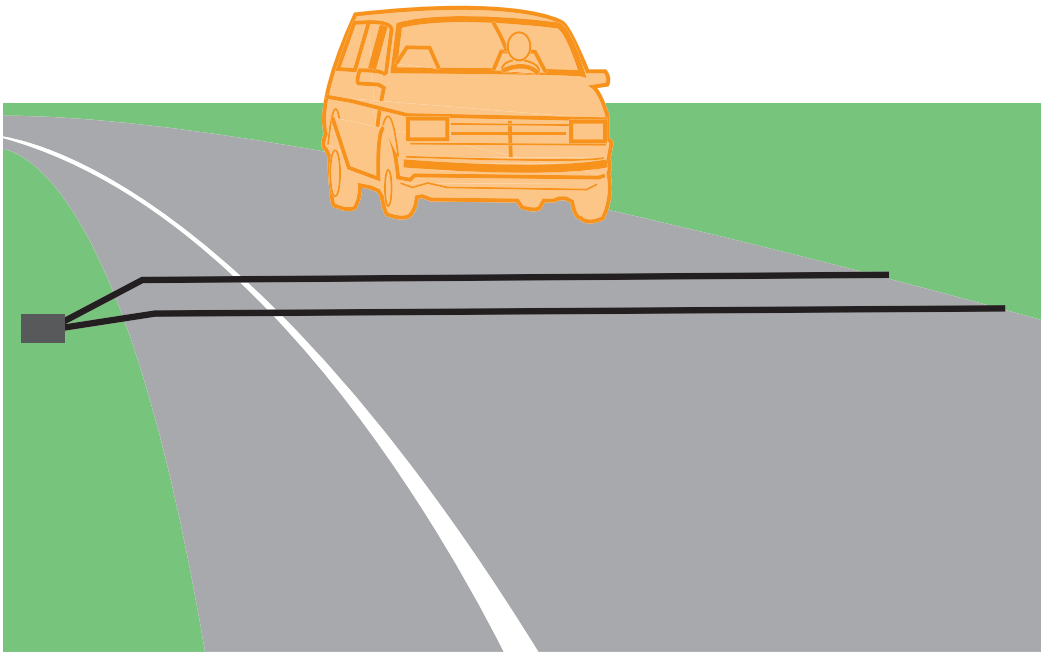
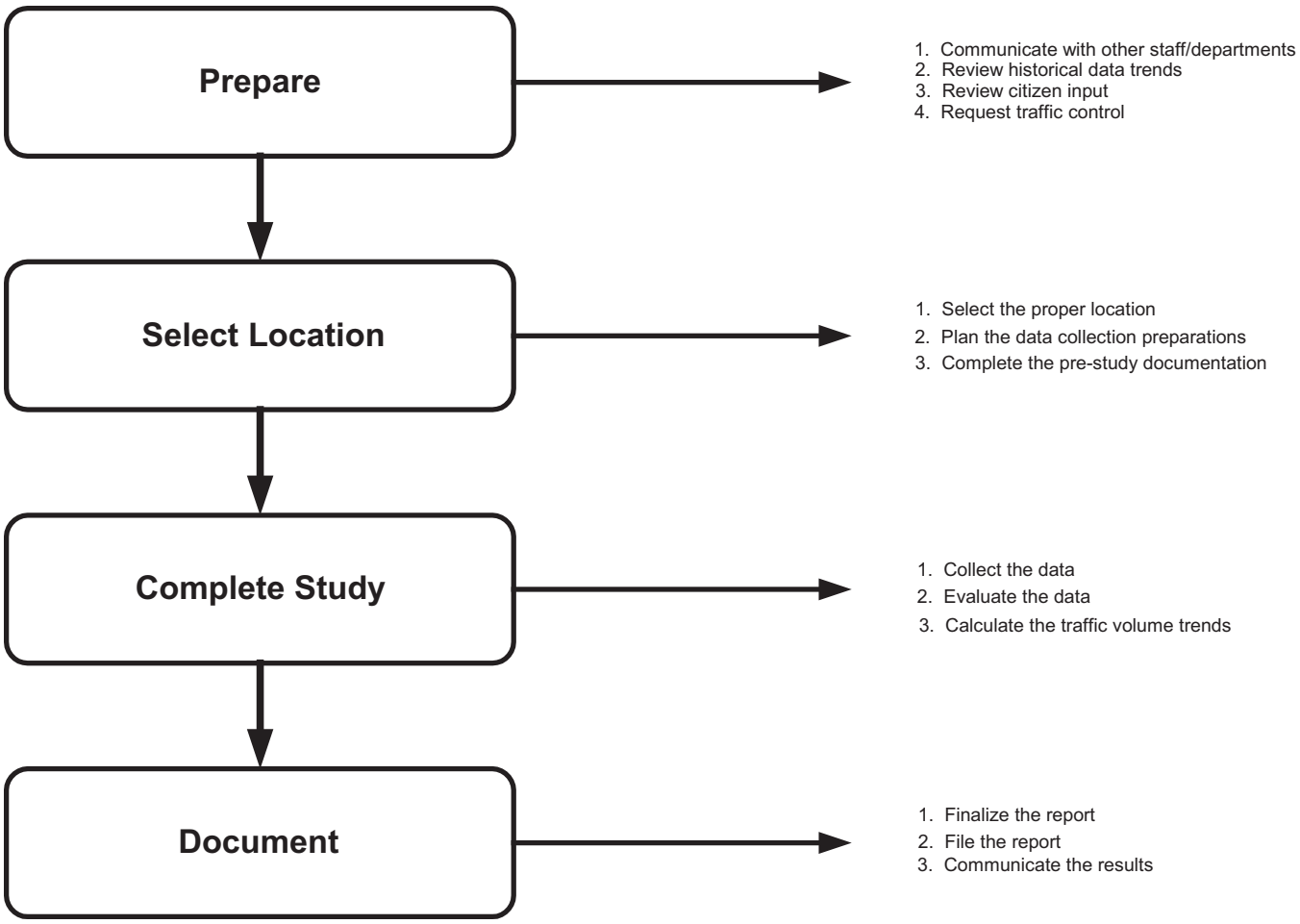
Traffic 3 Volume Counts



Traffic Volume Counts



INTRODUCTION

Traffic volume studies are conducted to determine the number, movements, and classifications of roadway vehicles at a given location. These data can help identify critical flow time periods, determine the influence of large vehicles or pedestrians on vehicular traffic flow, or document traffic volume trends. The length of the sampling period depends on the type of count being taken and the intended use of the data recorded. For example, an intersection count may be conducted during the peak flow period. If so, manual count with 15-minute intervals could be used to obtain the traffic volume data.

USING COUNT PERIOD TO DETERMINE STUDY METHOD

Two methods are available for conducting traffic volume counts: (1) manual and (2) automatic. 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.

The selection of study method should be determined using the count period. The count period should be representative of the time of day, day of month, and month of year for the study area. For example, counts at a summer resort would not be taken in January. The count period should avoid special event or compromising weather conditions (Sharma 1994). Count periods may range from 5 minutes to 1 year. Typical count periods are 15 minutes or 2 hours for peak periods, 4 hours for morning and afternoon peaks, 6 hours for morning, midday, and afternoon peaks, and 12 hours for daytime periods (Robertson 1994). For example, if you were conducting a 2-hour peak period count, eight 15-minute counts would be required.

The study methods for short duration counts are described in this chapter in order from least expensive (manual) to most expensive (automatic), assuming the user is starting with no equipment.

(1) MANUAL COUNT METHOD

Most applications of manual counts require small samples of data at any given location. Manual counts are sometimes used when the effort and expense of automated equipment are not justified. Manual counts are necessary when automatic equipment is not available.

Manual counts are typically used for periods of less than a day. Normal intervals for a manual count are 5, 10, or 15 minutes. Traffic counts during a Monday morning rush hour and a Friday evening rush hour may show exceptionally high volumes and are not normally used in analysis; therefore, counts are usually conducted on a Tuesday, Wednesday, or Thursday.

Manual Count Recording Methods

Manual counts are recorded using one of three methods: tally sheets, mechanical counting boards, or electronic counting boards.

Tally Sheets

Recording data onto tally sheets is the simplest means of conducting manual counts. The data can be recorded with a tick mark on a pre-prepared field form. A watch or stopwatch is necessary to measure the desired count interval. A blank traffic volume count intersection tally sheet is provided in Appendix B.

Mechanical Counting Boards

Mechanical count boards consist of counters mounted on a board that record each direction of travel. Common counts include pedestrian, bicycle, vehicle classification, and traffic volume counts. Typical counters are push button devices with three to five registers. Each button represents a different stratification of type of vehicle or pedestrian being counted. The limited number of buttons on the counter can restrict the number of classifications that can be counted on a given board. A watch or a stopwatch is also necessary with this method to measure the desired count interval. See Figure 3.1 for an example mechanical counting board.

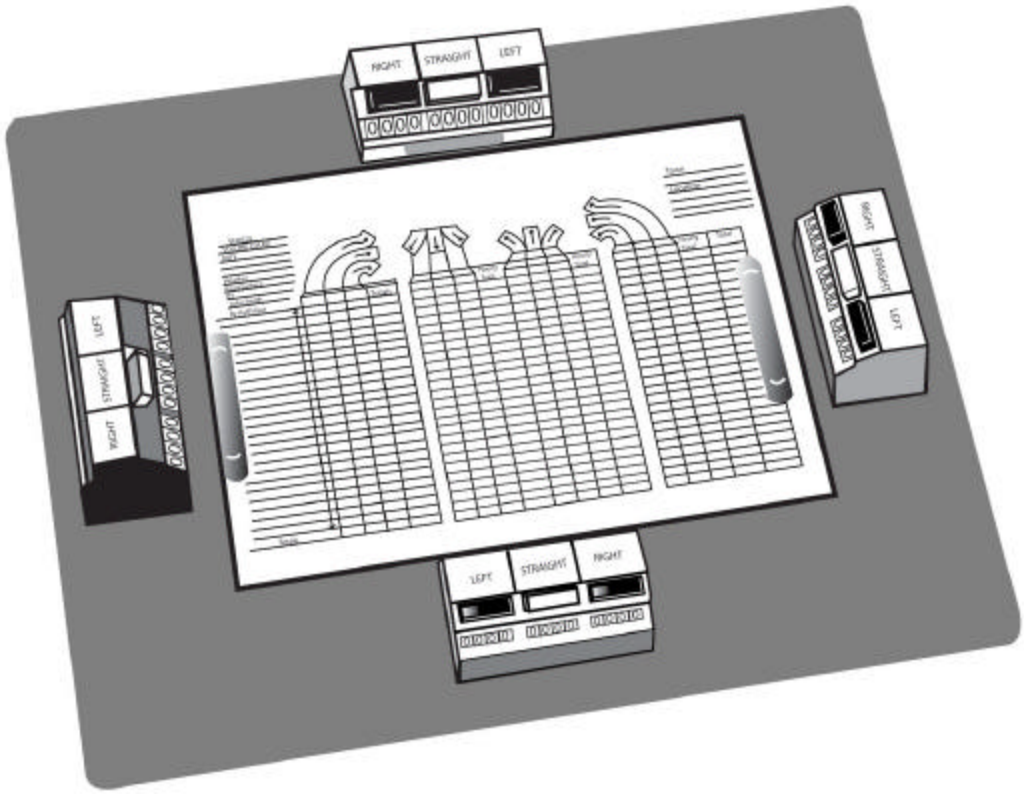


Figure 3.1. Mechanical Counting Board

Electronic Counting Boards

Electronic counting boards are battery-operated, hand-held devices used in collecting traffic count data. They are similar to mechanical counting boards, but with some important differences. Electronic counting boards are lighter, more compact, and easier to handle. They have an internal clock that automatically separates the data by time interval. Special functions include automatic data reduction and summary. The data can also be downloaded to a computer, which saves time. See Figure 3.2 for an example electronic counting board.

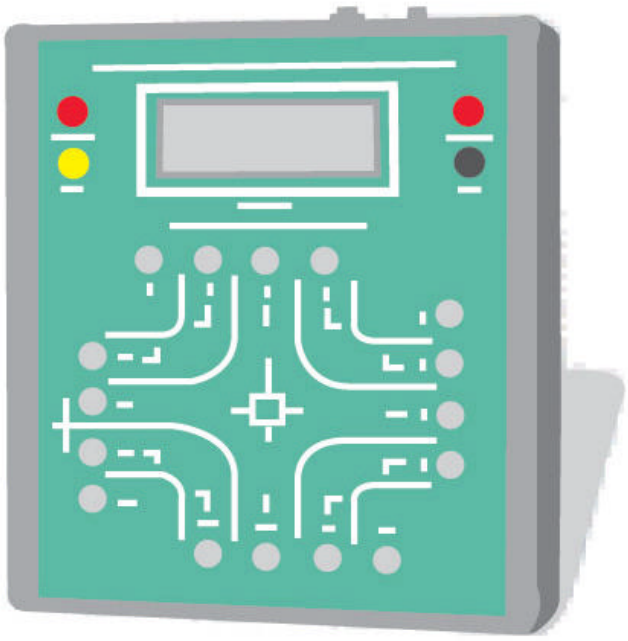


Figure 3.2. Electronic Counting Board

Manual Count Study Preparation Checklist

When preparing for a manual count study, use the checklist in Table 3.1. This checklist may be modified or expanded as necessary.

Table 3.1. Manual Count Study Preparation Checklist

Step	Õ When Complete	Notes
Obtain tally sheet or counting board		
Obtain watch		
Obtain hardhat and safety vest		
Select location		
Select time and day		
Determine availability of recorders		
Contact other jurisdictions/schools		
Contact adjacent residents/businesses		
Other:		

If an agency does not possess the equipment necessary to complete a manual count study, it may be obtained from the Iowa DOT, another jurisdiction, or a responsible consulting firm.

Personnel Involved in a Manual Count Study

The size of the data collection team depends on the length of the counting period, the type of count being performed, the number of lanes or crosswalks being observed, and the volume level of traffic (Robertson 1994). The number of personnel needed also depends on the study data needed. For example, one observer can record certain types of vehicles while another counts total volumes.

Observers conducting manual traffic counts must be trained on the study purpose. To avoid fatigue, observers must be relieved periodically. Every 2 hours observers should take a 10 to 15 minute break.

Key Steps to a Manual Count Study

A manual count study includes three key steps:

1. Perform necessary office preparations.
2. Select proper observer location.
3. Label data sheets and record observations.

Perform Necessary Office Preparations

Office preparations start with a review of the purpose of the manual count. This type of information will help determine the type of equipment to use, the field procedures to follow, and the number of observers required. For example, an intersection with multiple approach lanes may require electronic counting boards and multiple observers.

Select Proper Observer Location

Observers must be positioned where they have a clear view of the traffic. Observers should be positioned away from the edge of the roadway. If observers are positioned above ground level and clear of obstructions they usually have the best vantage point. Visual contact must be maintained if there are multiple observers at a site. If views are unobstructed, observers may count from inside a vehicle.

Label Data Forms and Record Observations

Manual counts may produce a large number of data forms; therefore, the data forms should be carefully labeled and organized. On each tally sheet (a blank tally sheet is provided in Appendix B), the observer should record the location, time and date of observation, and weather conditions. Follow the data recording methods discussed earlier.

Example Manual Count Study

Smith City was considering a land use change on one of its city blocks. The proposal was to remove four houses and construct an apartment complex (see Figure 3.3). This proposed land use change would affect traffic volume. The city wanted to document the traffic volumes at the closest intersection during the peak flow period of the day. The study was conducted at the intersection of 7th Street and Delaware Avenue, an uncontrolled intersection. The time period chosen, 7:00 a.m. to 9:00 a.m., included the morning peak flow.

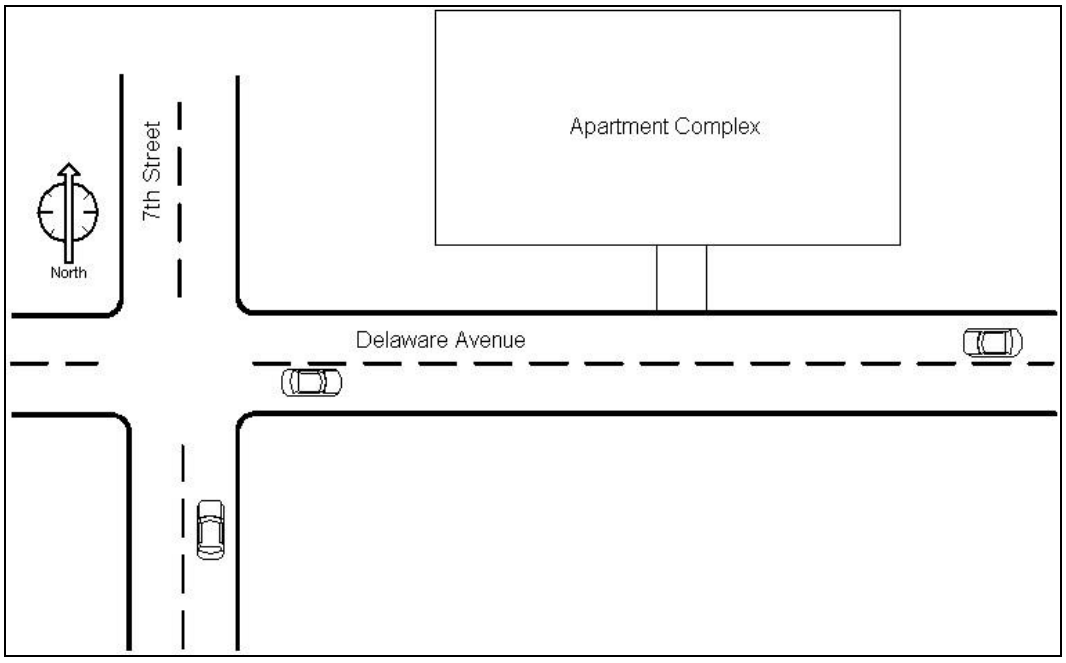


Figure 3.3. Example Proposed Apartment Complex and Intersection

The city decided to conduct a manual traffic count using the tally sheet method because they did not have access to a mechanical or electronic counting board. The example tally sheet in Figure 3.4 shows one 15-minute count. There were 71 westbound vehicles on Delaware Avenue. If you multiply this number by eight (eight 15-minute periods in a 2-hour peak flow), you arrive at 586 vehicles during the peak flow. Typically 2-hour peak flow counts would be conducted once in the morning and once in the afternoon.

If an apartment complex is introduced, another study may need to be conducted. The apartment complex could increase the traffic volume. If the traffic volume is increased, there may be a need for new traffic control. The initial study provides a baseline count that can be used in a traffic impact analysis or a traffic control device evaluation. *The Manual on Uniform Traffic Control Devices* provides current standards on traffic control device warrants.

Information on contracting for a traffic volume count study, including a project work order using the Smith City example, is provided near the end of this chapter.

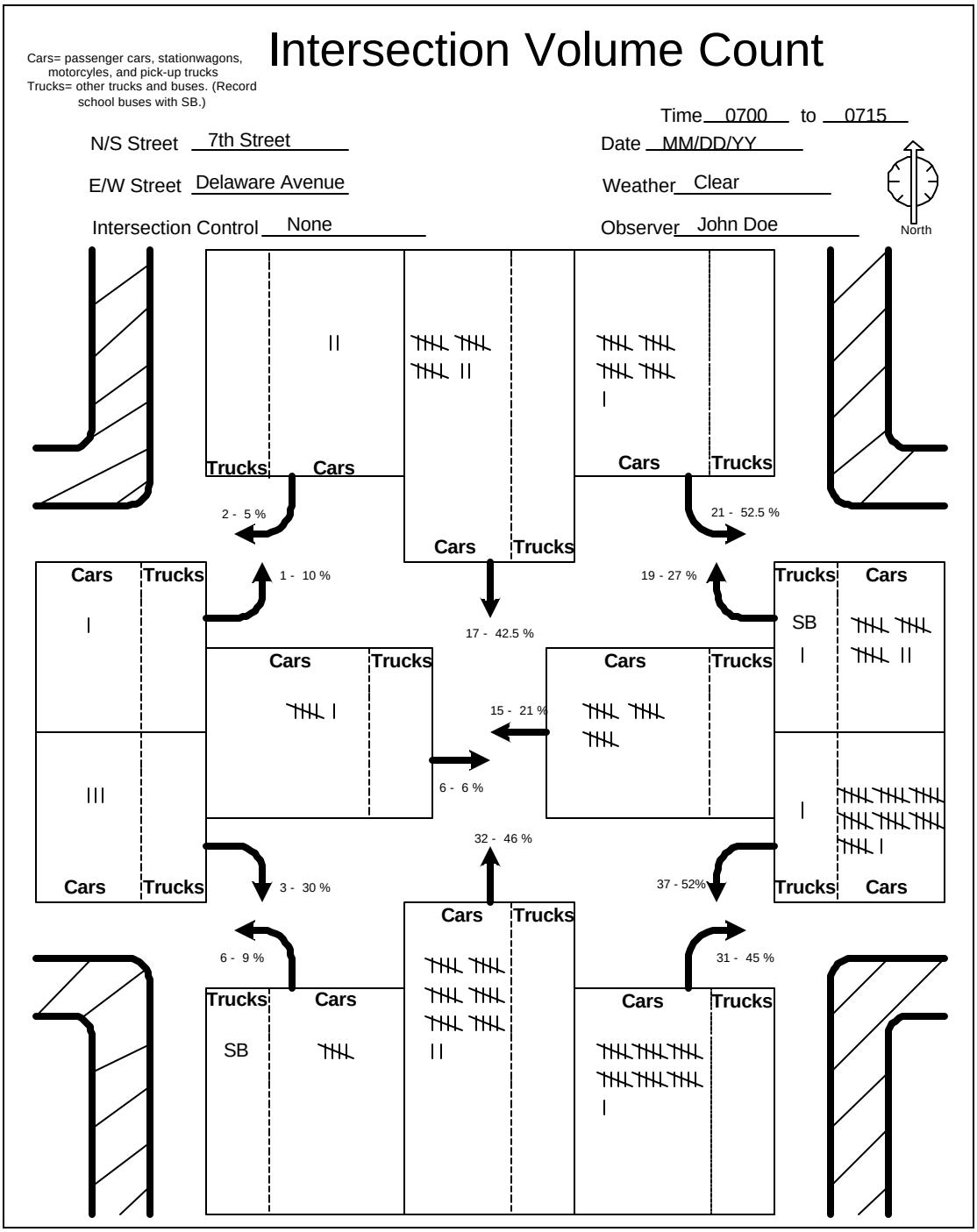


Figure 3.4. Example Manual Intersection Volume Count Tally Sheet

(2) AUTOMATIC COUNT METHOD

The automatic count method provides a means for gathering large amounts of traffic data. Automatic counts are usually taken in 1-hour intervals for each 24-hour period. The counts may extend for a week, month, or year. When the counts are recorded for each 24-hour time period, the peak flow period can be identified.

Automatic Count Recording Methods

Automatic counts are recorded using one of three methods: portable counters, permanent counters, and videotape.

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 (see Figure 3.5). Specific information pertaining to pneumatic road tubes can be found in the users' manual.

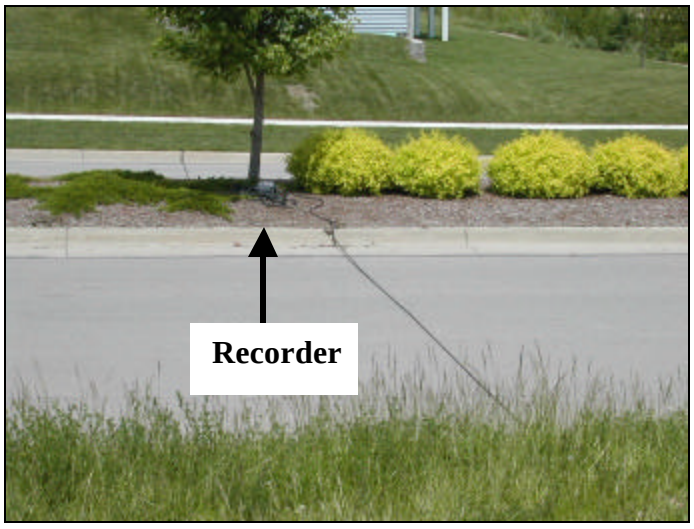


Figure 3.5. Pneumatic Road Tube and Recorder

Permanent Counters

Permanent counters are used when long-term counts are to be conducted. The counts could be performed every day for a year or more. The data collected may be used to monitor and evaluate traffic volumes and trends over a long period of time. Permanent counters are not a cost-effective option in most situations. Few jurisdictions have access to this equipment.

Videotape

Observers can record count data by videotaping traffic. Traffic volumes can be counted by viewing videotapes recorded with a camera at a collection site. A digital clock in the video image can prove useful in noting time intervals. Videotaping is not a cost-effective option in most situations. Few small jurisdictions have access to this equipment.

Automatic Count Study Preparation Checklist

When preparing for an automatic count study, use the checklist in Table 3.2. This checklist may be modified or expanded as necessary.

Table 3.2. Automatic Count Study Preparation Checklist

Step	Õ When Complete	Notes
Obtain equipment		
Read users' manual		
Obtain measuring tape for spacing tubes		
Obtain software		
Obtain scissors for trimming tubes		
Select method for attaching tubes to the roadways		
Obtain recorders		
Obtain new batteries for recorders		
Obtain hardhat and safety vest		
Select time and day		
Select location		
Involve corresponding jurisdiction to provide traffic control		
Notify the jurisdiction's roadway sweeper (to avoid potential damage to road tubes)		
Other:		

Note: Replace road tube equipment with video recorder and videotapes if applicable.

Automatic count studies require specialized equipment and knowledge of how to maintain the equipment. Few jurisdictions have the equipment to adequately complete this study; most jurisdictions require assistance from the Iowa Department of Transportation or an engineering consulting firm. Information on contracting out for a traffic volume count study, including a project work order example, is provided near the end of this chapter.

Key Steps to an Automatic Count Study

An automatic count study includes three key steps (Robertson 1994):

1. Perform necessary office preparations.
2. Deploy and calibrate data collection equipment.
3. Check data and retrieve equipment.

Perform Necessary Office Preparations

During office preparations, coordinate all data collection activities with appropriate state and local officials, including transportation, traffic, and law enforcement agencies. For example, you may coordinate with state or local officials in obtaining traffic control for the deployment and recovery of equipment. The field team must be briefed on the data collection process to ensure that all observers are collecting the same data type. The team should assemble and inspect all tools, supplies, and equipment. Each piece of equipment should be tested.

Deploy and Calibrate Data Collection Equipment

The portable counter method using pneumatic road tubes is described here since the other methods are not cost-effective for jurisdictions in most automatic count study situations. 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 may also be secured.

Check Data and Retrieve Equipment

When the data collection period has ended, the recorded data are checked for accuracy. Crews recover data collection equipment by reversing the process they used to deploy it.

EXAMPLES OF TRAFFIC VOLUME COUNT STUDIES

Intersection Counts

Intersection counts are used for timing traffic signals, designing channelization, planning turn prohibitions, computing capacity, analyzing high crash intersections, and evaluating congestion (Homburger et al. 1996). The manual count method is usually used to conduct an intersection count. A single observer can complete an intersection count only in very light traffic conditions.

The intersection count classification scheme must be understood by all observers before the count can begin. Each intersection has 12 possible movements (see Figure 3.6). The intersection movements are through, left turn, and right turn. The observer records the intersection movement for each vehicle that enters the intersection.

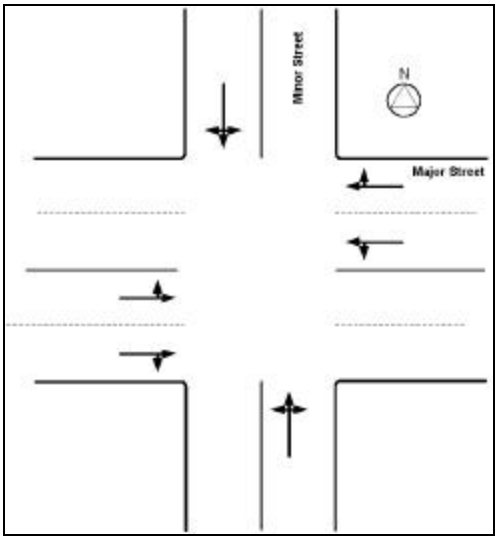


Figure 3.6. Intersection Movements

Pedestrian Counts

Pedestrian count data are used frequently in planning applications. Pedestrian counts are used to evaluate sidewalk and crosswalk needs, to justify pedestrian signals, and to time traffic signals. Pedestrian counts may be taken at intersection crosswalks, midblock crossings, or along sidewalks.

When pedestrians are tallied, those 12 years or older are customarily classified as adults (Robertson 1994). Persons of grade school age or younger are classified as children. The observer records the direction of each pedestrian crossing the roadway.

Vehicle Classification Counts

Vehicle classification counts are used in establishing structural and geometric design criteria, computing expected highway user revenue, and computing capacity. If a high percentage of heavy trucks exists or if the vehicle mix at the crash site is suspected as contributing to the crash problem, then classification counts should be conducted.

Typically cars, station wagons, pickup 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. The observer records the classification of the vehicles and the vehicles' direction of travel at the intersection.

Average Daily Traffic and Annual Average Daily Traffic Counts

Average daily traffic (ADT) 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. Local levels of government will typically conduct this type of count.

Annual average daily traffic (AADT) counts represent the average 24-hour traffic volume at a given location averaged over a full 365-day year. AADT volume counts have the following uses:

- measuring or evaluating the present demand for service by the roadway or facility
- developing the major or arterial roadway system
- locating areas where new facilities or improvements to existing facilities are needed
- programming capital improvements

CONTRACTING FOR A TRAFFIC VOLUME COUNT STUDY

Information Gathering

Before a jurisdiction contacts an engineering consulting firm to perform a traffic volume count study, a variety of information may need to be collected. Any information may aid the consulting firm in adequately completing the study. The following is a list of possible information that an engineering consulting firm may request:

- issue at hand
- historic volume counts
- existing zoning
- proposed future land use changes
- traffic impact statements if available
- citizen input
- location map
- appropriate contact persons
- any other relevant information

The following project work order may assist local governments in contracting to an engineering firm. The example project work order contains information from the manual count method example (a blank form is provided in Appendix E).

Project Work Order: Traffic Volume Count Study

Referenced Agreement

This work order is part of an agreement between McIntyre and Associates and the city of Smith City for municipal engineering services.

Project Location Description

This work involves conducting a volume count study around the location of 7th Street and Delaware Avenue. A map depicting the location is attached.

Obligation of the City/County

The city shall provide the following items to the consultant: historic traffic volume counts, traffic volume trends, existing zoning of the study area, proposed future land use changes, and a list of important contacts.

Scope of Consultant Services

This work involves an intersection traffic volume count. The traffic volume count should include all vehicular movements, vehicle classification, and a pedestrian count.

Schedule

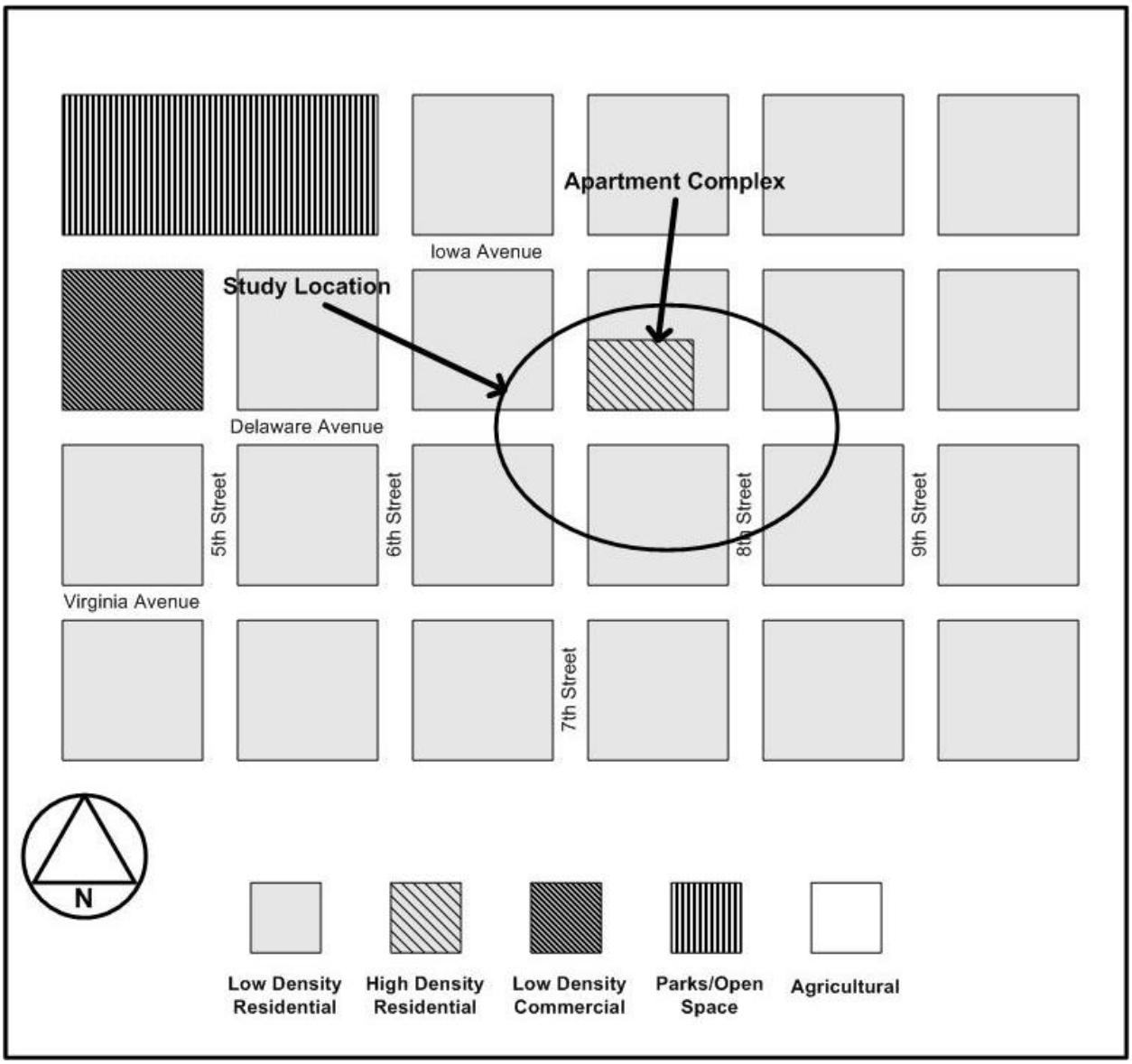
Field meeting date:	_____
Estimated date of preliminary deliverable:	_____
Estimated date of final deliverable:	_____

Compensation

Labor cost	$
Direct expenses	$
Subcontractor cost	$ _____
Overhead	$ _____
Maximum payable	$

Authorization

City of Smith City	McIntyre and Associates
City/County	Contractor
_____	_____
City/County Administrator	Project Manager's Name/Title
_____	_____
Signature	Signature
_____	_____
Date	Date


Apartment Complex
Iowa Avenue
Study Location
Delaware Avenue
5th Street
6th Street
8th Street
9th Street
Virginia Avenue
7th Street
N
Low Density Residential
High Density Residential
Low Density Commercial
Parks/Open Space
Agricultural

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