TRAFFIC ACCIDENT INVESTIGATORS' AND RECONSTRUCTIONISTS' FIELD MEASUREMENTS AND SCALE DIAGRAMS MANUAL

Second Edition

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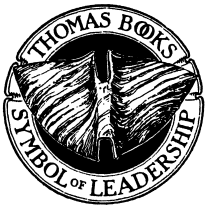
By

R. W. RIVERS

Inspector • Traffic Branch
Royal Canadian Mounted Police (Retired)
Province of British Columbia
Canada



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PREFACE

This new second edition of *Traffic Accident Investigators' and Reconstructionists' Field Measurements and Scale Diagrams Manual* has been prepared to meet the everyday field requirements of traffic accident investigators and reconstructionists who have a responsibility to obtain and document measurements at traffic crash scenes as well as those who have the responsibility to prepare follow-up plan or scale drawings from such measurements. The manual explains in detail the various types of situations requiring measurements that can be encountered during the on-scene investigation. These are followed by a large variety of examples of how to take and document measurements in an easily understood and appropriate manner. Examples are accompanied by solutions to problems and, in applicable circumstances, mathematical solutions are worked out in both the United States (Imperial) and metric (SI) measurement systems.

Recent surveys show that although there are now many new and innovative methods available to take measurements and prepare scale diagrams, such as electronic measuring and computer drafting devices, many departments and individual investigators cannot afford these rather expensive items. And, in a great number of cases, they continue to prefer the usual tape measure and hands-on methods of measuring and preparing scale diagrams. It is with this in mind that this manual is prepared–*to meet their essential needs*.

ACKNOWLEDGMENTS

In the development of this second edition, comments and suggestions of many field investigators were received and taken into consideration. In keeping with their comments and suggestions, much of the initial manual materials have been retained, adding only that which it is felt necessary to ensure that the manual is current in all respects. I wish to acknowledge with thanks those specialists who kindly offered their advice and suggestions. They include: Paul Feenan, Australia; Richard C. (Craig) Wilson, Dallas Police Department, Texas; Bob Snook, California Highway Patrol; Kim Duncan, Halton Regional Police Service, Canada; Frank Volpicella, Kendall Park, New Jersey, and Patrick Burley, Prince Frederick, Maryland.

DISCLAIMER

Various published works and technical papers have been studied, consultations with experts have taken place, and participation in many field tests have been made in the preparation of this manual. The information and practices set out herein are to best of the author's knowledge, experience and belief, current and accurate in the traffic accident investigation and reconstruction profession. However, the author, contributors, publisher, and editors expressly disclaim all and any liability to any person, whether a purchaser of this publication or not, as a consequence of anything stated, done or omitted to be done, whether in whole or in part by such person in reliance upon any part of the contents of this publication.

It is recommended that investigators pay particular attention to his or her personal safety, the protection of property and the safety procedures contained in the manual when conducting related field duties. Every acceptable procedure may not, however, be presented and some of the circumstances of a given case may require additional or substitute procedures. Also, since statutes, ordinances and organizational policies and procedures differ widely in various jurisdictions, those of the particular jurisdiction should govern when there is any conflict between them and any of the contents of this manual.

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TRAFFIC ACCIDENT INVESTIGATORS' AND RECONSTRUCTIONISTS' FIELD MEASUREMENTS AND SCALE DIAGRAMS MANUAL

Chapter 1

INTRODUCTION TO FIELD MEASUREMENTS AND SCALE DIAGRAMS

1.001 Upon arriving at the scene of a traffic crash, the traffic accident investigator must, along with the many other urgent requirements at the scene, decide what to measure and how best to complete those measurements. The positions of vehicles involved and other objects or evidence that are not likely to be immediately moved from their final resting positions or changed in their appearance, can be measured after the immediate concerns, such as caring for the injured, insuring safety at the scene and the taking of measurements of short-lived evidence have been attended to.

1.002 Some surveys have shown that although there are now many new and innovative methods available to take measurements and to prepare scale diagrams and plan drawings, such as electronic measuring devices and computer-generated drafting programs, many departments and individual personnel cannot afford the costs of many of these rather expensive items. Additionally, surveys have also shown that a great number of investigators prefer and continue to use the usual tape measure and hands-on methods of measuring and preparing scale diagrams, the procedures of which are covered in detail throughout this manual.

IMPORTANCE OF FIELD MEASUREMENTS

1.003 One of the most important aspects of the entire traffic accident investigation process is the taking and recording of accurate and adequate measurements during the on-scene investigation. Good measurements and records serve to:

1. Refresh an investigator's memory of an investigation;
2. Enable an investigator to testify, perhaps at a much later time, with

accuracy and confidence regarding the positions and locations of things at an accident scene;
3. Enable an investigator or someone else to prepare a scale diagram or map of an accident scene;
4. Assist in reconstructing an accident scene; and
5. Assist in determining how and why an accident occurred.

INVESTIGATORS' RESPONSIBILITIES

1.004 When an investigator arrives at the scene of a traffic accident, he should:

1. Care for the injured;
2. Plan the steps that he will follow in order to ensure the investigation will be carried out thoroughly and methodically;
3. Protect the scene from further damage or injury;
4. Examine the scene for all evidence that is available and indications of whether the evidence is
   a. primary short-lived
   b. secondary short-lived, or
   c. long-term evidence;
5. Take precautions to ensure that evidence, particularly short-lived evidence, is not moved, removed, damaged or mutilated, lost, or destroyed;
6. Take photographs and measurements once the scene has been adequately and properly secured.

WHEN MEASUREMENTS ARE REQUIRED

1.005 The seriousness of an accident will usually dictate the extent to which measurements are required.

1. Take comprehensive and extensive measurements in all fatal and personal injury accidents.
2. Take sufficient measurements to satisfy court requirements, both criminal and civil.
3. Take measurements where a view obstruction is a contributing factor.
4. Take measurements in those cases where there seems to be no logical explanation for the accident's having occurred.

It is better to have measurements that are not needed later than to need measurements that are not available and can no longer be obtained. Measurements can be made quickly and easily; therefore, some measurements should be taken at all accident scenes.

ACCURACY, ERRORS AND TOLERANCES IN TRAFFIC CRASH INVESTIGATION

1.006 This portion of the manual will give the investigator a general idea of the inherent errors that are or might be found in measurements and calculations made in traffic crash investigations, and methods that can be employed to recognize and compensate for them so that the most accurate results will be achieved and reported upon. In most cases, any such error will be associated with the device or with the procedure used to make the measurement. For these purposes, *error* is defined as *the absolute difference between the true value and the read value* and may be classified as systematic or random. *Systematic* errors are the result of bias in the measuring device or procedure. *Random* measurement errors are the result of a number of random influences which usually follow some statistical distribution (see Table 1-01, and see also Para. 3.022).

Table 1-01

MEASUREMENT ERRORS BY METHODS AND DEVICES

Method/Device	*[Distance: 100ft. (30m)]*	*±% Error*
Pacing Method		10.2
Heel-to-toe Method		5.1
Pocket Tape		0.1
Woven Metal Tape (New)		0.2
Woven Metal Tape (Old)		0.5
Cloth Tape (New)		0.3
Cloth Tape (Old)		1.0
Measuring Wheel		0.5

Source: Patterson (1991).[1] Percentage error of measurements taken over a distance of 100 ft. (30 m) using various measuring methods and devices. Errors may be classified as systematic or random. The table analysis treats only random error. Systematic errors may be detected by using an acceptable calibration procedure.