Digital indicator processes the raw output of the load cells and displays the weight in digital form. It facilitates calibration of the scale using standard weights and stores calibration data. It also provides basic control of weighing operations and further connectivity of data.

**Rated Capacity (Max):** This refers to the upper limit of the calibrated weighing range that the weighbridge is capable of measuring and indicating on display of digital indicator.

**Min. capacity (Min):** This refers to the lowest weight that can be measured correctly on the weighbridge. For Accuracy Class-III, this value is 20 times of display division 'd'.

**Display division / Least-count (d):** This is the smallest, incremental value of weight as shown on the display of the digital indicator of the weighbridge.

**Accuracy (e):** This refers to the smallest verifiable weight change that can be measured correctly by the weighbridge. For W&M Class-III scales, the value of 'e' must be equal to 'd', in other words the scale accuracy and least count must be the same.

**Accuracy Class:** The classification of weighing equipment based on its maximum permissible error defined by Indian Legal Metrology (W&M). Road vehicle weighbridges are normally approved under Class-III (max. nos. displayed divisions ranging from 500 to 10000).

**Stamping:** Every weighbridge needs to be verified by an authorized Weights & Measures inspector before using for the first time and then once every year. The indicator instrument is physically sealed and a stamping certificate is provided. Stamping charges vary from state to state.

**Model Approval:** Any weighbridge supplier, apart from manufacturing license from W&M, also needs to have Model Approval of the scale before the scale is commissioned. Model Approval specifies the accuracy class of the equipment and it is a pre-requisite for stamping.

**OIML:** International Organization for Legal Metrology (OIML) is the highest body governing performance standards of load cells and weighing equipment. India is a member country of OIML. Load cells certified for compliance to OIML R-60 standards are globally accepted as mark of performance & quality.

**DTA load:** Dual Tandem Axle (DTA) load is a parameter considered for design of weighbridge structure to check its suitability to road vehicle's rolling load which is not uniformly distributed.

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