HOW TO BUY A TRUCK SCALE

You've decided to buy a truck scale. Good. The purchase of a truck scale is a wise investment but, like any investment, it requires some research and thought to ensure that you get the most for your investment dollar. But where do you start? The information that follows will help you decide what type of scale is best for your needs, explain some of the jargon associated with truck scales and make you aware of potential pitfalls in purchasing and installing your new scale.

WHAT KIND OF SCALE DO I NEED?

You don't have to look at too many truck scale brochures to become thoroughly confused about what's available and what is and isn't important to you. Generally, there are two basic types of scales used to weigh trucks; axle load scales which are used to weigh one or two axles at a time and full-length truck scales which weigh the entire truck at one time. While axle load scales are less expensive they are also subject to error. The approaches to the axle load scale must be perfectly level and at the same elevation to minimize the error. Unless you simply don't have room for a full-length scale or your budget won't allow for one, the axle load scale is not a good choice for accurate truck weights. For that reason, we will limit our discussion to full-length truck scales.

Full-length truck scales may be of either portable or permanent installation. Portable truck scales include a lower framework that is placed on a prepared surface (either a concrete slab, wooden beams, or even dirt) and ramps are placed at either end for access. Portable scales are generally more expensive because of the lower framework but are much easier to move from site to site and are ideal for contractors or road builders. Scales that are permanently mounted may be mounted either in a pit (like the basement of a home) or of an above-ground low profile design where the scale is mounted on a concrete slab with ramps at either end. The advantages of a pit type scale include easier access to the bottom of the scale, the capability of adding a dump chute in the middle of the scale for unloading of bulk commodities like grain, no requirement for entry and exit ramps and no problems with snow accumulation beneath the platform. Generally, the cost of a pit type scale is greater because of the increased cost of excavation and pit construction. Low profile truck scale designs are less expensive yet require construction of access ramps at either end of the scale.

Both pit type and low profile scales offer a choice in platform material. Platforms may be constructed from concrete or steel plate or, in some cases, wood. The material you choose will depend somewhat on personal preference as well as the way you use your scale. The initial price of a concrete scale will be a little less than an equivalent scale with a steel platform yet when you add in the cost of the concrete and finishing labor, it will exceed the cost of its steel decked cousin. Concrete also requires a curing time which will delay the use of the scale but concrete is less slippery in wet weather, is not affected by most chemicals, doesn't rust, requires little or no maintenance and provides years of service. Steel decks are usually constructed from checkered plate which gives

extra traction in wet weather. In general, if your application calls for heavy loads and lots of them, concrete is the preferred material for the scale deck.

Scales are available in either full electronic or electromechanical models as well. Full electronic scales are directly supported by multiple load cells typically numbering 6 to 12 cells or more depending on the length of the scale. Electromechanical scales are supported by a series of bearings attached to ends of levers mechanically summing the forces applied to the scale platform. A summed force is applied to a single load cell. Most truck scales today are of the full electronic type simply because they are easier and less expensive to construct. Electromechanical scales are still available from some manufacturers (including Cardinal) and offer some unique advantages. The use of a single load cell makes the scale less susceptible to damage from lightning and they require less power to operate which means a simple battery operated weight indicator can be used when power is not available. Disadvantages of the electromechanical scale include the need for periodic maintenance or repair due to the wear in the bearings of the mechanical lever structure and higher initial cost. The full electronic truck scale has a lower initial price and is easier to work on since there is no complex lever system. The individual load cell signals of a full electronic truck scale must be summed to provide the total weight signal to the weight indicator. Summing of the load cell signals normally takes place within one or more junction boxes typically located at or near the scale. Because the outputs normally differ from load cell to load cell, it is necessary to make compensating adjustments which may become lengthy depending on the method used.

Finally, when choosing a truck scale, consideration should be given to the method of weighbridge restraint used. The weighbridge or scale platform must be constrained so that it does not slide off the supporting structure as a truck enters of leaves the scale. Although there are a number of ways of accomplishing this, the two most common are check rods and bumper bolts. Bumper bolt systems consist of an adjustable rod or bolt or similar device attached to the weighbridge and positioned such that it strikes the adjacent foundation or lower structure preventing further movement of the scale weighbridge. This is an effective and simple means of restraining the weighbridge but, to work properly, it must be periodically adjusted to maintain the proper clearance between the adjacent lower structure or scale foundation and bolt head. As the scale is used, this gap changes and must be adjusted to keep the restraint system operating properly. The check rod type of restraint system is a long thin rod that attaches the weighbridge to the surrounding structure preventing lateral movement of the weighbridge. The ratio between the length of the rod and its diameter is quite large allowing the rod to flex without affecting the accuracy of the scale. Unlike bumper bolts, check rods do not wear and therefore require little or no maintenance.

The table below summarizes the advantages and disadvantages of different types of truck scales. Remember that each the selection of a truck scale requires that you evaluate the various alternatives and choose those which offer the greatest advantages in your specific application. Perhaps the best way of accomplishing this is to contact your local Cardinal representative for an evaluation of your needs and a site survey.

	ADVANTAGES	DISADVANTAGES
Pit Type Scale	1. no ramps required, level with pavement 2. easy access to scale components 3. no accumulation of snow / dirt under deck 4. can accept dump access to conveyor below	1. requires expensive pit construction 2. not good for high water table locations 3. hazardous gases can collect in scale pit 4. safety issues related to pit
Low Profile Scale	1. less expensive to purchase 2. less complex foundation requirements 3. available in a portable model 4. fewer problems with water drainage	1. have to have ramps at both ends of scale 2. may require guard rails to keep truck on scale 3. inexperienced drivers may find it more difficult 4. debris / snow can accumulate under deck
Concrete Deck	1. more robust than steel 2. doesn't rust 3. unaffected by most chemicals 4. better traction, less chance of falling	1. more expensive 2. poor choice for portable scales 3. curing time required before use 4. concrete can / will crack
Steel Deck	1. less initial cost 2. no extra labor required 3. no cure time required 4. doesn't crack	1. can rust with use 2. affected by corrosive chemicals 3. slippery when wet 4. requires periodic maintenance
Full Electronic	1. simple construction / fewer parts 2. easier to service 3. no wear 4. less expensive	1. more wiring required 2. requires more power 3. increased sensitivity to lightning damage 4. requires one or more junction boxes
Electromechanical	1. less power required may be battery operated 2. no junction boxes required 3. simpler wiring 4. less susceptible to lightning damage	1. more expensive 2. subject to wear 3. greater complexity 4. more difficult to service
Bumper Bolt Restraint	1. simple to install and adjust 2. inexpensive 3.	1. requires regular maintenance and adjustment 2. permits the weighbridge to move or "float" 3. potential for damage to scale foundation 4. may become noisy if improperly adjusted
Check Rod Restraint	1. no maintenance required 2. does not allow movement in weighbridge 3. no potential for damage to scale foundation 4. quiet	1. more expensive 2. more attention required in adjustment 3.

HOW BIG A SCALE DO I NEED?

Truck scales are available in a wide range of sizes. Platform widths from 8 feet up are available while lengths often exceed 100 feet. You should select a platform size that is not only sufficient to weigh the trucks you currently have but large enough to weigh the trucks you may use in the future. Generally, widths of 11 to 12 feet are preferred for trucks used on the highway. Not only are scales of this width easier to ship, but they are approximately the lane width of many of our nation's highways. Scales of greater width are available but are more expensive both in initial cost and in the costs associated with testing. Choose a length that is long enough to weigh the largest truck you anticipate weighing in the future. Remember, adding an extra 5 feet or so to the length seven years from now will be much more expensive than purchasing that extra length initially. Also, keep in mind that the scale must fit within the area you have allocated for the scale remembering to allow for a straight approach and departure from the scale preferably equal in length to the scale platform itself. It's better to be a little large than too small.

WHAT ABOUT WEIGHING CAPACITY?

Like platform size, weighing capacity should be selected based on your current and anticipated needs. There are two capacities associated with truck scales. The first, nominal capacity, is the total measurable load that can be distributed over the scale platform. Most truck scales have nominal capacities of 200,000 pounds which is more

than sufficient to weigh highway trucks. Selection of the nominal capacity is normally not of concern since it is typically great enough to handle all but the most extreme loads.

The second capacity associated with truck scales is concentrated load capacity and is used as a measure of the ability of the scale to measure a load concentrated in a relatively small area. Concentrated load capacity, or CLC, is defined in the National Institute of Standards and Technology Handbook 44 as the maximum load that can be placed in an area four feet in length by the width of the scale platform and is recorded on the scale's identification plate. This area is designed to approximate the area required for the dual tandem axles found on most highway trucks. If you know the spacing and number of axles on your trucks and the CLC of the scale in question, you can easily calculate the maximum load that can be applied to the scale by the truck in question. Refer to Table U.R.3.2.1. in Handbook 44 (Handbook 44 may be ordered directly from the National Conference on Weights and Measures website at http://www.ncwm.net/pubs.html) By selecting the number of axles and spacing between the two extreme axles you can obtain the ratio of CLC to maximum load or "R" factor. Multiply this "R" factor from the table by the CLC to determine the maximum weight for this configuration of axles. Using this method, you may calculate the maximum load the scale under consideration is capable of handling for any configuration of axles that will fit on the platform. Remember not to exceed the nominal capacity of the scale. CLC ratings are normally listed in units of tons (2,000 pounds) and vary from 20 tons up to 50 tons depending on the scale model in question. Higher CLC ratings translate to longer life for a given load since the scale structure undergoes less stress each time it is loaded.

WHAT ABOUT OPTIONS?

There are about as many options available for truck scales as there are cousins at a family reunion. Some valuable options to consider for the scale itself include stainless steel sheathed load cell cable to prevent damage from hungry rodents, digital junction boxes that convert the analog load cell signal to a digital value at the scale then transmit it via fiber optic cables to the weight indicator, guard rails to prevent the truck from driving off a low profile scale, special finishes like galvanizing and other custom features. When it comes to choosing a weight indicator for use with your truck scale, the sky's the limit. Indicators range from simple, weight-only models up to programmable full featured versions with everything in between. Refer to our document on how to select a weight indicator for assistance in making this decision. Other options like remote displays for driver viewing, printers and software for managing your truck fleet and interfacing to your accounting system are readily available. Just contact your Cardinal representative for a recommended instrumentation package for your scale.

WHAT'S NTEP AND HOW DOES IT RELATE TO MY TRUCK SCALE?

Many truck scales are used in commercial transactions where the weight obtained from the scale is used in the determination of the price of the commodity being weighed. In

these instances, the scale must be approved for commercial use by your state's weights and measures department. In most cases, this means that it must have an NTEP Certificate of Conformance and be inspected and approved by a state weights and measures inspector. NTEP, which is short for the National Type Evaluation Program, is a program managed by the National Conference on Weights and Measures (NCWM) which is a organization consisting of both public and private members and dedicated to maintaining equity in the marketplace. Scales and scale components are formally evaluated in one of several metrology laboratories under the NTEP program to ensure that the device performs within published tolerances and over the range of environmental characteristics (temperature, voltage, etc.) which have an influence over the measurement process.

You should make certain that the components making up your truck scale system each have their own NTEP Certificate of Conformance. This means that the truck scale should have a NTEP CC as should the load cell(s) used with it and the weight indicator itself. An easy way to independently verify that these components each have a NTEP Certificate of Conformance is to check the NCWM website listing of certificates at http://asphost.isproductions.net/ncwm/certsearch.asp where you may search for certificates by number, manufacturer or type.

WHAT DO I DO AFTER I'VE SELECTED MY SCALE MODEL?

You've decided on a scale model and are ready to go, but before you sign on the dotted line, there are a few more things to investigate. First, check with your county and / or city zoning office to make certain that you can place a truck scale at the desired site. Often a building permit along with the necessary fees and drawings is required for installation of a truck scale. This will differ from location to location so it's best to check with your local authorities before you turn that first spade full of dirt.

Keep in mind the following requirements when selecting your scale site:

1. It must have the proper zoning, if required.
2. There must be sufficient room for access to and from the scale. Generally, state requirements mandate that there be a straight and level approach to and from the scale each equal in length to the scale platform or a specific length whichever is less. Your local weights and measures department can advise you of the minimum length and if there are other requirements for the scale foundation design, ramp slope (if a low profile scale is selected) or pit construction. The layout should be such that the truck does not turn onto or off of the scale. It should pull straight on and straight off of the scale platform.
3. The soil bearing capacity must be of sufficient strength to hold the scale and the greatest load to be measured by the scale. Generally, the soil bearing capacity must be a minimum of 3000 to 4000 pounds per square foot although smaller capacities can be used if provisions are made in the foundation design.

4. There must be proper drainage away from the scale foundation to ensure that water does not collect around the scale or in the scale pit. With pit scales this usually means installation of a sump pump with an adequate drain while low profile scales will require a gravity drain and proper ground slope to move the water away from the scale.
5. There should be no overhead power or telephone lines that could interfere with the movement of trucks across the scale.
6. There must be sufficient room for a crane to unload the new scale from the truck when it is delivered to your site.
7. There must be an acceptable site for placement of the weight indicating instrument. Normally the weight indicator is placed within a building of some type within easy view of the scale to allow the scale operator to verify that the truck is properly positioned on the scale before weighing begins. The site should have sufficient power available to power the weight indicator and printer. Power should also be run to the scale pit for pit-mounted truck scales. Refer to your local electrical codes for safety requirements.
8. A means of communication between the driver and scale operator (intercom or radio or similar device) is always a good idea.
9. Guard rails or posts to protect the scale, scale house and adjacent equipment is good insurance against damage from an errant truck.
10. Make certain that the site selected is not in a hazardous or explosive area. If it is, special precautions must be taken in the purchase of the scale to ensure that it is compatible with the environment.
11. Make certain that the effect from other influences to the scale are minimized. This may mean construction of a wind block if the site is in an unusually windy location or in a snow fence to minimize accumulation or drifting of snow over the platform.

I'M READY TO BUY, WHAT DO I DO?

Great! You've selected your site and made sure it's ready for a scale, contacted your local weights and measures department and advised them of your plans, met all of the local restrictions and now you're ready to get started. The best bet is to contact your local Cardinal representative and place your order. They can help you with selection of any peripheral equipment and provide you with a turn key job. Just call our toll-free number for the name of your nearest Cardinal dealer: (800) 441-4237.

DO I HAVE ANY PAYMENT OPTIONS?

There's more than one way to get a new Cardinal truck scale. You may, of course, pay in full for your purchase or you may arrange for a lease. If your need is only temporary, you may choose to rent a Cardinal truck scale. Regardless of your situation, we make it easy for you to choose a Cardinal.