Kansas
LTAP Newsletter

How to Use Pneumatic Road Tube Counters

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Traffic volumes, speed, and vehicle classifications are essential information for all areas of transportation planning. These data shape everyday decisions on how to design, operate, and maintain local infrastructure. The pneumatic road tube counter is by far the most commonly used sensor for automatically collecting highly accurate traffic data such as the speed of vehicular traffic passing along a roadway, traffic volume (counts), and vehicle classifications (1). This article will describe how pneumatic road tube counters work, and the pros and cons of using them, and how to obtain them through Kansas LTAP's Equipment Loan Program.

A pneumatic road tube counter is a temporary electronic traffic recording device. The collected traffic data can be used by local agencies and traffic professionals to identify traffic patterns and for traffic studies to improve roads or provide alternatives. For instance, traffic counts, often collected by pneumatic road tube counters, provide the source data used to calculate the Annual Average Daily Traffic (AADT), to compare two or more roadways, or to determine different zones such as a central business district (CBD) in an urban area. Another example of collected data is speed, which is usually used for defining peak speeding periods and speed limit enforcement efforts.

Applications

A pneumatic road tube is an on-roadway technology that involves rubber tubes laid on top of paved road lane(s). There is a difference between pneumatic road tubes and other traffic counting devices like piezoelectric sensors, which are embedded in paved roadways, and inductive loops, which are cut into paved roadways. Pneumatic road tubes are generally used for temporary studies to collect a short-term count, while piezoelectric sensors and inductive loops are used for ongoing data collection. Piezoelectric sensors and inductive loops detect traffic patterns and are often used for monitoring traffic congestion on major roads to improve the operational efficiency of traffic signals in the intersections (1).

How do I install pneumatic road tubes?

Selecting the installation location is the first step of the process. To do so, place tubes exactly perpendicular to the flow of traffic and install them on a straight stretch of road so vehicles are not hitting the tubes on an angle. Installation should be away from locations where traffic will be queueing up and stopping on the tubes, or in locations where vehicles will turn or pass over the tubes on an angle.

The second step is the tube layout or installation configuration. This step varies depending on the type and manufacturer of the equipment and the type of data to be collected. Figure 1 shows an example of pneumatic road tube layouts provided by a manufacturer. Reading and understanding the user's manual for the device is very important because the internal calculations depend on those layouts to calculate speed, vehicle length, headway, and other traffic parameters. If the specified layouts are not followed, the device will generate erroneous data. For instance, the spacing between tubes in a two-tube setup is a function of the posted speed limit for the segment

Figure 1. Kansas LTAP Team Installing Pneumatic Road Tube Counter in Republic County, Kansas.

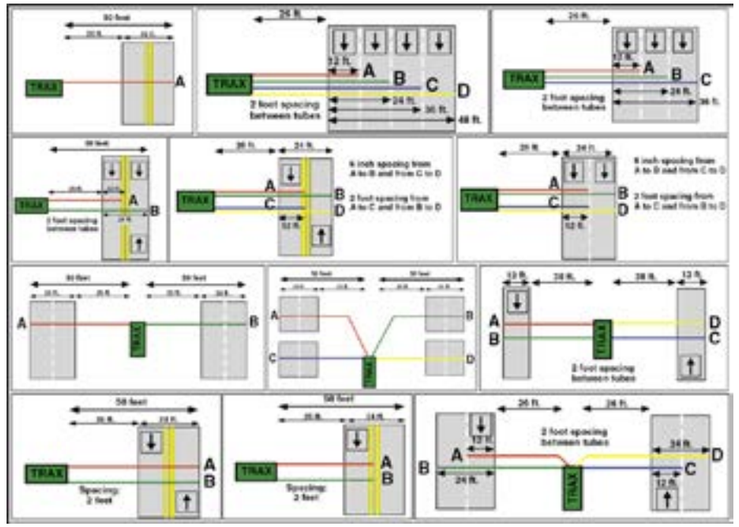

Figure 2. Pneumatic Road Tube Layout Samples (2)

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of the road in question. When the posted speed limit of a segment is high, it is recommended to increase the distance between the tubes to allow for a more precise measurement of the collected speed. Once the location and layout are specified, the installation process can be started. The equipment required for installation depends on the type of device and road tubes used, but generally includes tubes, a hammer and PK nails, mastic tape in 6-inch strips, a clamp, a utility knife, a tape measure, and end plugs.

After measuring the proposed distance between the tubes, the tubes are stretched by an additional 10 percent of their length across the desired lane(s), sealed at one end, taped in the middle by mastic tapes, and then attached to the collection device at the other end. When a vehicle passes over a tube, the wheels pinch off that section of the tube, sending air pulsing back to the counter. The counter then records this pulse and converts it into a vehicle count. Using a single tube records the time between individual vehicles and axle counts, which must be converted to vehicle counts using factors related to assumed vehicle classification in the area (3).

The last step of the installation process is observing the traffic as it is being recorded to ensure the setup is working correctly. Checking the tubes periodically during the traffic study is important to ensure they have not been damaged and data is being recorded as programmed.

Where do pneumatic road tubes work most effectively?

Ideally, the use of road tubes would be exclusively on paved segments of roadways to minimize the risk of damage to the equipment from sharp gravel and to avoid erroneous data caused by irregularities in the road surface (3).

Which types of data do pneumatic road tubes collect?

Pneumatic road tubes provide individual detection; that is, the traffic parameters in each row of the data table represent an individual vehicle detected on the road. The data can then be downloaded as a Microsoft Excel file, which displays various details about the location and time of data collection and several parameters of a detected vehicle in different columns. These traffic parameters include date and time of detection, travel lane, number of vehicle axles, space between axles, class of vehicles (see Figure 3), length of vehicles, and travel speed. (1). Some of the recent versions of pneumatic road tube counters have been upgraded to count bicycles. Kansas LTAP has five counters with upgrades that count bicycles for loan.

Advantages and disadvantages of using pneumatic road tubes

The FHWA has identified the following advantages and disadvantages of pneumatic road tube counters (5).

Advantages

- Quick installation for permanent and temporary recording of data,
- Low power usage,
- Low cost,
- Simple to maintain,
- Manufacturers often supply software packages to assist with data analysis.

Disadvantages

- Inaccurate axle counting when truck and bus volumes are high,
- Temperature sensitivity of the air switch,
- Tubes can be cut from vandalism and truck tire wear.

Interested in using pneumatic road tubes? Kansas LTAP can help

A pneumatic road tube counter costs approximately $1,700 without the tubes and installation tools identified in this article. However, Kansas LTAP has

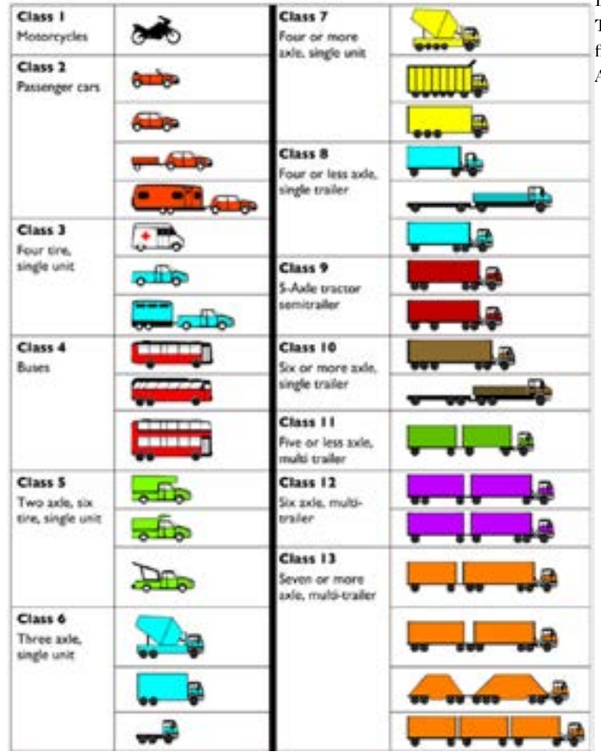

Figure 3. FHWA 13 Vehicle Category Classification (4)

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18 pneumatic road tube counters with the installation tools and offers them to public agencies for free through its Equipment Loan Program. Learn more at http://kutc.ku.edu/equipment-loan-program.
Kansas LTAP also provides hands-on training for using the pneumatic road tubes (and many of the other devices available through the loan program) and will analyze the collected data for no cost, if needed. For further information on the proper devices for your needs, please contact Kansas LTAP at hemin@ku.edu.

Endnotes

References

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