WEIGHBRIDGE BASICS

Weighbridges are fabricated structures constructed of steel and steel/concrete combinations. Two broad classifications are "Over-The-Road" and "Off-Road" types.

"Over-The-Road" weighbridge applications are generally classified as motor vehicle scales and are designed for trucks that are used in highway transportation. A subcategory is railroad track scales.

"Off-Road" weighbridge applications are also generally classified as scales and can be designed for a variety of service objectives. The potential for unique and modular design of these products lends them to exceptional customization for both permanent and portable installations.

Beam bridges are the most simple of structural forms being supported by an abutment at each end of the deck. No moments are transferred through the support hence their structural type is known as simply supported.

Modern weighbidges will usually be constructed of steel or steel/reinforced concrete in combination. The concrete used can either be reinforced, prestressed or post-tensioned. Types of construction could include having many beams side by side with a deck across the top of them, to a main beam on either side supporting a deck between them. The main beams could be I-beams, trusses, or box girders.

Weighbridges are not limited to a single span or section. When there is more than one section the intermediate supports are known as piers. Some weighbridges have multiple simply supported sections supported by piers.

THE STRUCTURE

Weighbridge design and the weight of structural steel used directly affect the life of a weighbridge. Weighbridge designs incorporating lower grade, non-certified steel and similar cost reduction methods must be examined carefully to optimize the weighbridge for its intended duty cycles. While overbuilding is costly and unnecessary, excessive reductions in material grade, schedule and fabrication generally reduce all aspects of the life of the weighbridge. For a tried and true design methodology, consider emulating a longitudinal highway bridge design, who's I-beams are arranged longitudinally relative to the traffic flow to ensure wheel support regardless of load position. As an example, see figures 1.0 and 2.0 below.

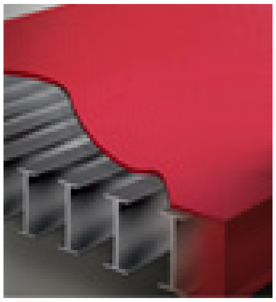

Figure 1.0

Figure 2.0

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Stress concentration areas should be identified through the use of FEA or similar technology to develop a thorough understanding of the effects of weighbridge deflection on accuracy and longevity. Excessive deflection not only degrades weight measurement performance, it will lead to premature failures in the structure. A relative knowledge of the weighbridge life expectancy can be accomplished using basic structural calculations predicated on the construction constituents and techniques.

THE WEIGH MODULE

When integrating a load cell weigh module into the weighbridge, the weigh module should be arranged such that it provides direct support of the load via a primary structural member. All support points of the weighbridge must be supported via a load cell weigh module. Load cell cages and similar add-on appliances that are welded or bolted to exterior beams can allow excessive bending and flexing of the structure to occur, leading to premature deterioration of the weighbridge, loss of performance and potentially structural failure. Therefore, such construction techniques are generally discouraged.

Ideally, the weighbridge will rest directly on the load cell weigh module. Alternatively, it can be designed with load cell weigh module “pods” integrated into the steel structure to reduce the overall height of the deck above ground level as illustrated below in Figures 3.0 and 4.0.

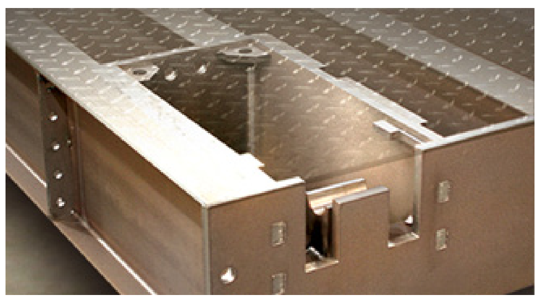

Figure 3.0

The “pod” can be incorporated into the outer structural I-beam as shown in 4.0. These load cell weigh module “pods” are constructed of heavy-duty steel plates incorporated into the design of the weighbridge. Using this technique involves adding large, wide-flange I-beams around the “pod” effectively integrating it into the weighbridge structure. This method adds extraordinary strength and integrity to a very critical area of the weighbridge.

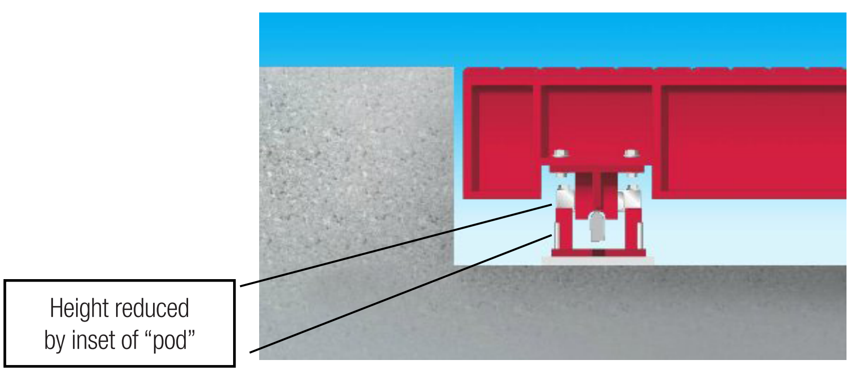

Figure 4.0

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CHECKING OF THE WEIGHBRIDGE

There are numerous methods for checking the movement of the weighbridge. The ideal choice for any given application depends on several factors including:

- Load cell weigh module style/type
- Weighbridge application requirements
- Weighbridge structural components and design

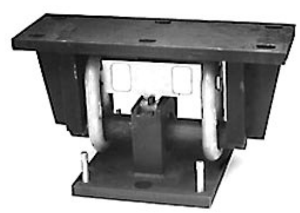
Bumpers, check rods, and similar solutions have their place in the checking scheme, but they do not reliably provide for automatic return-to-center of the weighbridge. Check rods and bumpers primary function should be limited to preventing excessive travel of the weighbridge in any direction (X or Y axis). Even then, reasonable care must be taken to insure no binding of the checking devices occurs. Such binding most often adversely affects the accuracy of measurements.

A good load cell weigh module system solution consists of a "self restoring/self-centering" module that is effective as a stand-alone device. That is, check rods and bumpers are not necessary for the load cell weigh module to function properly within normal limits. Therefore, their use should be limited to extraordinary situations that warrant additional checking. Self-checking load cell weigh modules of this type control excessive movement by virtue of a "Floating Suspension System" technology to create a self-centering, pendulum affect motivated by gravity. As a result, the possibility of binding is eliminated, as is any potential for damaging the load cells due to side loading and similar extraneous effects.

Examples of "Floating Suspension System" load cell weigh modules are shown here:


Weigh Module Series MM 1


Weigh Module Series MM-B 1


Weigh Module Series MM-C 1

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