SORTPO/SWODA TRAFFIC COLLECTION PROCEDURES

Introduction

These procedures are designed to acquaint the traffic counter with the tools and methods of traffic-counting work using the portable Metro Count Traffic Count machine (MC). Knowledge of, and adherence to, these guidelines is recommended for acceptable work and help to ensure accurate data is collected. The traffic counting machine records a count each time a vehicles' tires roll over a hollow tube stretched across the road. A pulse of air travels up the tube to the machine and activates the counting mechanism. The machine records the number of axles passing over the tube.

Requests for Traffic Counts

The borrower of equipment shall not perform special traffic counts for the public nor shall the traffic data be revealed to the public. Upon collection of the traffic data SORTPO Director of Transportation will download and review the data before sending to the borrower of the equipment.

Average Daily Traffic and Annual Average Daily Traffic Counts

Average daily traffic (AADT) counts represent a 24-hour count at any specified location. These counts are obtained by placing an automatic counter at the analysis location for a 24-hour period. Accuracy of the ADT data depends on the count being performed during typical roadway, weather, and traffic demand conditions. Annual average daily traffic (AADT) counts represent the average 24-hour traffic volume at a given location averaged over a full 365-day year.

Schedule

Manual counts are typically used to gather data for determination of vehicle classification, turning movements, direction of travel, pedestrian movements, or vehicle occupancy. Automatic counts are typically used to gather data for determination of vehicle hourly patterns, daily or seasonal variations and growth trends, or annual traffic estimates.

Portable Counters

Portable counting is a form of manual observation. Portable counters serve the same purpose as manual counts but with automatic counting equipment. The period of data collection using this method is usually longer than when using manual counts. The portable counter method is mainly used for 24-hour counts. Pneumatic road tubes are used to conduct this method of automatic counts.

The portable counter method uses pneumatic tubes placed in the travel lanes and then connected to recorders located at the side of the road. The automatic recorders can store large amounts of individual vehicle data or even larger amounts of vehicle classification data. The collected data are downloaded from the recorder to a laptop.

The road tubes are prepared on the roadside to minimize the time each traffic lane is closed. Workers then place the road tubes across the lanes. The location of the tubes should be outside the influence of other factors such as an intersection, major access points, etc. Traffic control should be provided to protect the crew. After placing, the crew should make sure that the tubes are functioning properly. Finally, the crew can secure the road tubes to the pavement. To avoid theft, the recorder must be secured with a chain and padlock to an immovable object

Vehicle Classification

Some vehicles have more than 2 axels and in some locations the number of vehicles on a specific roadway can only be known is the relative percentages of trucks, busses, trailers and automobiles are known. A count of axles is the average number of axles of the vehicles on the roadway.

Intersection counts are used for such projects as timing traffic signals, turn prohibitions, analyzing high crash intersections and evaluating congestion. The intersection count classification scheme must be understood by all observers before the count can begin. Each intersection has 12 possible movements. The intersection movements are through, left turn, and right turn. The observer records the intersection movement for each vehicle that enters the intersection. Typically, cars, pickups and panel trucks, and motorcycles are classified as passenger cars. Other trucks and buses are classified as trucks. School buses and farm equipment may be recorded separately.

Data

The traffic information is collected is crucial to SORTPO's and other community's transportation and community planning process. Traffic counts data is best collected Monday-Friday when school is in session unless it is a special event count. To obtain accurate data, the traffic counter must set up the equipment at the correct location, in the prescribed manner, and allow the machine to count for no more or less than 24 hours. This precision regarding the counting period is especially crucial in high-traffic areas, but is also very important in medium- and low-traffic areas, where counting an extra fifteen minutes into a peak period of traffic flow can so distort the count as to make it useless. Traffic counting is recommended to be conducted between 12:01 a.m. Monday and 11:59 p.m. Thursday. Friday counting is permitted for 48-hourcounts which began on Wednesday. Saturday and Sunday counting are permitted for special events.

Safety

Safety is the first consideration of our traffic-counting program, both for the counter and the traveling public. Traffic-counting work is extremely hazardous. The counter is required to spend a lot of time on and near roads and highway. Failure by the counter to follow safe practices and wear proper attire could result in serious injury or death. SORTPO recommends that the entity collecting data review their internal safety procedures to ensure that traffic counting meets applicable procedures. The following are recommended for proper clothing.

Attire

- A hard hat is required to be worn while working in the right of way.
- A reflective safety vest is always required to be worn while outside of the vehicle.
- No shorts, skirts/dresses are to be worn. Camouflage clothing is prohibited.
- Footwear should have a nonskid sole. Steel toed footwear and water-resistant footwear is recommended.
- Leather gloves are recommended.
- Eye protection, such as goggles are recommended.

General Procedures

- Do not block private drives or mailboxes.
- Do not park where such parking restricts the visibility of other drivers or causes an unsafe condition for other drivers.
- Ensure the vehicle is out of the travel lane and that an open door will not intrude in the travel lanes.
- A strobe light is recommended to be used while parked near a roadway.
- Emergency flashers shall be used while a person is parked on the right of way during the traffic county work.
- Extreme care should be taken in handling the tubing so that the person does not become entangled. If a vehicle catches the tubing, it should be released immediately. Tubing should never be carried looped across the shoulders or in any manner which risks entanglement.
- The counter shall not flag down, stop or otherwise hinder restrict or interfere with traffic. Counting machines should never be chained to mailboxes, nor to trees or chain-link fences which are on homeowners' property, nor to gas lines or gas meters. the counter will not make any setup on any road marked "Private Road," "Posted - Keep Out," or with other similar signing.
- If the counter observes vandalism of state equipment, he should not approach the vandal or seek to interfere but should call the local police.
- The counter must check for traffic in both directions prior to proceeding onto the travel lanes. If equipment belonging is either lost, stolen, or damaged it should be reported to SORTPO immediately. Report stolen equipment to the local police.
- If SORTPO determines that the loss or damage of the equipment is the result of negligence, SORTPO will require compensation from the borrower.
- When the count is completed, and the tubing is retrieved from the roadway, all nails and studs (pins) shall be removed. The site should be cleaned of all debris,

such as used nails and clamps. A container should be carried in the vehicle for debris and trash.

- The counter should report all accidents, in which he is involved during counting work, to the supervisor as soon as possible. The supervisor will contact SORTPO.

Tools and Accessories

It is very important to use heavy-duty, good-quality tools in traffic counting work. The tools are used during every set-up and take a lot of abuse. Poor-quality tools which break on the job can cause the loss of a day's work. SORTPO will provide all tools; accessories such as gloves and hard hats must be provided by the borrower. Equipment needed for safe installation of traffic count equipment include hammer/mallet, yellow vest, tape measure, road tape, padlock/chain, side cutter, crowbar, cloth yellow tape and gloves.

Description of Tools

- A straight-claw, 28-oz. or 32-oz., steel-handle framing hammer is important so that nails can be easily driven into road and removed. The steel handle will stand the stresses of nail removal better than a wooden handle.
- A 3/4-inch-thick, 36-inch-long gooseneck crowbar is recommended for pulling out nails or studs which cannot be dislodged by the hammer.
- A small, inexpensive voltmeter is needed to check the voltage of the ACR machine batteries. The voltmeter should be capable of measuring up to 7 volts DC. It should have at least a 4% accuracy on full-scale meter deflection on an analog meter.
- Two types of nails are required for traffic-counting work:*60d spike (nail)* - These are used to nail the road-tube clamp in soft asphalt and gravel. *PK (masonry) nail at least* 2 1/2" *inches long* - These are used to nail the road-tube clamp in hard asphalt and concrete.

Friction tape is used to construct a collar around a road tube. The collar prevents the tube from slipping through the hole in the clamp when tension is put on the rubber tube. The friction tape should be of cloth-like consistency and sticky on both sides. Duct tape, electrician's tape, or any other tape shall not be used.

Road Tube

The road tube and the MC machine comprise the two components of a traffic counting set-up. The term road tube refers to the rubber tube which is stretched across the roadway and the clamps and other associated devices that go with it. A standard road tube is constructed from several parts:

- 5O feet of rubber tubing

- 2 clamps
- 1 collar
- 1 plug

Making the Road Tube

- ✓ The tube should be checked inside for wax (from the manufacturing process). If wax or other debris is stuck to the inside of the tube, it should be returned to SORTPO.
- ✓ Cut a 100-foot roll of rubber tubing in half to produce the 5O-foot length of tubing. Note: Road tubes shorter than 40 feet in length or longer than 65 feet in length shall not be used. A tube which is too short allows the pulse of air hitting the counting mechanism to be too strong, possibly causing damage. A tube too long will keep some pulses from reaching the counting mechanism.
- ✓ Feed one end of the tube through the hole in one clamp and pull about 2 feet of the tube through the clamp.
- ✓ Tie a knot near (within 5 inches of) the end of the tube. Plug the end of the tube with a 60d spike cut to 2 1/2 to 3 inches in length. Allow the clamp to slide back down the tube to rest against the knot.
- ✓ Run the other end of the tube through the other clamp.
- ✓ Rub some talcum powder (or dust will do) on the tube where the collar will be installed. Take the 3/4" friction tape and wind six or seven turns around the tube (between the end of the tube and the clamp). The tube should be slightly stretched in the area of the collar while wrapping the tape. After a portion of the tape is wound, apply more powder and force it back and forth along the tube so that it will slide. The collar should be about an inch long and 3/8" thick.
- ✓ The roll of tubing, or other tools or objects, shall never be thrown across the roadway.
- ✓ Nails and studs should be fully driven into the pavement, so they don't protrude above the surface of the base of the clamp. Do not drive nails in part way and then bend them flat against the pavement.
- ✓ Do not restraighten PK (masonry) nails for reuse. They may shatter on being hit with a hammer (60d nails may be straightened and reused).
- ✓ MC machines shall be secured with a chain and lock. The chain should be attached to the lock and looped around a guardrail post, signpost, telephone pole, light pole, guy wire, or a tree. Never secure a machine to a mailbox, fireplug, temporary sign, construction barrel or any object on homeowners' property such as a tree, mailbox or to any fence within a city’s limits. If no object is available to secure the chain to, nail the chain into the ground with a 60d nail. The chain can also be attached to a 60d clamp nail. This shall only be done if no object is available within the road section or if the only object available is too near a driveway to secure the machine.

Installation

This section describes the detailed set-up procedures which are common to all sites. Attachment A includes links to installation videos for MC machines and must be watched prior to installation.

• *Set-Up Procedure* - The following steps should be followed for all set-ups:

- ✓ Prepare a map and identify location to be counted.
- ✓ Ensure that there are adequate machines to make the setup, especially if more than one machine is required at the site. Never set up only part of a site.
- ✓ Select the MC machine to be set up at the site. Check the machine's battery's voltage. If the voltage reads 5.5 volts or less, replace the battery.
- ✓ Locate and travel to the counting station location.
- ✓ Park the vehicle and log in the time of arrival on the schedule.
- ✓ Put on safety gear and exit vehicle.
- ✓ Survey the general location to choose a specific site for the set-up. Consider the following in choosing the location:
    - The site should be as close as possible to the location marked on the map.
    - The site should not be located so far down the roadway from the designated location that another roadway intersects the road being counted.
    - Ensure that the road at the site is reasonably level, and free of chug holes, bumps, and deep wheel paths. Roadway bumps and holes can cause the traffic to vault over the tube or cause the vehicle body to dip close to the pavement surface and possibly cut or snare the road tube.
    - Care must be taken at railroad locations since the tracks are placed at a slightly higher level than the roadway. This can cause the vehicles to vault over a tube that is set too close to the tracks. Further, do not set up so close to a railroad crossing that the vehicles are moving too slowly to count.
- ✓ The site should not be set so close to an intersection that turning vehicles would impact the tube four times (two times for the front axle and 2 times for the rear axle) during their turning movements.
- ✓ The site should be moved far enough from the intersection that vehicles have completed their turning movements prior to impacting the tube. If there is no reasonable way to avoid turning movements at the site, note this on the form in Attachment B.
- ✓ If the road is muddy or flooded, do not set up the site. Describe the situation on the Attachment B.
- ✓ Get a 5O-foot road tube from the vehicle. (Note that the "far" clamp is always secured first.) Carry the road tube across the road. If the road is asphalt or gravel, secure the clamp with two 60d nails. The nails should be driven in at a 350 angle, with the tip of the nail toward the roadway. Drive the nail flush with the ground. *Do not drive the nails in part way and then bend them over!*
- ✓ After the far clamp is secure, pull the excess tube through the clamp until the knot at the end of the tube is encountered. Ensure that the plug is in the end of the tube.
- ✓ Carefully carry the tube across the roadway, feeding out the tube onto the road.
- ✓ Be sure to hold the tube so that arms or legs cannot become entangled.
- ✓ Install the near clamp in a manner like the first. Ensure that the clamp is directly across the road from the far clamp so that the tube will lay perpendicular to the direction of travel.

- ✓ In order to slide the collar along the tube, place one foot on the tube and pull upwards on the tube to stretch it (thus reducing its diameter). The collar should slide easily toward the clamp.
- ✓ Pull the tube taut across the road, so that it is stretched about 10% of its length.
- ✓ With one foot on the clamp, again stretch the road tube in order to slide the collar against the clamp. Release the tube and check that the tube maintains its tautness.
- ✓ On low-speed facilities, the tube should be stretched, but left slightly looser than on freeways. The reason is that stretching the tube lessens its inside diameter, reducing the size of the air pulse to the machine. A tube pulled too tightly on a low-speed facility may undercount as a result.
- ✓ The counter should adjust the angle of the road tube while observing the machine to obtain the correct angle for the road tube.
- ✓ Carry the remainder of the tubing over to where the MC machine will be secured, letting the tubing feed out onto the ground.
- ✓ Place the machine near the object to which the machine will be secured. Do not place a machine in a low spot or a drainage ditch where it may incur water damage.
- ✓ Run the chain around the object and feed one end of the chain through the loop at the other end so that the chain is looped around (or through) the object
- ✓ If an object is not available, secure the chain to a clamp nail or to a nail driven into the ground.
- ✓ Wrap the excess tubing around the machine in a neat coil (no kinks, etc. to
- ✓ restrict air flow) and attach the end of the tube firmly to the road tube adapter. If the set-up is on a narrow road there will be a large excess of tubing to coil around the machine. A coiled tube does not transmit the air impulse as well as a straight tube due to the slight friction of air against the inside of the tube. The tubing should be wrapped in large coils around the machine to lessen this effect. Tight coils will increase friction and possibly cause the machine to under count.
- ✓ Ensure that the machine is counting all lanes of traffic. Note the total on the readout. If traffic is impacting the tube, ensure that the readout total is increasing with each impact. If there is no traffic, stomp on the road-tube, where it crosses the travel lane farthest from the MC machine, while pushing in the direction of the MC machine. Observe the readout total to ensure that it has increased by one.
- ✓ Log the MC machine number on form provided once it has been set up and properly working.
- ✓ Complete the form (Attachment B).
- ✓ Close the machine and slide the lock through the lock holes. Attach the end of the security chain to the lock and close the lock. The set-up is complete.
- ✓ Check the setup area for nails, empty shop casings, pins and other debris. Do not leave, or throw, any debris on the right-of-way or on private or public property.

Proper Road-Tube Installation Procedure

- ✓ The following is a guide on selecting the proper way of securing the road tube to different roadway surfaces:

- *Gravel Roads* - Secure the clamp 2' off the traffic path. Nail into the gravel or the adjoining ground, provided the ground is firm enough to hold the clamp.
- *Asphalt Road with Gravel Shoulder*- Nail the clamp at the edge between the asphalt and shoulder.
- *Asphalt Road with Concrete Curb* - Nail the clamp in the edge crack between the road and the bottom of the concrete curb.
- *Asphalt Road with Asphalt Shoulder* - Nail the clamps one foot off of the edge of the asphalt shoulder because traffic often drives on shoulders, and the further out of the traffic stream the clamps are, the less likely it is they will be knocked out.
- *Concrete Road with* No *Shoulder* - The clamps should be nailed into the gravel or dirt off the roadway.
- *Concrete Road with Asphalt Shoulder* - The same procedure should be used as for an asphalt road with an asphalt shoulder.
- *Concrete Road with Concrete Curb* - A fastening tool will probably need to be used to drive a pin into the bottom of the concrete curb (Only one pin is required per clamp. Be sure to use all safety precautions. Some concrete is so hard that several attempts may be required to imbed the pin. If the bottom of the curb proves to be too hard, try setting the pin in the side of the curb Attach the clamp to the pin and secure it with a 1/4" nut tightened with a nut driver.
- Never reuse a fastening tool pin or straighten a PK (masonry) nail for reuse. They can disintegrate upon impact.

✓ *Medians* - Medians can sometimes be used as locations for the ACR machines if the outside of the road is not acceptable. Most medians, by nature, are set apart from the roadway with curbs. Attachment of clamps should follow the previously stated practices for roads with curbs.

- *Median Barriers and Fences* - The clamp should be set as close to the barrier or fence a possible, since these objects are often very close to the inside travel lane. If the road is concrete, the fastening tool may need to be used.

✓ *Drainage Ditches* - Drainage ditches should be avoided, both as areas for clamps and locations for MC machines. Attach the clamp off the roadway as described above for the various types of roads. If it is necessary to cross the ditch to secure the ACR machine, ensure that the tubing is not stretched across the ditch, but follows its contours.

Pick-Up Procedure

The following general procedures should be followed on all pick-ups:

✓ Arrive at site. Park vehicle. Don safety gear. Inspect set-up to see if road tube is in good shape.
✓ Open the MC machine. Ensure that it is still counting all lanes of traffic.
✓ Check the time to ensure that it is exactly 24 hours from the set-up time. Then unplug the tube from the machine's road tube adapter.

- ✓ If the count is obviously bad (due to a damaged road tube, machine not
- ✓ counting, etc.) note *"N/G"* (for *"no* good") on the schedule and the form and state the reason for the bad count.
- ✓ Place the chain and lock into the toolbox.
- ✓ Using the hammer or the crowbar, dislodge the nails or pins in the far clamp.
- ✓ Carry the tubing across the road and pull up the other clamp.
- ✓ The 60d nails should be straightened for reuse.
- ✓ Coil the road tube in a neat coil about I' in diameter and tie the end of the tube to prevent uncoiling. While rolling up the tubing, the counter should check the tubing for damage and holes, and should carefully check the plug, collar and clamps for damage.
- ✓ Stow all supplies and equipment in the vehicle. It is best to store the rolled tubing so that the tubing ends droop down. If rain accidentally gets into the storage area, this will prevent water from collecting in the tubing.
- ✓ Check the area for any nails, pins, or clamps. Do not leave materials at the site, e.g., nails, pins, clamps, tubing, etc. Further, if there is a bad battery include this information on Form B. Do not discard old batteries on the roadside or in dumpsters as they present an environmental hazard.
- ✓ Exit the site.

Attachment A - Installation

Watch videos

https://www.youtube.com/watch?v=yfyMAAFmhxE&list=PL3Dz27ZOhi_4QjA1q0Pk8XL28wC35CycQfigure

https://www.youtube.com/watch?v=TxjHmokXrD8&list=PL3Dz27ZOhi_4QjA1q0Pk8XL28wC35CycQ&index=2

https://www.youtube.com/watch?v=poszYgphE6U&list=PL3Dz27ZOhi_4QjA1q0Pk8XL28wC35CycQ&index=3

https://www.youtube.com/watch?v=WPQDkK6wGjw&list=PL3Dz27ZOhi_4QjA1q0Pk8XL28wC35CycQ&index=4

https://www.youtube.com/watch?v=qg4QrM4_eeU&list=PL3Dz27ZOhi_4QjA1q0Pk8XL28wC35CycQ&index=5

NOTES SUMMARY

Determine the length of tubing needed (what is width) for the road.

Place figure 8 clamp on each end of the tubes. End of tubing with terminator place the clamp 8-10 inches from end.

Place end terminator on the tube end opposite.

Place colored tape on either one tube. This will help you remember if it is nb/sb or ew/we.

Use 2.5 nail with a washer and hammer into pavement

Install 2nd tube about 3 ft from tube 1.

Tubes installed perpendicular to traffic.

Pull tubes taught after installation – adjust tension with figure 8

Use tack strip/webbing to tack tubes in the middle.

Use pavement tape between center webbing and end of tube.

Attach tubes to counter and test.

Anchor point must be to a tree/pole. Wrap extra tubing around the pole or tree.

Sketch location of the intersection and where tubes are placed. Include on the sketch the equipment inventory, posted speed and street name and start time.

Attachment B – SORTPO Count Recorder Record

County Name _____ Employee Name _____

Date _____ Day of Week_____

Time (Beginning) _____ Time (Ending) _____

Serial Number of Machine _____

Weather Conditions and Temperature _____

Street Name (N/S/E/W)	**Road Material Type**	**Road Condition**	**Curb & Gutter (Y or N)**

1. Map Showing location of counts
2. Identify New or Closed Traffic Generator (shopping mall, school, housing addition, business)_____
_____
_____
3. Identify land use i.e.., farming/agriculture, commercial, residential, recreational, park, lake, livestock auction, school/university (provide name of business if available)
_____
_____
_____
4. Is there oil field activity such as drilling rig, pumping activity or oil field services (provide name of business if available) _____
_____
_____
5. Special events (i.e.., ball games, fairs, rodeos) _____
_____
_____
6. Reason count is not valid such as tube cut, tube stolen, tube unplugged, machine stolen _____
_____
7. Remarks: _____
_____
_____

Figure 1 - 2 Lane Road

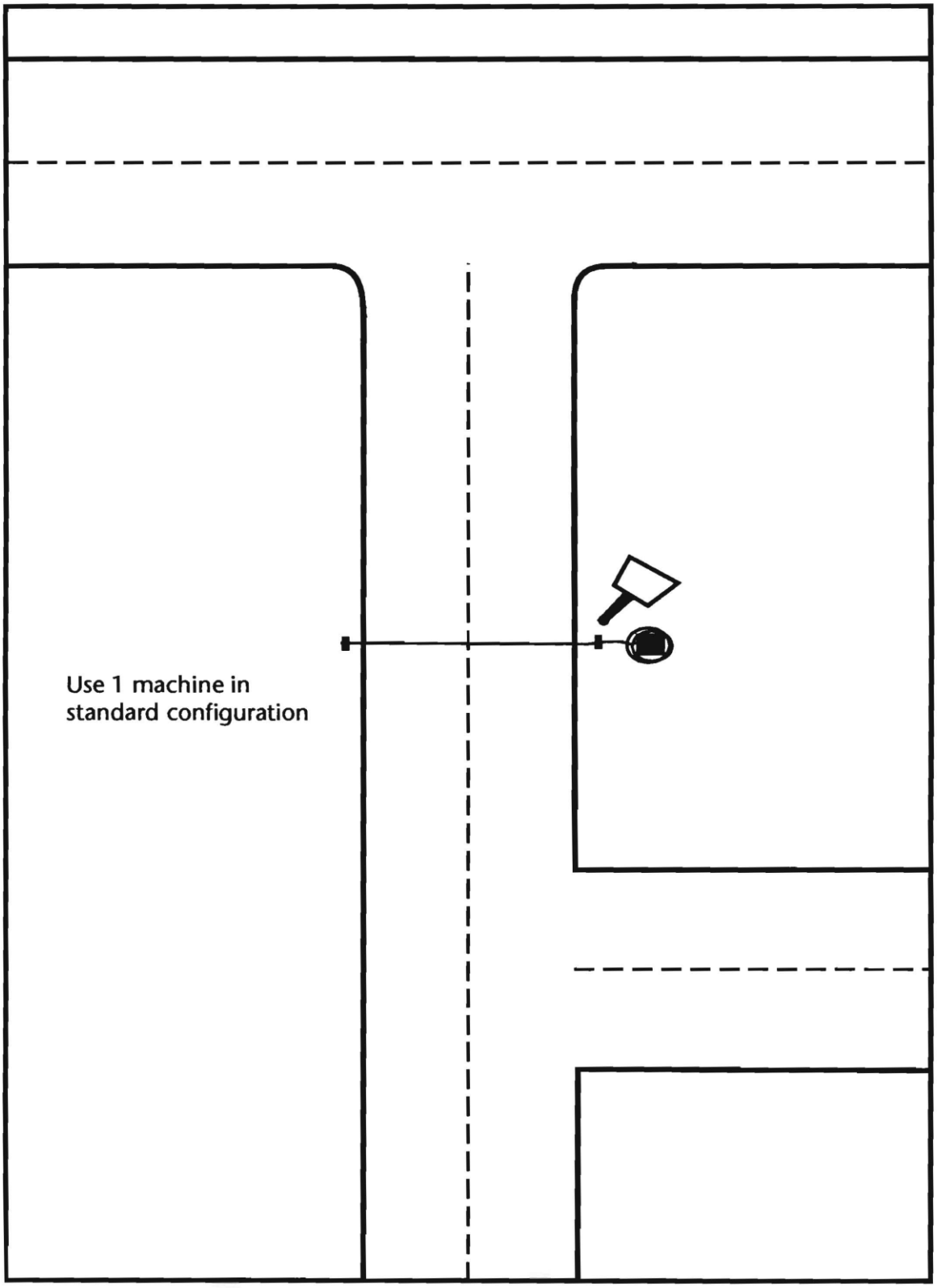
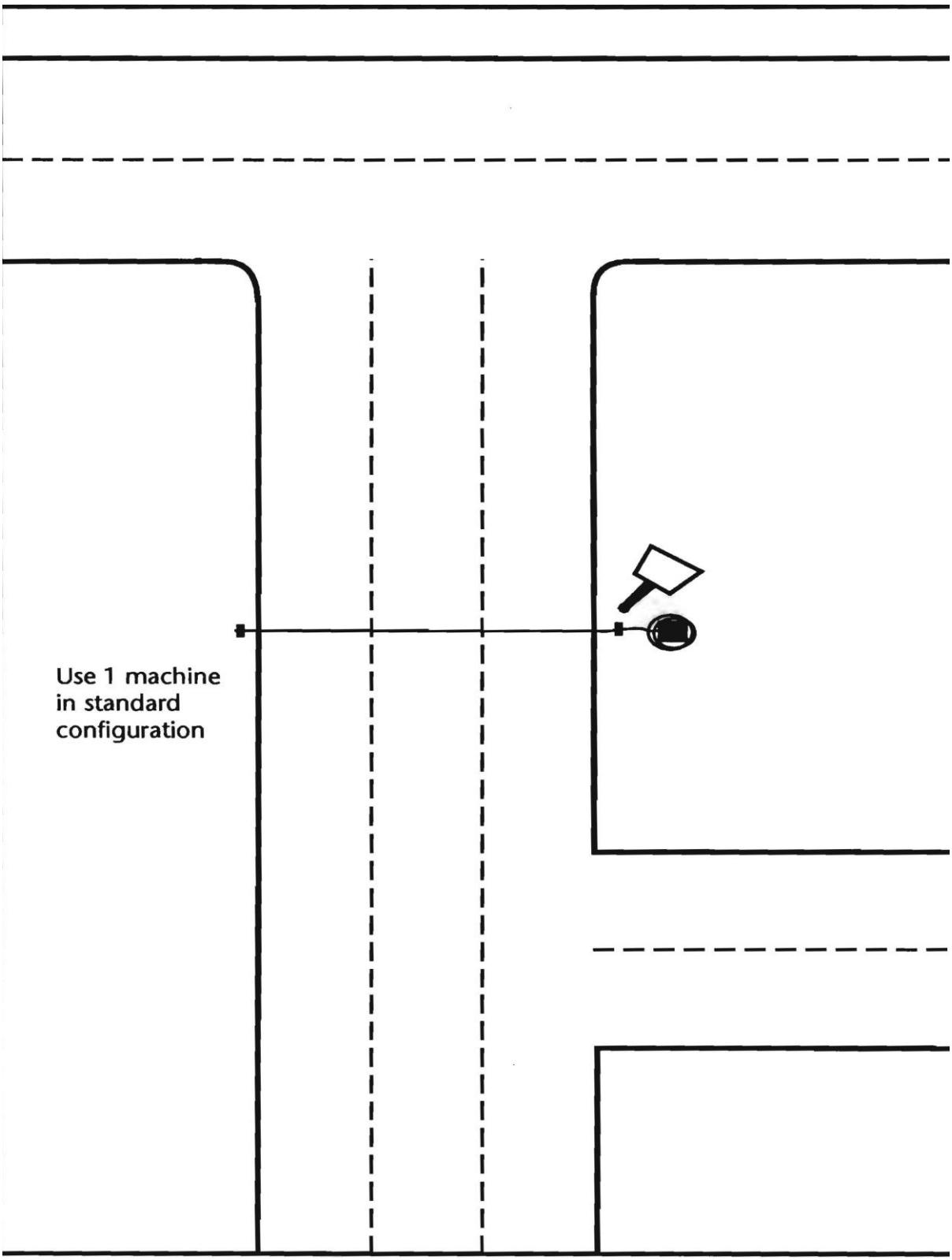


Figure 2 - 3 Lane Road



4-

Figure 3 - 4 Lane Road

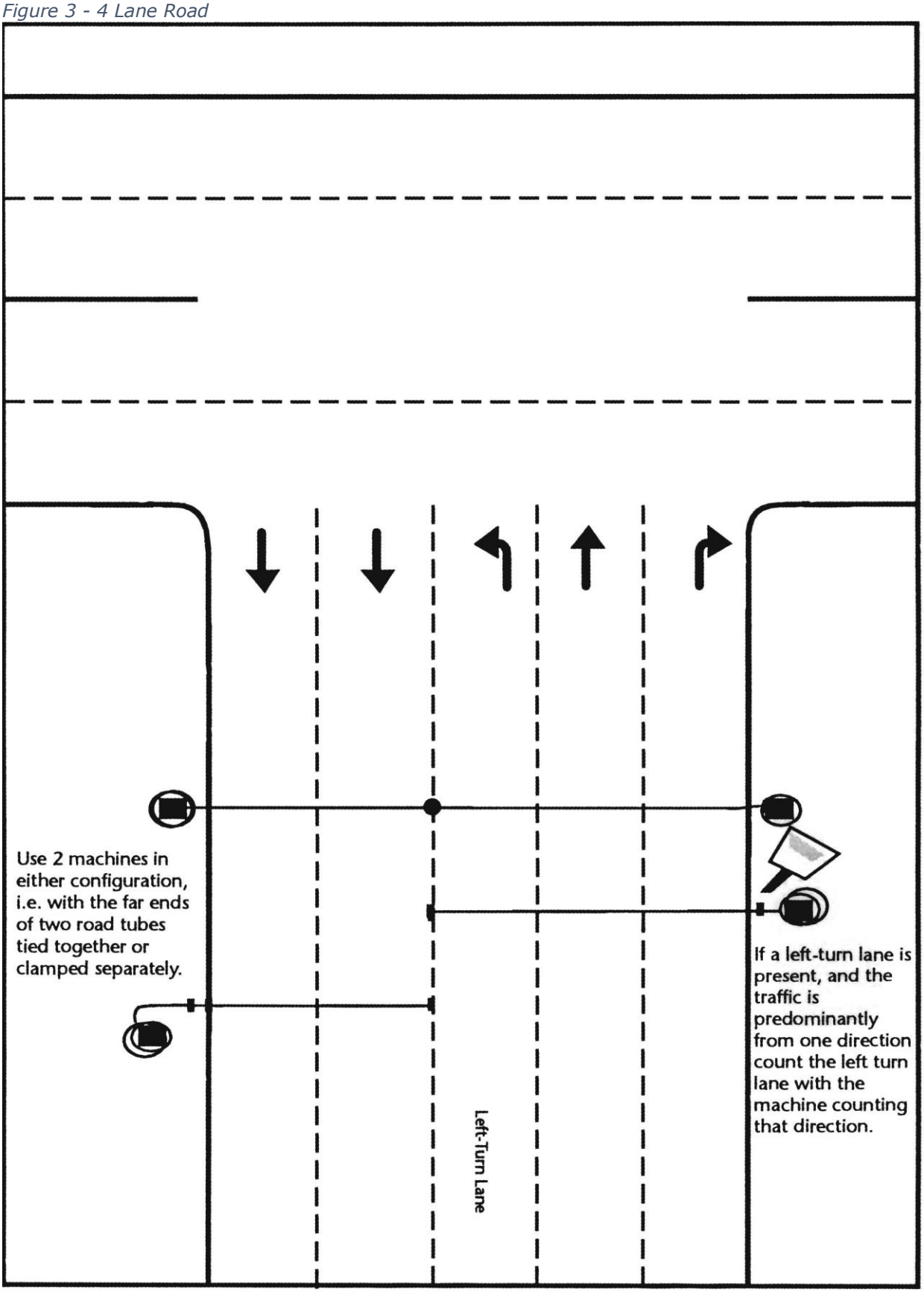


Figure 4 - Adjacent to Railroad Double Tracks

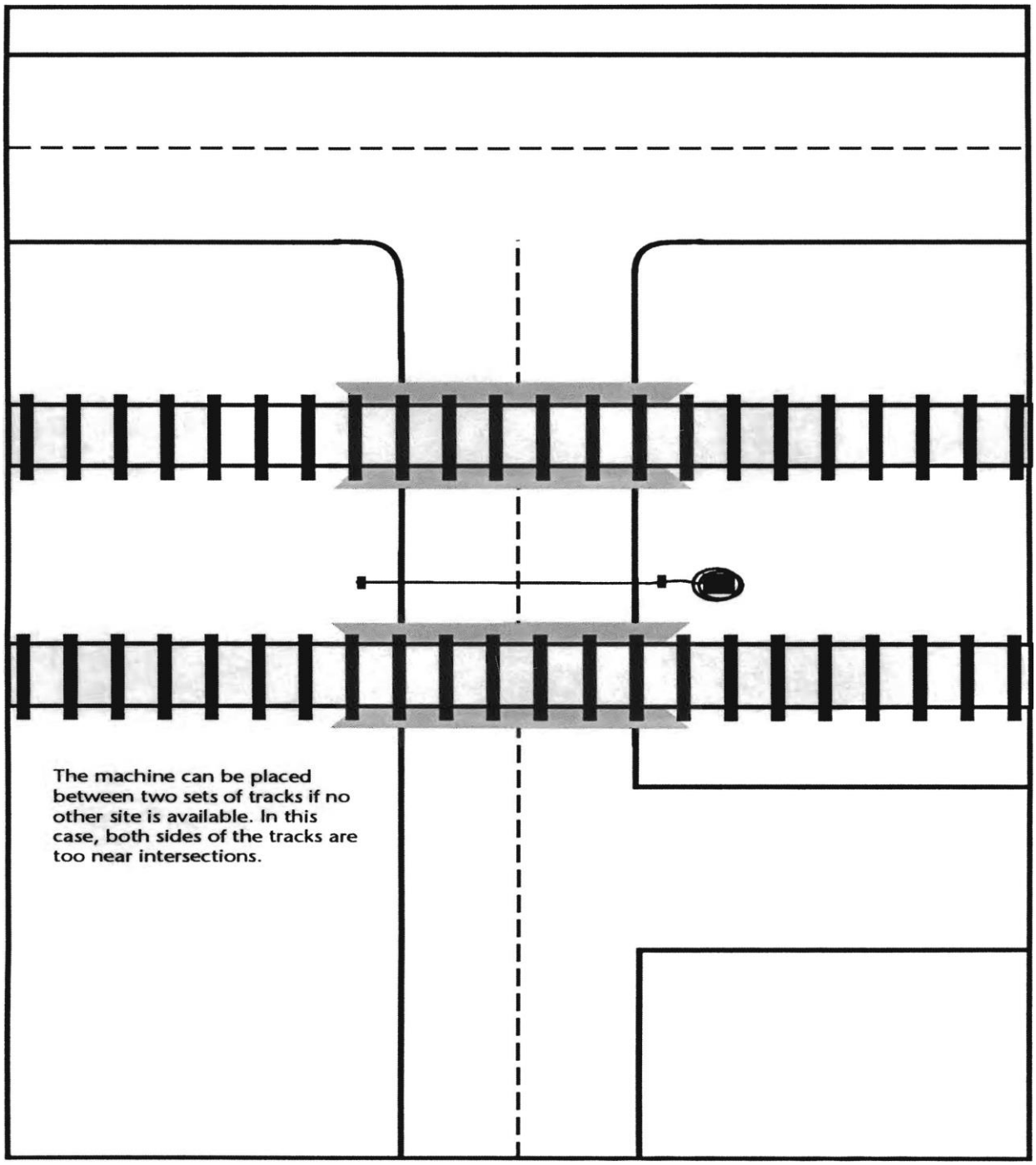


Figure 5 - Adjacent to Single tracks