

IN-MOTION SCALE SITE SELECTION

As our country's transportation infrastructure ages and reaches the limit of its capacity, the need for accurate and reliable traffic data is perhaps greater than ever. Engineers, planners and various agencies depend on this data in performing their work in pavement design, evaluation of safety standards, enforcement of motor carrier regulations and in forecasting future needs. The efficient utilization of our roadways demands optimum performance in the collection and management of data and that includes truck weights.

Today's traffic volume and limited throughput capacity of existing weigh stations simply will not allow every truck to be weighed statically. One solution to this problem is to weigh trucks in motion as they travel down the roadway. Weigh-In-Motion (WIM) scales today offer performance levels acceptable for use in presorting as well as for data collection. WIM scale performance, as with most devices, is affected by a number of factors including not only the characteristics of the vehicle being weighed but also the type, condition and geometry of the road in which it is installed. To make certain that the WIM scale performs at its maximum potential, it is necessary to eliminate as many factors adversely affecting its accuracy.

Site selection is the single most important factor in making certain a WIM scale operates at its full potential. The selection of a site for a new WIM scale is an investment in future long-term performance. When determining the location for a new WIM scale, there are two basic factors to consider. First, the characteristics of the road itself play an important role in the performance of the WIM scale. Second, proximity to utilities and, depending on the application, to the weigh station are also important considerations affecting the cost of the installation. In many instances, it may be necessary to trade off the advantages of utility access or proximity for a site with better road characteristics or vice versa. Be careful not to let the nearness of a phone or electrical line cause a site with unacceptable roadway characteristics to be selected.

Begin by looking at the ASTM specification E1318 that describes road characteristics for a WIM scale. Included are specifications for road smoothness, slope and curvature. Generally, the smoothness of the road in proximity of the WIM scale can be addressed, but the slope and curvature are pretty well fixed. Keep in mind that the smoothness of the road before and after the WIM scale is more critical than it is for classifiers. Classifiers typically look for the presence of a wheel signaling an axle. Unlike a WIM sensor, a classifier does not measure the magnitude of the force applied by the wheel(s), but simply its absence or presence. Sensors employed by WIM scales measure the magnitude of the force applied by the wheel and convert this force measurement into an estimate of vehicle weight. By adhering to the ASTM specification for smoothness both before and following the scale, the effects of oscillation within the truck's suspension and load are minimized thus keeping the weight errors to a minimum. The relatively long (in relation to the truck length) length of smooth pavement is required to allow oscillations in the truck suspension to minimize before the truck passes over the scale sensors. Likewise, selection of a site complying with the slope and curvature requirements ensures

that external forces due to centrifugal force or acceleration are kept at a minimum. Sites where trucks are climbing up or speeding down hills or shifting gears or braking should be avoided if at all possible.

Location of the utilities needed is normally only of secondary importance. Normally it is less expensive to run additional telephone or electrical line than it is to deal with poor road conditions. Often alternatives exist to dependency on utilities. Cellular telephone service can be utilized as can solar-powered instrumentation. Utility proximity is best used as a deciding factor between two sites each with acceptable road characteristics.

It is highly recommended that you pay a personal visit to the prospective sites before the final site selection is made. By visiting the sites, it is possible to determine first hand the advantages and disadvantages of each proposed site. Access to the site for construction and maintenance personnel should be a consideration as should the current and predicted traffic flow. Sites located near an intersection or interchanges may experience a relatively large number of trucks changing lanes while those located further away may not experience this problem. The condition of the existing pavement including thickness, wear and general condition should be noted. Care should be exercised to make certain that the trucks passing over the WIM scale do so straight and at a uniform speed.

Other things to look for during the evaluation of a potential WIM scale site are overhead power lines or other power transmission equipment and radio and television transmission towers. The strong electrical and RF fields emitted by equipment of this type can adversely affect some types of sensors used in WIM scales. Watch out for adjacent railroad tracks (they may not be readily apparent) which can impart ground vibrations which affect scale performance. Make certain there is not a drainage pipe or tunnel beneath or near the proposed scale installation site. Finally, make certain that there are no trees, buildings, hills or other objects that block the sun from reaching the solar panels if your system will be solar powered.

Once you have made your final selection, your work is not done. It is important to coordinate the installation of the WIM scale with any future road paving. Nothing is more frustrating than to install a WIM scale only to learn that the site is scheduled for new paving. On a similar note, be certain that any future striping does not direct the traffic to one side or the other of the WIM sensors. Striping that causes the vehicles to straddle or pass offset to one side of the WIM sensors will result in a scale that fails to function correctly.

When the site is finally selected and there are no paving or striping issues, it is important to adequately identify the site so that others know exactly where it is. This can be done using a GPS (Global Positioning Satellite) system to determine the coordinates of the site. A written description including references should also be used as a backup. It may sound trivial, but unless you properly record and convey the site information to others, all your hard work in selecting the site may be for nothing.

Understanding what a WIM scale does and how it works enables you to take into consideration those factors which will affect the performance of your scale. If you are uncertain about the scale or not sure what you need, by all means seek help. Making certain that you pick the best site will save you time, money and potential aggravation.

In general, the following steps are recommended in site selection:

1. Refer to ASTM 1318 for required roadway characteristics, i.e. smoothness, curvature, slope, etc.
2. Conduct a site survey to determine proximity to utilities and, if required by the application, to the weigh station.
3. Narrow the field of choices to two or three then take another look to make certain that there are no other factors (merging traffic, adjacent power transmission lines, etc.) that could adversely affect the performance of the scale.
4. Adequately identify the site with coordinates and description.
5. After the final selection is made, ensure that any scheduled paving or striping in the area will not affect the scale.

The proper site selection can do wonders in minimizing those factors that can have a major impact on the performance of your scale and on the accuracy and reliability of the weight data. Regardless of whether you use the scale for data collection or presorting of trucks to be weighed statically, the proper selection of the site for the WIM scale is perhaps the most critical undertaking of the whole process. The ultimate performance of your scale depends greatly on your ability to make the proper site selection. If you have any specific questions about site selection, Cardinal engineering personnel would be happy to assist you.