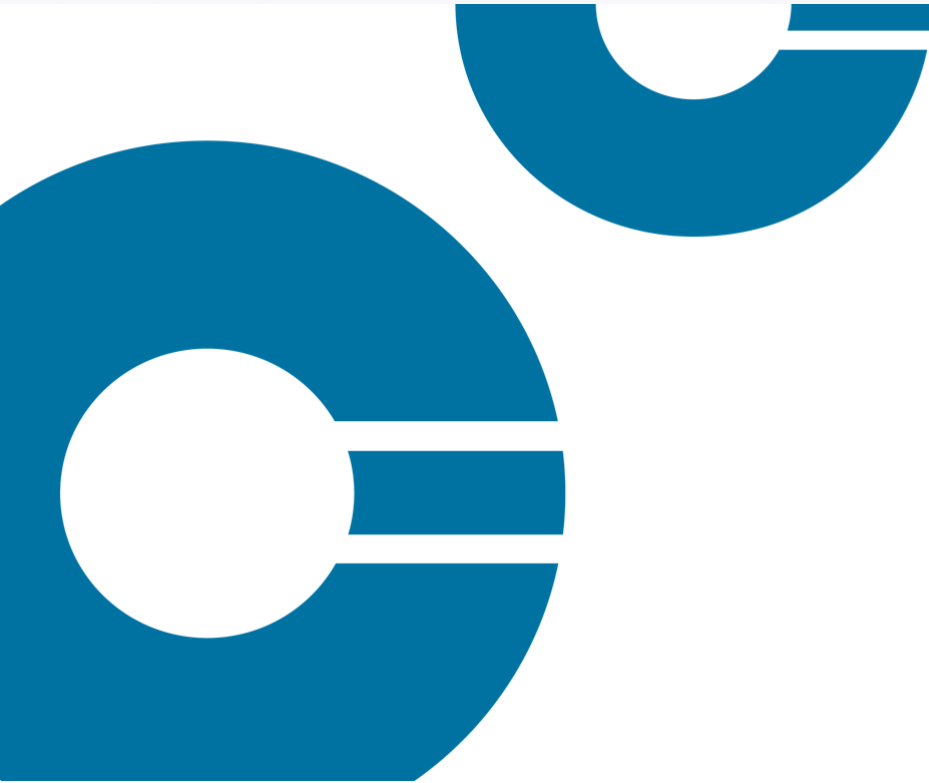


# Weighbridge Technology



## **Weighbridges- *the workhorses of industrial weighing***

Weighbridges play a vital role across a diverse range of industries. They provide valuable weight data for incoming and outgoing vehicles at quarries, recycling plants, energy from waste sites, ports & terminals, cement works and processing plants. Now a blend of versatile instrumentation, user-friendly software, peripheral control equipment and communication technology is rapidly increasing the scope of weighbridges, thereby expanding their operational, data collection and connectivity capabilities. In addition, weighbridges act as critical control points at many sites and can be used to improve on-site traffic flow and site security.

### **Weighbridge Choice**

These work horses of weighing come in all different shapes, sizes and designs, manufactured from steel,



steel-concrete composite and pre-stressed concrete. Designs include **surface mounted, pit mounted, modular and transportable**. Typical capacities range from 30 to 100 tonnes, in lengths of 9, 15 and 18 metres and widths up to 6 metres. The common factor for all these variants is that they need to be robust, accurate and reliable.

The choice for a particular application will depend on factors including maximum vehicle sizes and weights, available space, usage and, of course, budget. Most weighbridges are operated in a drive-through manner. In other words, the vehicles drive on at one end and off at the other. However, in applications where space is at a premium, vehicles may go on and off from the same end. For plants where vehicles are weighed in and out, the obvious choice is to operate two separate weighbridges. Not only does this streamline traffic flow but it also gives the opportunity to service one bridge whilst keeping the other operational. However, this is clearly a more expensive option and in many applications one weighbridge is sufficient.



### **Design**

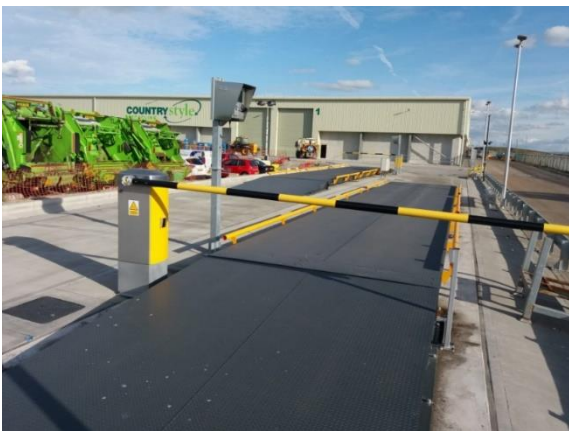
Most mechanical weighbridges have now given way to fully electronic versions where the weighbridge deck or deck sections are supported on a number of strain gauge load cells, connected to weight instrumentation.

**Pit mounted weighbridges** are flush with the ground. As a result, they pose no restrictions to vehicular movement and are therefore particularly useful at sites where vehicle flow can be in multiple directions and allow vehicles to have a reduced turning circle when entering or exiting the weighbridge deck, the pit mounted design also allows for the ease of loading or unloading of material from a truck with unrestricted access from the sides of the weighbridge at ground level. Bespoke weighbridges can be designed and manufactured to install into existing pits when a replacement deck or an update is required.



A new bespoke size pit mounted steel weighbridge decks provide a very cost-effective answer rather than making expensive civil works alterations. Weightron have developed special mounting assemblies to facilitate the use of existing pits, ensuring the new decks sits level with the surrounding surface area regardless of the depth of the existing pit.

**Surface weighbridges** offer straightforward installation procedures, and the side barriers help to guide vehicles centrally through the bridge. Approach and departure ramps can either be of steel construction or



pre-cast in concrete on-site. Removable steel ramps have the advantage of being able to be moved with the bridge if relocation is required, leaving the site level.

Weightron offer two main designs of steel weighbridge. The modular **Eurodeck**, which can be used in both surface and pit installations, provides a low-profile solution for weighing normal size vehicles and is available up to 36 metres in length.

The **Titan** design (opposite) is ideal for solution installations on existing concrete surfaces or yards. The single steel structure has two main longitudinal beams and a varying concentration of cross beams to provide optimum strength at critical load points along the length.



Modular and compact ramp designs make the design easy to install and having a low drive on height of 180mm requiring only a short run-on ramp reducing the overall footprint of the weighbridge, making it ideal for areas with tight access or limited space.



**Portable weighbridges** have special load cell assemblies and feet, allowing temporary installation with



minimum foundation preparation. Steel ramps usually provide access. Weightron offer a fully transportable weighbridge assembly, which can be transported complete with the load cells and wiring. The modular design is delivered to site and then folded out onto the ground. Large integral spreader plates provide stability for the loadcells, and two or more modules can be used to provide the requisite length.

**Concrete weighbridges** can offer advantages for certain applications. Pour on site composite versions provide perfect solution for areas of use that may be exposed harsh chemicals such as oils and acids or high salt content at coastal locations. These consist of a steel outer frame, inner strengthening beams and reinforcing mesh. Once the unit is assembled on site, the ready mixed concrete is poured in and when the deck has cured, the load cells are fitted. Alternatively, the complete weighbridge can be constructed at the factory and delivered to site.



### **Weighbridge surface coatings**

Weighbridges are expected to operate in the harshest of environments, fully open to the elements. Therefore, a well-structured finishing procedure is essential to provide optimum longevity. At Weightron all steel is shot-blasted to remove mill scale and surface imperfections prior to painting.



This ensures maximum adhesion of the surface coating applications. In parallel sound design principles ensure a well-drained deck and no hidden traps underneath where hidden corrosion can occur. The under-surfaces are coated with a special marine grade rust inhibitor coating. Special surface finishes can be applied for weighbridges operating at or near the coast.

### **Foundations**

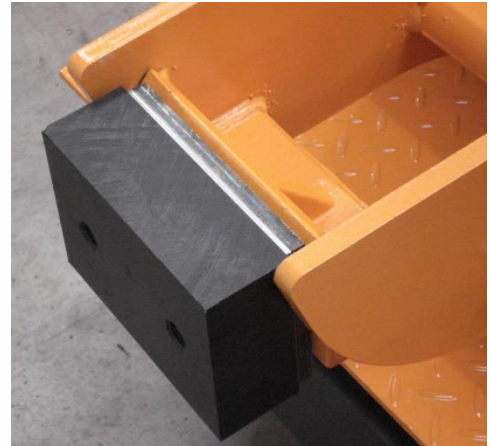
The foundations of any weighbridge are crucial to their performance. It is of little use having the most accurate load cells and well-designed weighbridge structure if the foundations are unlevel or unstable. For pit weighbridges, adequate drainage is also important to prevent flooding. The fitting of 'T' section rubber strip between the weighbridge deck and the edge of the foundation's limits deck movement without impairing performance and prevents debris entering the weighbridge pit.

**Significant end to end forces** can be generated when vehicles drive on and off the weighbridge, especially if heavy braking occurs.



Such forces can damage critical components such as load cells and can also cause serious damage to the surrounding structure.

Built-in impact limiting restraints to reduce the movement of the weighbridge deck are therefore an important part of any weighbridge design.



### Sloping Terrain

Weightron have developed proprietary technology to make it is possible to install weighbridges on sloping terrain. This can be beneficial for installations at existing sites where finding suitable level ground is difficult.

### Load cells

Load cells are the prime measuring sensors for weighbridges and therefore are one of the most critical components. Modern sealing methods and materials of construction provide excellent environmental protection, whilst well-designed mounting hardware ensures optimum load introduction.



Two basic types of load cell are used in weighbridges - Analogue and Digital. Although analogue load cells are well tried and tested, giving excellent service, digital load cells offer distinct advantages, especially during installation, calibration and troubleshooting. The capability of being able to remotely communicate with individual loadcells via Web based Nexia Diagnostic software with real time data brings important benefits and in addition, each load cell stores pertinent weighbridge calibration data, which can be transferred to a new load cell if replacement is necessary.

Weightron's **CPR-M** (analogue) and **CPD-M** (digital) stainless steel IP69K rated canister load cells have a second to none reputation for performance and reliability. There are important design features within these load cells that set them apart from similar looking lower quality products. The CPD-M and CPR-M feature a specially designed central column with eight strain gauges, together with special mounting cup assemblies all of which ensure optimum load introduction, even when the angular alignment changes as the weighbridge deck expands under extreme temperature changes.



A - 8 STRAIN GAUGES  
 High precision - Repeatability - Reproducibility  
 B - HEAVY-DUTY PROTECTION AT 45° CONE  
 C - MECHANICAL PROTECTION COVER  
 D - INSULATION DISC FOR LIGHTNING PROTECTION  
 E - OVERVOLTAGE AND INTERFERENCES PROTECTION  
 F - COPPER BRAIDED EARTHING CABLE  
 G - WATERTIGHT IP68/IP69K STAINLES STEEL CONNECTOR

The lower section of the outer canister housing has a substantial thickness, thereby offering excellent mechanical protection from rocks and dirt that may accumulate under the deck. Special dust seals prevent debris from entering the lower part of the mount.

This modern compact canister design is superior to more cumbersome single ended and double ended loadcell shear beam designs.



### Calibration and Certification

Weighbridges are classed as non-automatic weighing instruments (NAWIs) and if the weight data is used as part of any commercial transaction, they require approval to UK weights and measures standards (or those applicable in the country where they are installed). This involves the weighbridge being tested with traceable calibrated weights when first installed, and then re-verified at regular periods or when any critical components are replaced.

Some companies insist their weighbridges are weights and measures approved even if they are not used for commercial transactions.

This ensures that the weighbridges are maintained and certified for optimum precision.



### Ownership options

There are several ways of 'owning' a weighbridge. These include outright purchase, lease purchase and hire.

Portable weighbridges are ideal for short term usage or where the weighbridge has to be moved from one part of a site to another or to a different site. Purchasing weighbridges and support services on cost alone can be false economy. No-one likes paying more for their products than necessary, but a number of factors should be considered when choosing a weighbridge supplier. Cost of ownership may be an over-used cliché, but it is still very relevant when it comes to weighbridges.





## Modern technology

Traditionally the weighing process in many weighbridge applications has been relatively slow and data collection has been confined to local printouts of tickets and daily tally rolls. Now more emphasis is being placed on developing key peripheral areas. This is aimed at speeding up throughput of vehicles, improving security and extending weighbridge operational periods, together with improving and simplifying data collection and distribution. Technologies employed include Cloud based communication, automatic vehicle recognition systems, smart card or key readers, wireless interfacing, direct integration with SAP or D365 type ERP systems.

## Driver operated systems

Driver operated systems (often referred to as unmanned weighbridge systems) have been one of the most effective developments for improving weighbridge operational efficiency and security. Such systems offer a number of advantages and remove the need to have permanently manned weighbridges. Not only does the system speed up weighing operations which is on average within 25 seconds, but it also extends the available working period for weighbridges.



Weightron's latest  Windows 10  Microsoft based DD2060 Diade colour touch screen driver terminal is the most advanced of its kind and brings a new level of control to unmanned weighbridge systems. It features a large colour touch screen that can be configured for specific applications, multilingual and easy-to use pictograms to guide drivers through the weighing operation. The voice activation feature further facilitates ease of use.



Operational access can be via a range of smart technologies including designated RFID cards, long range readers, fingerprint, key or bar code. This ensures the terminal provides a complete material handling management system, which is easy to use by both vehicle and site operators. The power of the DD2060 is optimised when used in conjunction with WinWeigh4 weighbridge management software. This unrivalled combination brings the latest in industrial interactive touch control together with leading edge programmability.

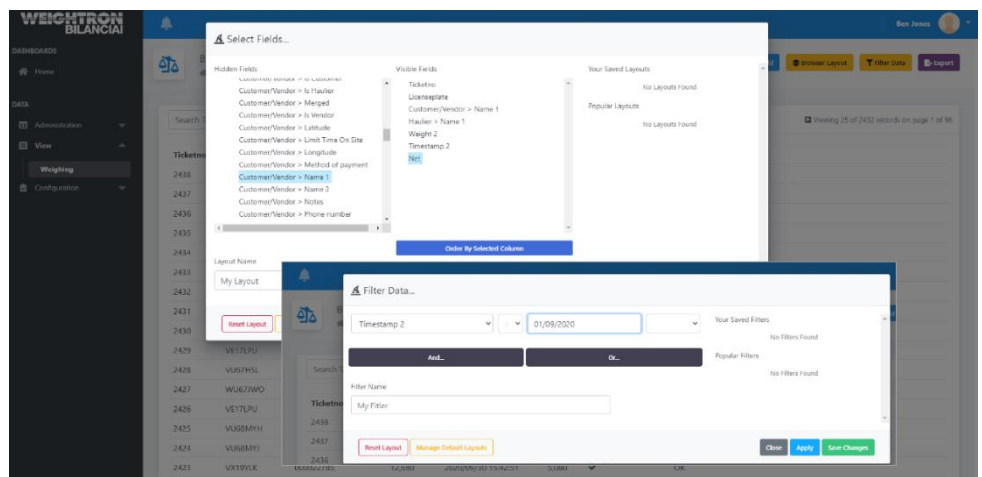
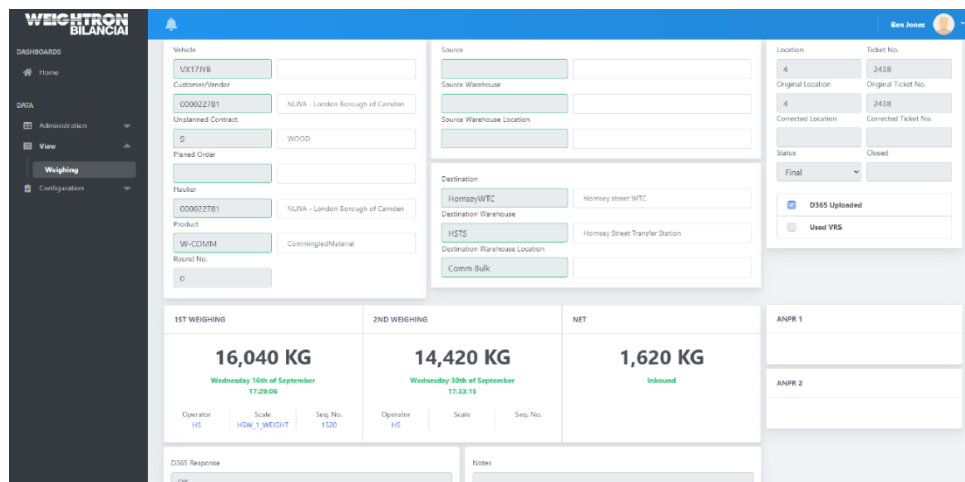
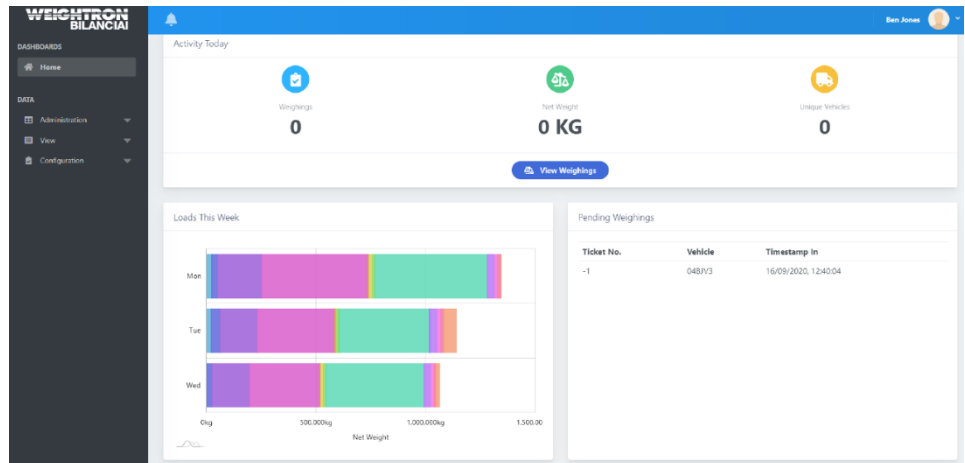
## Weighbridge Management Software

Weighbridge management software is now at the heart of many busy and demanding industrial site and plant operations. **Winweigh4** is the world's most powerful and versatile weighbridge and vehicle management software. It has been developed to provide virtually limitless flexibility for truly future proof weighbridge management systems. With capabilities to interface directly with leading management systems, including **SAP, JD Edwards, Microsoft D365, Microsoft Dynamics GP and Sage to name a few**, Winweigh4 brings the ultimate in control. Whether you operate a single weighbridge or have multi-site installations, Winweigh4 provides the optimum solution.

Not only is Winweigh4 capable of managing weighbridge operations and data collection, but it can also be used as a comprehensive vehicle management system, reducing on site bottlenecks and improving site security.

WinWeigh4 is fully integrated to the **Nexia™ Suite of Cloud Web-Portals** for access to statistics, data, live weighing operations, reports for each client or operation type 24/7 no matter where you are in the world.

**Nexia™ Mobile Apps** allow site supervisors to take real time control of weighing operations at site level, drivers can be notified of collections or deliveries, site operatives can be prepared to load or unload vehicles through the Mobile app scheduler system. Changes to loads or locations can be made in real time.





**Winweigh4** can be used to control security cameras and automatic number plate recognition cameras, providing digital records of each and every vehicle entering and leaving sites. In conjunction with this it can control entry/access barriers and interface with Weightron's **Radiation detection Portal system**.



### Radiation Detection Portal Systems

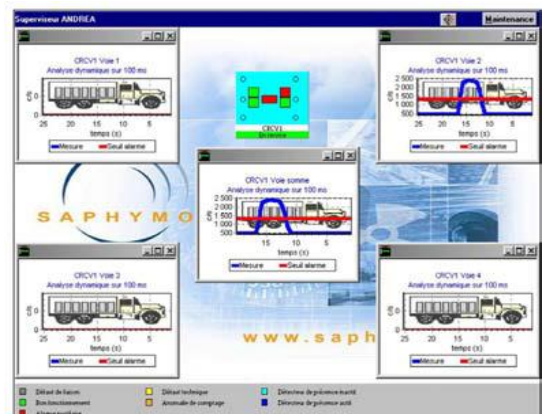
Weightron's radiation portal system is specifically designed for the detection of radioactivity in vehicle loads entering or leaving industrial sites. As more and more materials are recycled, especially scrap metal, there is a growing need to monitor the waste material for traces of radioactivity before it is reprocessed or incinerated.



The system already has a proven track record at steel works, incineration plants, land fill sites and waste reprocessing plants. Weighbridges are critical control points at these operations and therefore the ideal location for monitoring radiation. As the loaded vehicle passes through the portal detector plates, (positioned each side of the weighbridge,) it is scanned for traces of radioactivity. The system can be programmed for specific radiation thresholds and if it determines that a radioactive source is

present, either in the load or the vehicle, the system actuates an alarm to immediately notify site security. Weightron's radiation portal system can also be linked to automatic number-plate cameras to capture vehicle identification to provide a 360-degree traceability of the vehicle identification.

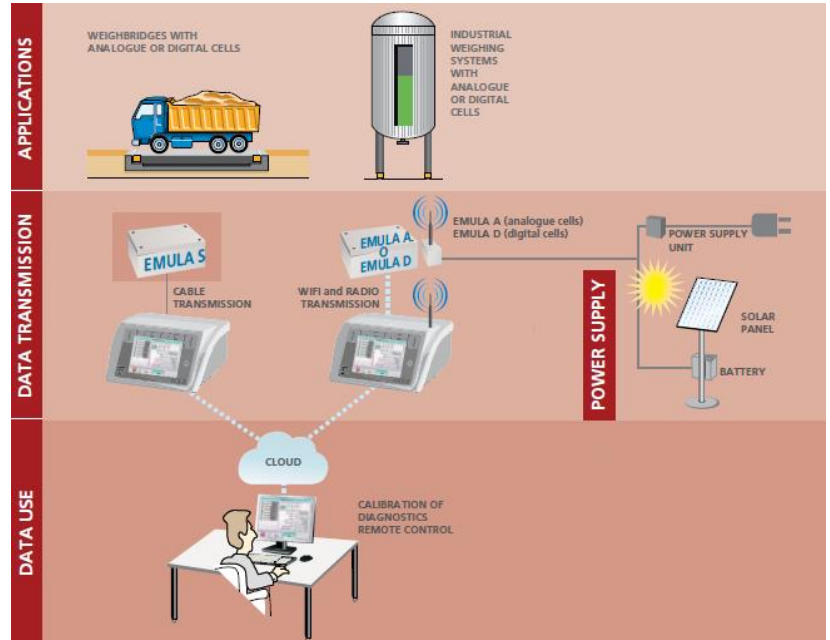
Weightron's radiation portal system provides a full radiation profile of the vehicle load, and the system is fully integrated with the WinWeigh4 software suite. Multiple units can be networked via Ethernet and the powerful portal software records full details of any radioactive profiles, clearly identifying the strength and location. This allows site management to take risk assessments in total confidence.



## Wireless weighbridge systems

Fitting weighbridges at existing sites is normally straightforward, but in some applications, site logistics may mandate that the weight indicator be mounted remotely from the weighbridge at another part of the site. Normally this would involve time consuming and disruptive civil works to lay underground cables.

The Weightron's **EMULA wireless system** overcomes these problems by using robust and secure 2.4 GHz radio transmission or Wi-Fi interface to send bi-directional data between the weighbridge and the weight indicator at distances up to 1500 m. The installation comprises the weights and measures approved DIZIG/IP radio transmission system, in conjunction with a Emula digital junction box mounted at the weighbridge and a weight terminal from Weightron's extensive range. The EMULA and terminal are connected to their respective transmitter and receiver via a standard serial link or via the clients Wi-fi network.



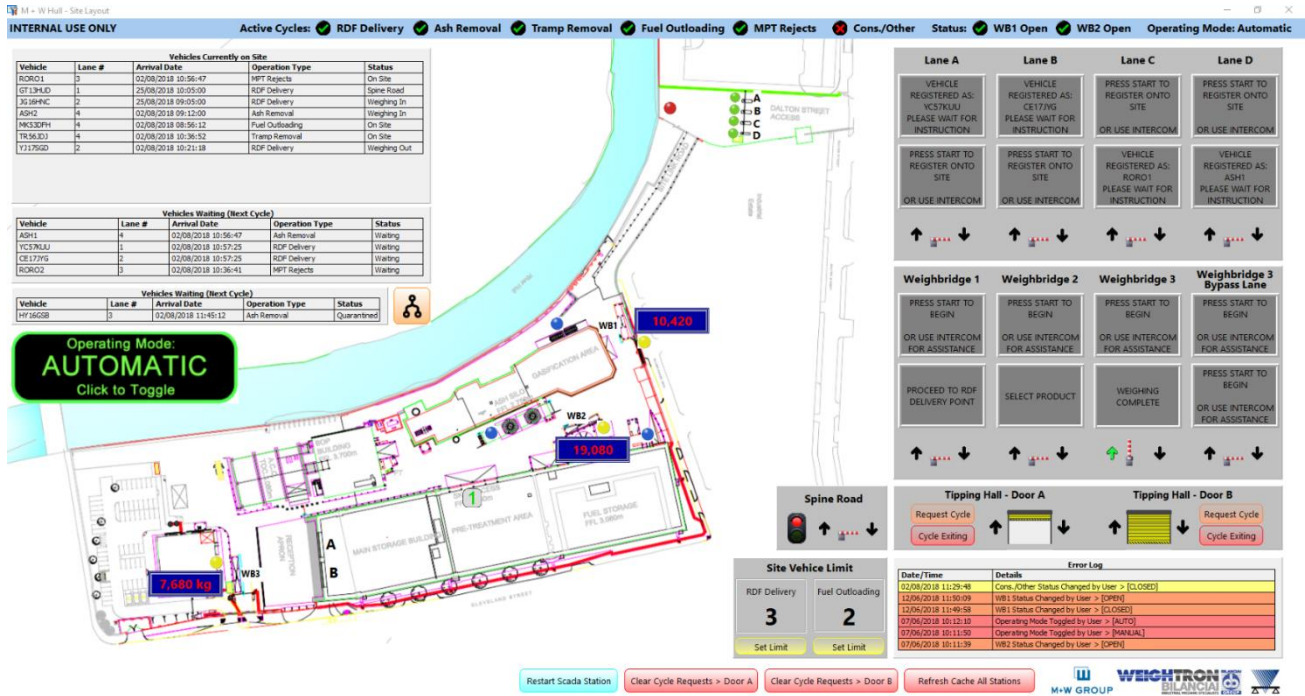
## Automatic number-plate recognition cameras, barriers and traffic lights

Automatic number-plate recognition cameras are increasingly being used in conjunction with driver-operated weighbridge systems. Weightron's ANPR is fully integrated with the company's powerful WinWeigh4 software suite and provides a secure fast and reliable method of identifying pre-registered vehicles entering and leaving site.





The system can be used to operate traffic lights and control security barriers at the weighbridge and any bypass lanes, making it an important asset to any driver-operated system. SCADA screens can be added to the WinWeigh4 software application allowing for a single user to have complete site wide control of all access points, barriers, traffic lights, driver terminals and weighbridges.

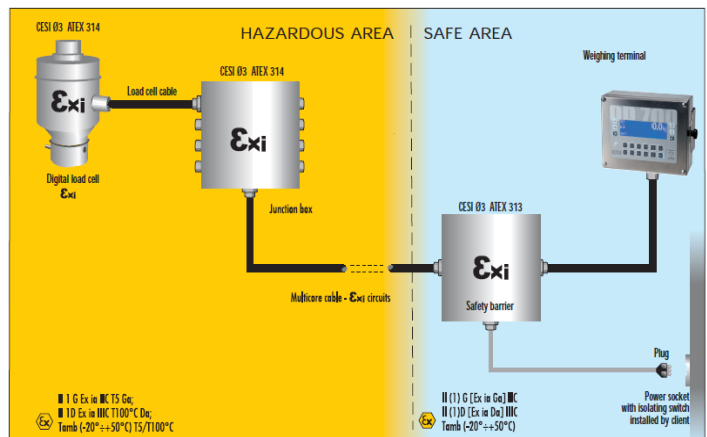


Overall, such weighbridge management systems streamline weighing procedures and remove the need for permanently manned weighbridges.

### Hazardous ATEX certified Weighbridges

Special design considerations need to be given to weighbridges installed in hazardous areas. The weighbridge shown here is used for weighing liquid gas tankers and has multiple holes in the weighbridge deck and suitable clearance underneath to prevent the build-up of gas should any leakage take place during the filling process.

Special ATEX certified CPD-M Digital load cells Zone 1 certified and safety barriers ensure compliance with ATEX requirements.





## Exporting weighbridges

The modular Eurodeck is ideal for export applications, providing a very cost-effective solution for destinations where there are no indigenous weighbridge manufacturing facilities. The weighbridge sections



including ramps, instrumentation and load cells fit inside a standard shipping container for easy, cost-effective transportation anywhere in the world.

On arrival at site, the deck module sections are unloaded and bolted together before being lifted into place on the prepared foundations. The load cells and



instrumentation are pre-calibrated prior to shipping, making onsite

installation very straightforward and requiring only one Weightron engineer for commissioning.

## Service and support

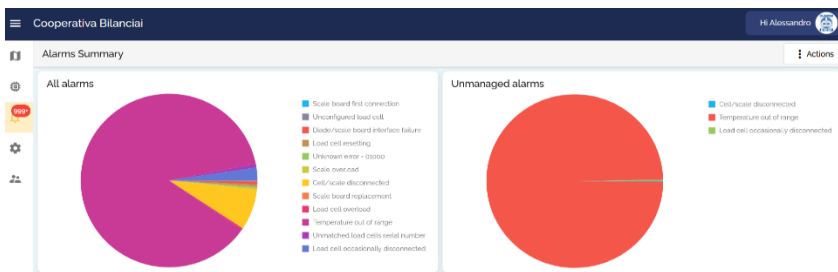
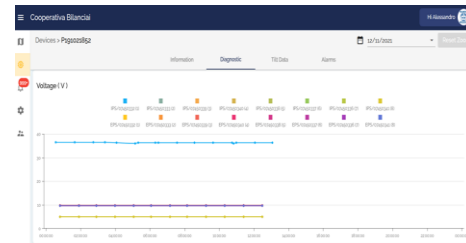
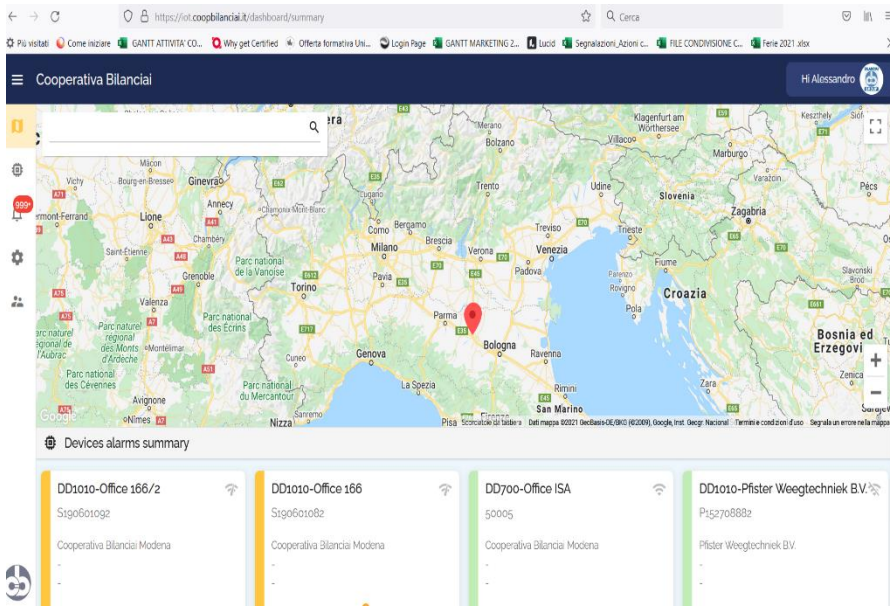
Service and support and product aftercare is a critical issue for weighbridge operators especially for equipment working in harsh environments. The new technologies are bringing important changes to the way in which servicing can be optimised and this is particularly useful at remote unmanned sites. Any weighbridge breakdowns have a rapid and major impact on daily operations and therefore effective servicing and troubleshooting is very important. However traditional methods of servicing do not necessarily cater for the changes in the working pattern of a particular weighbridge. Typically estimates are made to establish the frequency of servicing, often with the emphasis on minimising costs.

## NEXIA Remote Diagnostics

### The future for Weighbridge Predictive Maintenance

If you've previously had issues with your weighbridge and are left wondering when or if it might encounter a fault, then you'll be pleased to know that at Weightron, we have new NEXIA™ technology to help.

Our Remote Diagnostics are developed through NEXIA™ and use cloud technology. We're offering this web based new tool to help enhance our support packages for all scale owners and operators. Through this revolutionary new technology, our support team can get real-time notifications for any issues with your weighbridge, as well as a live status update function to monitor essential components of a scale or weighbridge. This information is available remotely and can be configured so that larger operators can have a level of controlled access to their own equipment on site.



This new NEXIA™ technology will help to minimise any downtime by reporting any hardware faults or by isolating them. This system will also deliver suggestions for remedying any issues, allowing you to keep your equipment in operation for longer and reducing your repair costs. Technicians can visit with all the information, prepared to tackle the outage as they will have visibility into your scale remotely.

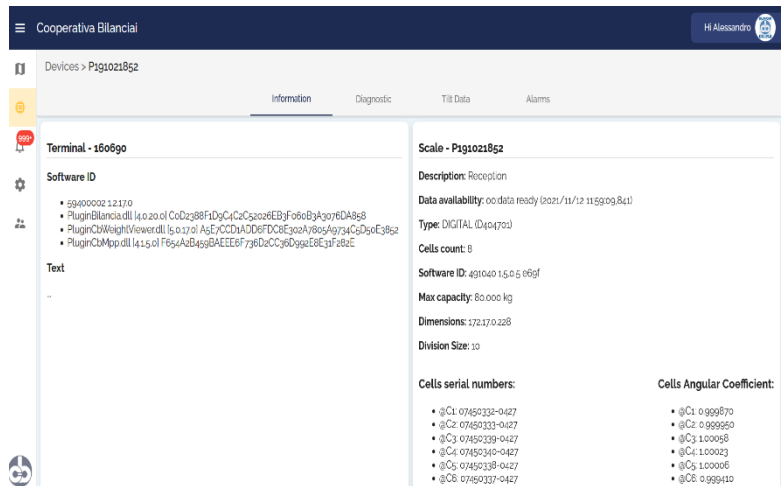
**This technology is:**

- Ideal for both single and multi-site installations
- Suitable for any weighbridge with CPD-M digital load cells, ethernet or GSM connection
- Suitable for any Weightron Bilanciai scales with ethernet or GSM connection
- Suitable for upgrading existing analogue weighbridges when fitted with our Emula digital junction box

From anywhere in the UK, our engineers can log in and view how your scales and weighbridge are operating. It's a 24/7 capability delivering comprehensive data via a secure connection. This system allows for the following:

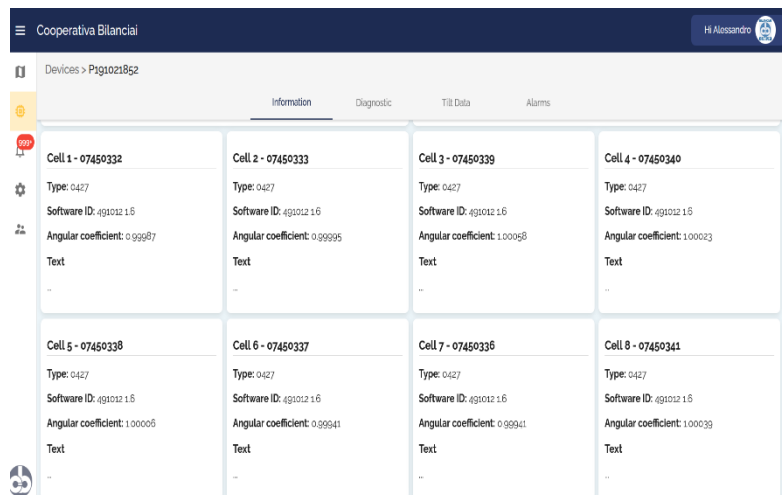
### Data Analytics

- 54 points of data transferred and converted to usable scale information
- Loadcell data – Temperature – Calibration data – Serial number – Supply Voltages – Internal Voltages – Live weight readings – Inclination – Software release
- Terminal Data – All errors messages generated (temporary or permanent) CPU and scale card performance – Software release – Metrological data Components changed and registration of changes



### Alert System Benefits

- Preventative alerts prior to scale outage
- Automated scale outage notifications
- Abuse and overload monitoring alerts
- Maintenance reminders
- Analysis of trends to optimise throughput and efficiency
- Identify unusual activity within a fleet of weighbridges and scales



Although regular servicing and maintenance can help to minimize problems, predicting what and when things will go wrong is very difficult with traditional weighbridges. Therefore, the ability to offer remote maintenance service support can save considerable time and effort especially for equipment operating in harsh, remote areas.

### Troubleshooting Benefits

- Arrive prepared with the proper equipment and reduce critical downtime
- Quickly isolate and repair faulty hardware
- Recommended break/fix solutions

This new NEXIA™ technology allows for real-time oversight and swift response to weighbridge and scale issues, giving engineers the information, they need before they arrive. Downtime to your operations is minimised as the right parts can be sourced ahead of a visit and the weight calibration truck can also be made available. With the data available, we can also help to create an optimised service schedule for your weighbridges and scales on an individual basis.



## Conclusion

Modern weighbridge systems can offer considerably more than weight information and their integration with other technologies is bringing dramatic changes to a wide range of industries, improving efficiency, streamline operations, automating business back-offices. However, the quality of the data they provide is still totally dependent on sound mechanical design principles, quality and reliable product and well-defined installation procedures.



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