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AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Practice for Using Pneumatic Tubing for Roadway Traffic Counters and Classifiers[1]

This standard is issued under the fixed designation E 1957; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers the use of pneumatic road tube to detect axle hits used for recording vehicles or for the classification of vehicles as part of roadway traffic monitoring.

1.2 The practice applies only to pneumatic road tubes used for the detection of vehicle axles on a roadway.

1.3 The values stated in SI units are to be regarded as the standard. The inch-pound units given in parentheses are for information only.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

E 1442 Practice for Highway Traffic Monitoring[2]

E 1572 Practice for Classifying Highway Vehicles from Known Axle Count and Spacing[2]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *axle counter*—a device that receives signals from an axle sensor and indicates the cumulative number of axles that have passed over the sensor.

3.1.2 *axle hit*—an event in which the presence of a weight-bearing vehicle axle is sensed by a pneumatic road tube or other axle sensor.

3.1.3 *machine count*—automatic recording of axle counts, vehicle counts, or classifications, or all of these, by sensors attached to a recording device.

3.1.4 *manual count*—recording of vehicle counts or classifications, or both based on human observation.

3.1.5 *pneumatic road tube*—an elastic tube that is stretched across a roadway for the purpose of detecting a weight-bearing vehicle axle.

3.1.6 *traffic counter*—a device that records vehicles or vehicle axles, or both, that pass over a sensor.

3.1.7 *traffic recording device*—a unit that receives output from a sensor and registers an axle count, vehicle count, vehicle classification or speed, gap, or headway.

3.1.8 *validation count*—an independent count made for the purpose of insuring that the installation is operating properly.

3.1.9 *vehicle*—an assembly of one or more units coupled together for travel upon a roadway; vehicles include one power unit and may include one or more non-powered trailer or semi-trailer units.

3.1.10 *vehicle classification count*—the recording, summarization, and reporting of traffic volume by vehicle type.

3.1.11 *verification/test count*—comparison of sensor counts to a concurrently recorded validation count on the same segment of roadway.

4. Significance and Use

4.1 This practice addresses the recording of traffic characteristics, using pneumatic tubing with recording devices. This practice provides information for use with professional judgment by governmental agencies and private firms in the management of roads and roadway traffic.

4.2 Traffic monitoring is important to the safe and efficient movement of people and goods. The purpose of this practice is to ensure that traffic monitoring procedures produce traffic data and summary statistics that are adequate to satisfy diverse and critical traffic information needs.

5. Procedure

5.1 *Installation Procedures and Techniques*:

5.1.1 Select a relatively straight and smooth section of roadway with free flowing traffic throughout the duration of the data collection session. For example, in selecting the roadway section, attention should be given to avoiding proximity to driveways and intersections. The availability of a place to anchor the counting device is also important.

5.1.2 Install the tubing on the surface of the roadway, perpendicular to the flow of vehicular traffic. The end away from the recording device must be effectively sealed to prevent leakage of air and to prevent the intrusion of foreign matter and water. This end must be secured to the ground or pavement using a suitable anchoring device, such as a nail, clamp, or bracket.

5.1.3 Place a second anchoring device at the near edge of the pavement. This device must not restrict the flow of air. Pull

[1] This practice is under the jurisdiction of ASTM Committee E-17 on Vehicle-Pavement Systems and is the direct responsibility of Subcommittee E17.52 on Traffic Monitoring.

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[2] *Annual Book of ASTM Standards*, Vol 04.03.

the tubing across the roadway, and through the anchoring device. Between the anchoring devices, stretch the tubing approximately ten percent of its length, for example, for a 10.0 m (32.8 ft) length of tubing, stretch the tubing 1.0 m (3.3 ft). While it is stretched taut, secure the tubing with the second anchoring device.

5.1.4 The tubing may be secured to the pavement surface between the anchoring devices with other appropriate anchoring devices, such as asphaltic or adhesive tape. This tape can be spaced at 1 m (3.3 ft) to 1.5 m (5 ft) intervals along the length of the tubing.

5.1.5 The installation of tubing should be accomplished in a manner that places no nails in the wheel path on the surface of the traveled roadway.

5.1.6 When the use of more than one tube is required, for example, for vehicle classification or speed data collection, both tubes must be exactly the same length from the counter to the near edge of the pavement. In addition, the two sections of tubing should be of the same cross-section, approximate quality, durability, and age.

5.1.7 The length of the road tube should be between the minimum and maximum specified by the manufacturer of the traffic monitoring device. The use of shorter lengths of tubing may result in damage to the recording device. The strength of the air pulse, and therefore the accuracy of the count, can be influenced by a number of factors, including: tube length, tube cross-section, hardness of the tube, speed of traffic, tire widths, distance between recording device and point of impact on the tube, and uncontrolled movement of the tube.

5.2 Once the tube or tubes have been installed and connected to the recording device, a validation test such as 5.2.1 must be conducted to determine if the air pulses are being recorded correctly.

5.2.1 *Machine Count*—Vehicles in the traffic stream have to be observed to verify that the recording device is properly registering the axle hits. A minimum of 50 axle hits is recommended. On low volume roads, it may be necessary to manually check the road tube using an alternative method. As an example, the equipment installer's vehicle may have to be used to test the installation.

5.2.2 At the end of the data collection period, repeat the procedure outlined in 5.2.1 to make certain that the installation is still properly registering the axle hits. If the installation is not functioning, the count should be retaken.

5.3 *Pressure Testing of Road Tube*—Verify that the road tube or tubes can hold 7 KPa (1 lb/in.^{2}) of air pressure for 1 min; if not, discard the road tube. At this time, the tube should be cleaned by blowing air through it.

5.3.1 At regular intervals such as at the end of each data collection session, inspect each road tube, paying particular attention to the area around the clamps. During the inspection, check the tube for chafing, abrasions, or punctures. The tubes should be tested at least once every month for air pressure retention, in accordance with 5.4.

6. Keywords

6.1 axle hits; pneumatic road tubing; traffic counters; vehicles; vehicle axles; vehicle classifiers