CHAPTER 5
RESULTS OF SPEED-MODE SURVEY AS VEHICLES APPROACH OBSTACLES OR SMALL-RADIUS CURVES (TBS-3)

To determine how vehicles decelerate when approaching controlled-speed locations or short-radius curves, a pilot survey was carried out on test sections with grades ranging from 2.0 to -3.5% (Table 5.1). Measured on these sections were: (1) the speed of different vehicle types at three given moments: the beginning of deceleration, the moment the driver stepped on the brake, and the moment the vehicle reached the beginning of the speed-controlled location), and (2) the instant when each event occurred.

In the data analysis, it was assumed that vehicles ran, within each interval, at a uniformly varied rectilinear movement, and based on this hypothesis deceleration at three intervals was determined: from the beginning of deceleration (Point A) to the moment when the vehicle was braked (Point B), and from this point to the end of the section studied (Point C), and later on the whole road segment, from (A) to (C) (Table 5.1).

The results obtained clearly show the influence of vehicle type and load. Table 5.2 presents, for each class of vehicle, the average deceleration before and after braking, and the weighted average deceleration of these two averages. The weighted average reflects the change in speed on approaches to curves or highway intersections.

As to the time periods in which vehicles were decelerating, it was found, on a nearly level highway intersection, that in the case of trucks and cars the first deceleration phase lasted for a period varying from ten to fifteen seconds. The second (after the use of brakes) lasted approximately five seconds for cars, and from six to twelve seconds for trucks. These results, however, should only be used as a first approximation of the solution to the problems of predicting decelerations, since they are based on the hypothesis of uniformly varied rectilinear movement, which does not actually occur, as deceleration varies along the road segment.

At the moment, the PICR is working on a new experiment to measure the distance run by the vehicles and the time they will take on it, at intervals short enough to permit the development of a model to describe deceleration and acceleration as a function of time (or distance), which will better reproduce the speed modes of vehicles

TABLE 5.1

MEAN VEHICLE DECELERATION WHEN APPROACHING CURVES OR INTERSECTIONS

TEST SECTION	GR. %	RADIUS m	INTERVALS	CARS	BUSES	UTILITIES		TRUCKS	
						EMPTY	LOADED	EMPTY	LOADED
765	0.7	40	A → B	0,39	0,57(2)	0,36	0,30	0,23	0,22
			B → C	1,49	1,68	1,15	1,11	1,11	1,01
			A → C	0,70	0,63	0,58	0,59	0,49	0,43
766	0,8	95	A → B						
			B → C	0,72	0,39	0,68	0,68	1,00(1)	0,55
			A → C	0,45		0,55	0,39		
647	2,0	80	A → B	0,36				0,11	
			B → C	0,41		1,38		0,80	
			A → C	0,38		0,57	1,39(1)	0,45	0,26
603	1,0	175	A → B	1,50(3)			0,34		
			B → C	0,25			0,59		
			A → C	0,49	0,75	0,34	0,42	0,19	0,10
846	-2,0	20	A → B	0,56	0,44	0,91(2)			0,34
			B → C	1,17	0,79	1,10	0,42(1)	0,31(1)	0,69
			A → C	0,98		0,97(3)	0,49	0,43	0,47
967	-3,5	20	A → B	0,84	1,20(1)	0,77	0,09(1)		0,10
			B → C	1,40	0,66	1,37		1,54	0,83
			A → C	0,99	0,56	0,56		0,76	0,52
ALL SECTIONS ABOVE			A → B	0,54	0,69	0,46	0,21	0,26	0,22
			B → C	1,40	0,92	1,11	0,65	0,89	0,68
			A → C	0,70	0,64	0,51	0,43	0,45	0,35
				AVERAGE ALL VEHICLES					
			A → B	Deceleration previous to braking = 0,41					
			B → C	Deceleration during braking = 1,14					
			A → C	Deceleration before and after braking = 0,53					

NOTE: The numbers in brackets indicate the number of observations available for calculation of the mean acceleration.

TABLE 5.2

MEAN DECELERATION IN m/sec^2

CLASSES OF VEHICLES	DECELERATION		
	BEFORE USE OF BRAKE	AFTER USE OF BRAKE	DURING THE ENTIRE SECTION
Cars	-0.54	-1.40	-0.60
Buses	-0.69	-0.92	-0.64
Empty utilities	-0.46	-1.11	-0.55
Loaded utilities	-0.21	-0.65	-0.63
Empty trucks	-0.26	-0.89	-0.46
Loaded trucks	-0.22	-0.68	-0.35

passing a section or obstacle which restricts their normal speed (see Volume 9 of this Report).