Government of Pakistan
Planning and Development Division
National Transport Research Centre

****

BUS DRIVER TRAINING
PILOT STUDY

M. Sadiq Swati
Chief

A. J. Downing
Adviser

NTRC-62

DECEMBER, 1981

C O N T E N T S

A B S T R A C T

The Punjab Urban Transport Corporation (PUTC) had 10 times more fatal road accidents per million kilometers operated in 1980 than did London Transport in the United Kingdom (UK). One of the reasons for the PUTC's higher accident rate could be a poorer standard of bus driving. To assess their standard, 7 PUTC bus drivers and 2 instructors were given driving tests. All of them failed to meet even the minimum requirements for passing the UK car driving test. They also on average answered only 79 per cent of the questions on knowledge tests correctly. Clearly, the PUTC standard of bus driving was unsatisfactory and it is likely to be an important contributory factor in their high accident rates.

The 9 drivers and instructors were subsequently given a retraining course lasting 4 days to determine whether retraining could raise their standards sufficiently. After training the errors made on the driving test were reduced by 37 percent and the average knowledge scores were improved by 13 per cent. However, as only 1 driver passed the driving test and 3 passed the knowledge tests, it is recommended that most PUTC drivers would need more than 4 days retraining.

1. INTRODUCTION

An analysis of the vehicles involved in accidents in Third World cities[1,2] showed that conventional forms of public transport were involved in proportionately many more accidents than in Great Britain. In the Indian cities studied 16 to 22 per cent of the reported accidents involved buses compared to only 5 per cent in the U.K.

In Pakistan, it would appear that the problem of bus accidents is as great if not greater than in India. Data from the district of Bahawalpur indicated that although buses represented only 5 per cent of the registered vehicles, they were involved in 39 per cent of fatal road accidents in 1977 and 1978. An even higher figure, 49 per cent of all reported accidents, was reported for the Punjab Province[3] but this figure may be an over-estimate because only the main vehicle involved in each accident was included in the analysis.

The high involvement of buses in accidents may be a reflection of their high annual kilometerage compared to other vehicles. However, a study of bus safety in India[4] indicated that buses had far higher accident rates per million kilometers travelled than any other type of vehicle (nearly 5 times higher than the rate for trucks). The fatality rates per million bus kilometers ranged between 0.52 and 0.82 in India. In Pakistan, the rate for the Punjab Urban Transport Corporation in 1980 was over 1, indicating that the bus accident problem in Pakistan is at least as serious as that of India and much

more serious than in the UK where the equivalent rate in London is only 0.11 fatal accidents per million kilometers.

The relatively high accident rate of buses in Pakistan may be due to low standards of driver behaviour, poor vehicle condition and overloading practices. Of these, contributory factors driver behaviour may be the most important. Certainly, 2 previous studies of road user behaviour in Pakistan have shown that some traffic rules were disobeyed by many drivers.[5,6] This is perhaps not surprising as the driving tests are usually very simple and driving procedures are rarely tested. Also few drivers receive any formal training in Pakistan.

If bus driving standards are low in Pakistan relative to the UK, it is possible that they could be raised sufficiently by retraining the drivers and as a result the accident rates could be considerably reduced. This pilot study was carried out to determine whether a training course could raise the standards of bus driving.

2. PURPOSE

This preliminary research has been carried out in order that recommendations could be made about the retraining of bus drivers. In particular the objectives were:

1) To determine whether bus drivers' driving ability and knowledge were above a minimum standard required for the safe operation of buses. The standard chosen for driving ability was similar to the standard required for passing the United Kingdom car driving test. To reach the minimum standard of knowledge, drivers had to answer at least 95 per cent of the questions correctly on 3 knowledge tests.

2) To determine whether a specially designed 4 days training course was effective in raising their knowledge and ability to the required standards.

3) To determine whether there was any relationship between drivers levels of knowledge and their driving ability.

3. SCOPE

The retraining course was run with the cooperation of the PUTC and, as the course was to be run at the offices of the National Transport Research Centre (NTRC) in Islamabad, it was decided that the first group of trainees should come from the Rawalpindi/Islamabad Depot. 10 people were allocated to the class. Of these, 8 were selected at random from the Rawalpindi Depot and the remaining two were instructors from the Central Training Institute in Lahore.

The teaching methods used were classroom instruction, demonstration drives and practical driving instruction. For many of the sessions the class was splot into two and one half stayed in the classroom and the other half went in the training bus. The two halves then changed around and the instruction was repeated. This arrangement was necessary in order to maintain a 5 to 1 ratio of trainees to instructor in the bus (this ratio was felt to be the maximum for a retraining course of this kind). The course lasted 4 days.

The content of the course was fairly comprehensive but in particular the teaching of driving procedures was emphasised. The main objectives of the course were to:

1) Ensure that drivers knew the Pakistan Highway Code.

2) Ensure that they knew the stopping distance of their vehicle and that they could use the "2 second rule" to check their following distance.

3) Ensure that they followed the correct procedures for moving off, stopping, overtaking and carrying out manoeuvres at junctions.

4) Instill in them the habit of using a "mirror signal manoeuvre" (MSM) procedure.

5) Ensure that they positioned their vehicles correctly at all times.

6) Correct the bad steering habits of the drivers.

7) Ensure that they used the correct gears for all manoeuvres.

4. METHODOLOGY

7 drivers and 2 instructors were given four tests before and after the course (1 driver failed to attend). These were a driving test lasting 45 minutes, an oral test of driving rules (100 questions), an oral test examining knowledge of the principles taught in the course (26 questions) and a road signs test (27 signs).

The methods of assessment and marking adopted in the driving test were similar to those adopted in the UK learner driving test. Driving faults were classified by type and were marked as minor, serious and dangerous, according to the severity of the faults. All the judgements were based on the UK standards and every fault committed by a driver was noted on a test form.

5. RESULTS

In the bus driving test given before the course, the 9 trainees committed a total of 779 errors of which 662 were minor and 115 were serious or dangerous. In the UK, learner drivers automatically fail their car driving test if they make one or more serious or dangerous errors. All the drivers tested including the instructors made at least 2 serious or dangerous errors and therefore all of them failed to reach the standard required for UK car drivers.

The types of error committed (regardless of severity) before training are shown in Figure 1. Steering faults were the most common (174) followed by mirror (146) and signalling (134) faults. The frequency of different types of serious and dangerous errors committed, i.e. those which resulted in the driver failing to meet the minimum standard for passing the UK test, are shown in Table 1. Steering and mirror faults were no longer very common as they were mostly of a minor nature. Most of the serious and dangerous mistakes were committed at junctions (60 per cent) and these usually took the form of turning from the wrong position (27 per cent) and emerging when approaching traffic was too near (21 per cent). Also overtaking errors were made more frequently than other types of serious and dangerous errors (25 per cent of them).

Table 1

Types of Serious and Dangerous Driving Errors Made Before Training

		Before No.	Before %
CONTROL			
	Accelerator, footbrake gears and hand brake used incorrectly.	1	1%
	Steering incorrect	1	1%
	TOTAL CONTROL ERRORS	(2)	(2%)
PROCEDURES			
	Junctions Speed Too Fast	8	7%
	Observation inadequate	13	11%
	Emerged when traffic was too close	21	18%
	Position wrong	27	24%
	TOTAL JUNCTION ERRORS	(69)	(60)
	Overtaking Mirror Not Used	12	10%
	Too close to other vehicles	13	11%
	TOTAL OVERTAKING ERRORS	(25)	(21%)
	Moved off incorrectly	1	1%
	Disobeyed Signs and Signals	16	14%
	General Driving Errors	2	2%
T O T A L :		115	100%

In the 3 knowledge tests the average percentage of questions answered correctly by the driver was 66 per cent for the 'oral course' test, 81 per cent for the '100 question highway code' test and 84 per cent for the 'road signs'test. In the UK driving test there is no separate knowledge test although learner drivers are asked some highway code questions at the end of their test. In the United States of America knowledge tests are given before the practical test and the standard usually required for car drivers to pass is 95 per cent. Clearly all the bus drivers and instructors failed to meet this standard.

After the training course the drivers made 211 fewer minor errors and 77 fewer serious and dangerous errors than they did before the course. Therefore, the course did result in a statistically significant* reduction in driving errors. However, it did not result in a statistically significant increase in the number of drivers who reached the UK test standard and only 1 driver made no serious or dangerous mistakes in the test after the course.

From figure 2, it is evident that the drivers improved in all aspects of their driving except for use of the mirror. The largest improvements were made in their steering,overtaking and junction behaviour(all 3 improvements were statistically significant). However, the 4 days training course was not

*The term "statistically significant" is used in this report to indicate that the probability of the result having occurred by chance is less than 1 in 20. The probabilities were determined by applying the Wilcoxon Matched Paris Signed Ranks test.

FIG. 1 : THE FREQUENCY OF DIFFERENT TYPES OF ERROR* MADE IN THE DRIVING TEST BEFORE TRAINING

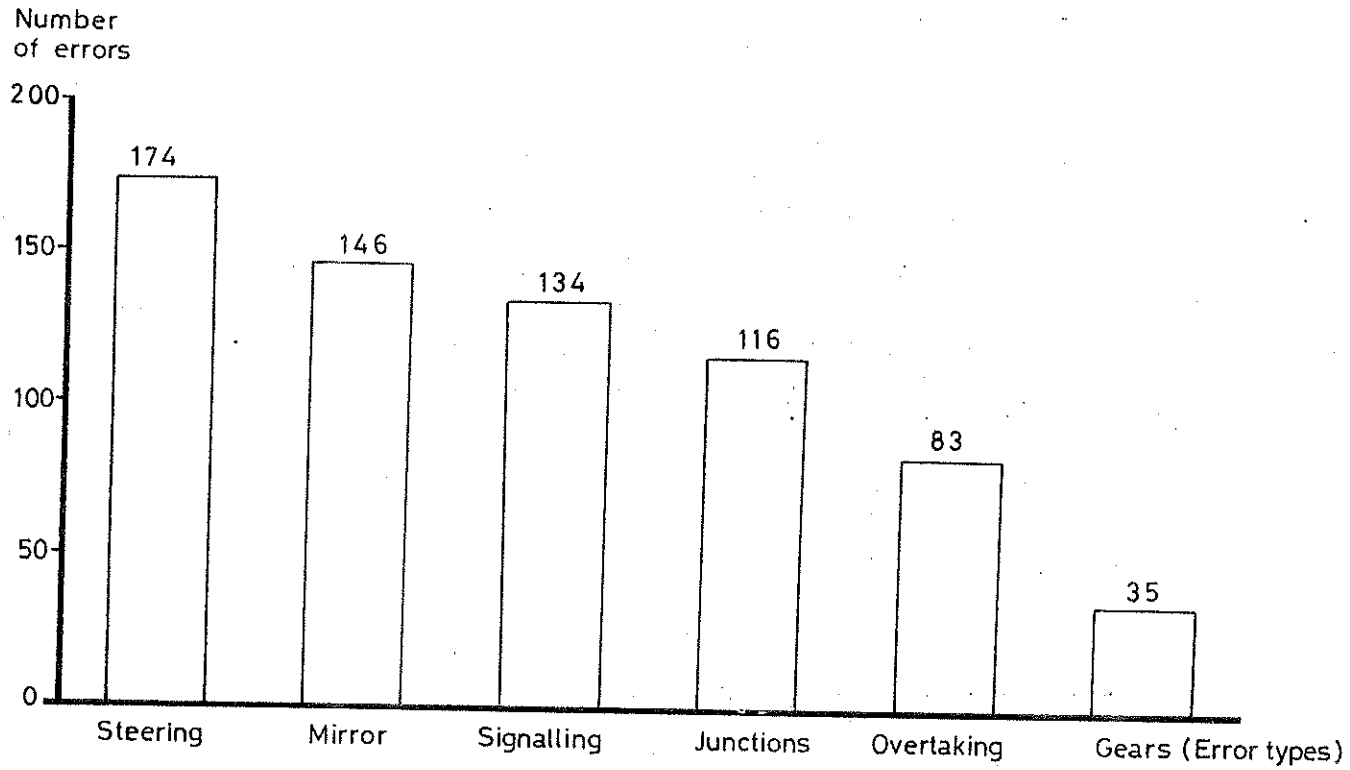
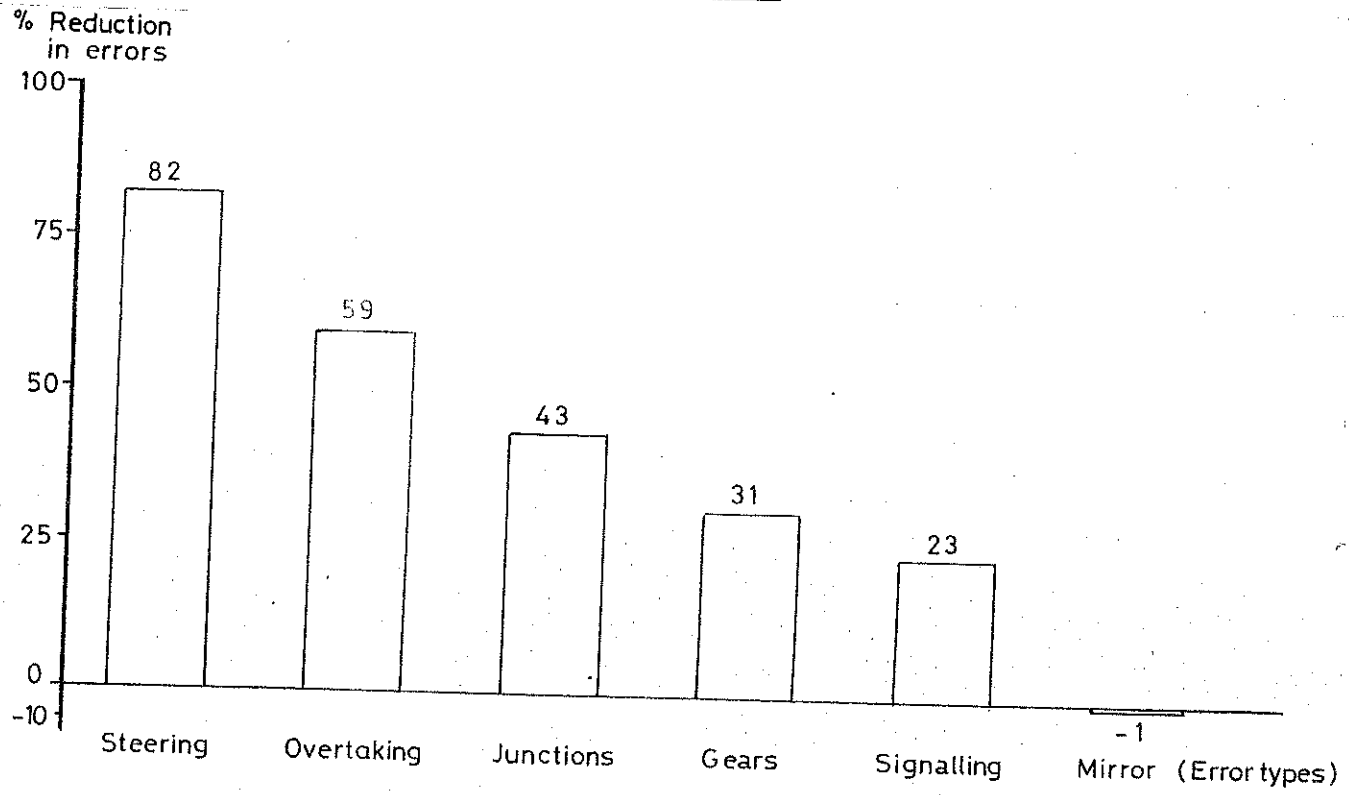


FIG. 2 : THE PERCENTAGE REDUCTION** IN DIFFERENT TYPES OF ERROR* AFTER TRAINING



* ..... includes all errors irrespective of their severity.

** Percentage reduction = $\frac{\text{Errors made before training} - \text{Errors made after training}}{\text{Errors made before training}} \times 100$

sufficient to change the drivers bad habits of checking the mirror after signalling even though 'mirror before signal before manoeuvre' was one of the key principles taught in the course.

From Table 2, it can be seen that the failable errors (serious or dangerous) were also considerably reduced for all types of error except for control and general driving errors. The total reduction in serious and dangerous errors at junctions and when overtaking were statistically significant. The trainees were therefore closer to passing the driving test after training than before but they had not, except for one driver, improved sufficiently to reach the minimum standard of no serious or dangerous errors.

In the 3 knowledge tests, the drivers' average percentage of correct answers improved by 9 per cent (to 75 per cent) in the 'oral course'test, by 15 per cent (to 96 per cent) in the 'highway code' test and by 9 per cent (to 93 per cent) in the 'road signs' test. All three improvements were statistically significant. 3 of the 9 drivers answered 95 per cent or more of the questions in all 3 tests correctly and they did therefore reach the required standard of driving knowledge. All but one of the remaining drivers scored at least 90 per cent overall and clearly the training had brought them closer to passing the knowledge tests.

Table 2

The reduction in serious and dangerous errors committed in the driving test after training

		Total reduction after training	Percentage* reduction after training
Control Errors		0	0
PROCEDURAL ERRORS			
Junctions	Speed too fast	8	100
	Inadequate observation	13	100
	Emerged when traffic was too close	5	24
	Position wrong	19	70
TOTAL JUNCTION ERRORS		(45)	(65)
Overtaking	Mirror not used	8	67
	Too close to other vehicles	10	77
TOTAL OVERTAKING ERRORS		(18)	(72)
	Moved off incorrectly	1	100
	Disobeyed signs and signals	15	94
	General driving errors	- 2	-100
ALL ERRORS		77	67

*Percentage reduction = $\frac{\text{Errors made before training - errors made after training}}{\text{Errors made before training}} \times 100$

A correlation analysis was carried out between the drivers scores on the 3 knowledge tests and the errors they made on the driving test. The results indicated that the drivers who made fewer errors in the driving test after training were also the drivers who obtained higher scores on the road signs test given after training (correlation = - 0.75). No other relationships were found to be statistically significant and the evidence for relationships between driving theory and practical driving tests is inconclusive. However, 3 of the correlation figures were larger than 0.49 and a similar study with a larger sample of drivers may prove more of these relationships to be statistically significant.

6. CONCLUSIONS

The results of the driving tests given before training indicated that bus driving standards in the Punjab Urban Transport Corporation (PUTC) were very low indeed. The 7 drivers and 2 instructors included in the study made several serious or dangerous mistakes on their first driving test and they therefore failed to meet even the minimum standard required to obtain a car driving licence in the UK. The drivers' level of knowledge was also unsatisfactory and all the drivers failed to reach the 95 per cent score which was set as the standard for the knowledge tests. Clearly these low standards of driving and knowledge are likely to be a major contributory factor in the PUTC's high accident rates.

The 4 day training course resulted in considerable improvements in the drivers' behaviour (37 per cent fewer errors on the driving test) and their knowledge (13 per cent improvement in overall scores). However, only 1 driver out of 9 improved sufficiently to pass the driving test and 3 improved enough to pass the knowledge tests. It is probable that the course was too short, particularly with respect to driving practice, to change the drivers habits of a lifetime. Future retraining courses should therefore be longer than 4 days.

To provide all experienced bus drivers with such retraining courses is likely to be costly. Nevertheless,

the resulting reduction in road accidents could very well produce savings which are in excess of these costs. The benefits of retraining demonstrated by the pilot study are sufficient to recommend that a full scale study should be carried out in which a large number of drivers are trained for at least 5 days in the manner described in this report. To evaluate the retraining programme, the drivers' accidents should be monitored before and after their training.

The pilot study also examined the relationships between the drivers' performance on the 3 driving knowledge tests used and their performance on the practical driving tests. It was found that the drivers who did better on the road signs test after training made fewer errors on the driving test after training. However, as this relationships did not hold for tests given before training, the evidence for any relationships between knowledge tests and practical driving tests is inconclusive.

7. ACKNOWLEDGEMENTS

The work described in this report forms part of the joint research programme of the National Transport Research Centre (Chief, Mr. M. Sadiq Swati) and the Overseas Unit (Unit Head : Mr. Bulman) of the Transport and Road Research Laboratory (UK). The author wishes to thank the Mr. Syed Muhammad and Mr. Ayub for giving the instruction and the Punjab Urban Transport Corporation for providing a bus and the trainees.

8. REFERENCES

1. JACOBS, GD and I A SAYER. A study of road accidents in selected urban areas in developing countries. Department of the Environment Department of Transport, TRRL Report LR 775. Crowthorne UK 1977, (Transport and Road Research Laboratory).

2. HINGORANI, DV and A C SARNA. A review of road accidents in India - their causative factors and preventive measures. Indian Highways, December 1978, Vol 6, No. 12.

3. SWATI, MS and M K IDRIS. Accident Study for Punjab. Planning Commission, NTRC Report NTRC-27, Islamabad, Pakistan, 1978 (National Transport Research Centre).

4. JACOBS,GD and A J DOWNING. A study of bus safety in Delhi. Department of Environment Department of Transport, TRRL Report SR* , Crowthorne 1982 (Transport and Road Research Laboratory).

5. SWATI, MS. Real Problem of Highway Safety in Pakistan. Planning Commission, NTRC Report, NTRC-43 Islamabad, Pakistan, 1980 (National Transport Research Centre).

6. SAYER, IA and A J DOWNING. Driving knowledge of road safety factors in three developing countries. Department of the Environment Department of Transport, TRRL Report SR 713, Crowthorne, UK, 1982 (Transport and Road Research Laboratory).

*Awaiting Publication

9. APPENDIX 1

BUS DRIVER TRAINING COURSE - TIME TABLE

TIME	Class Room		Demonstration		Bus Driving	
	Topic	Trainees	Topic	Trainees	Topic	Trainees
day 1 8:30 – 12:00	driving knowledge tests	1st half			driving tests	2nd half
13:00 – 17:00	driving knowledge tests	2nd half			driving tests	2nd half
day 2 8:30 – 8:45	Introduction	All				
8:45 – 10:00	Highway Code-Rules+Signs	All				
10:00 – 10:40	Pre-driving checks Mirror - blindspots Starting the engine Steering	All				
10:40 – 10:50			Pre-driving checks Starting the engine	All		
10:50 – 11:15					Pre-driving checks Mirrors - blindspots	All
11:15 – 12:00	Moving off Stopping	All				
Break						
13:30 – 13:45	Following Distance* Stopping Distance	1st half	Moving off & Stopping	2nd half		
13:45 – 15:15					Moving off & Stopping	2nd half
15:30 – 17:00	Following Distance* Stopping Distance	2nd half	Moving off & Stopping	1st half		
					Moving off & Stopping	1st half

*Demonstration in Toyota Wagon

BUS DRIVER TRAINING COURSE - TIME TABLE

TIME	Class Room		Demonstration		Bus Driving	
	Topic	Trainees	Topic	Trainees	Topic	Trainees
8:30						
day 3						
9:30	Signalling & use of horn	All				
	Types of Intersection Crossing Intersections Approaching & Emerging	All				
10:30						
	Turning at Intersections Mirror Signal Manoeuvre Correct Positioning Give-way to on-coming traffic and pedestrians	All				
11:30						
			Signalling Junctions	All		
12:00						
Break						
13:30						
	Roundabouts Recapitulationo of Junctions & Rules	1st half			Signalling Junctions Following Distance	2nd half
15:15						
	Roundabouts Recapitulation of Junctions & Rules	2nd half			Signalling Junctions Following Distance	1st half
17:00						

BUS DRIVER TRAINING COURSE - TIME TABLE

TIME	Class Room		Demonstration		Bus Driving	
	Topic	Trainees	Topic	Trainees	Topic	Trainees
8:30						
day 4	Land discipline Positioning Overtaking (M.S.M.) being overtaken	1st half			Signalling Junctions Following Distance	2nd half
10:15						
	Lane Discipline Positioning Overtaking (M.S.M.) being overtaken	2nd half			Signalling Junctions Following Distance	1st half
12:00						
Break						
13:00						
	Night driving driving on hills driving in bad weather	1st half			Junctions Signalling Positioning Overtaking	2nd half
15:00						
	Night driving driving on hills driving in bad weather	2nd half			Junctions Signalling Positioning Overtaking	1st half
17:00						
8:30						
day 5	Pedestrians & Ped. crossing Reading the road	1st half			Practice all topics	2nd half
15:15						
	Pedestrians & pd. crossing Reading the road	2nd half			Practice all topics	1st half
12:0						
Break					Manoeuvring reversing	All
13:00						
15:00					Commentry drive	All
17:00						
day 6	Same as day 1					

10. APPENDIX 2

Driving Test Form

Date of test....................
Time commenced..................
Time finished ....

WEATHER...........
....
....

PRE						No door check | No II/B check | No gear lever check
ACC						ACC+ | ACC- | ACC erratic
CL						CL fierce | CL slipping
F.BR						Not using when nec. | Too fierce | Erratic use
G						Wrong G to M/O | Wrong G for situation
						Keeps in lower gears | Coasting
H.BR						Not released | Not applied | Used before car stops
ST	POS					One hand | Arm on door | Crosses hands | Wrong hold
	OS					Late cor. | Over cor. | Erratic | Wanders | O/S | U/S
MO	ANG					No O/R | Not acting on what is seen | No O/F
						Rough take-off | Sig O.
	HIL					No O/R | Not acting on what is seen | No O/F
						Rund-back | Stalling
	LEV					No O/R | Not acting on what is seen | No O/F
						Rough take-off
SP						Within speed limits | Outside speed limits
REV	CON					Incorrect ST | Too fast | Loses control | Stalls
	MAN					Mounts pavement | Too far from kerb
	OBS					No Obs. | Waits too long | Ignores peds.
						Ignores other road users
TR	CON					INcorrect ST | Too fast | Loses control | Stalls
	MAN					Mounts pavement
	OBS					No Obs. | Waits too long | Ignores peds.
						Ignores other road users
MIR	SIG					
	DIR					
	CT					
	S					
SIG	O					
	W					
	L					

SNS	ST				
	KL				
	NE				
	TRL				
	DIR				
CON	POL				
	SCW				
SIG	ORU				
SP+					Too fast on approach to X & J | Too fast into hazards
					Too fast in other sits.
X	SP+				
	RLR				
	EM				
	PSR				
	PSL				
	RCC				
J	SP+				
	RLR				
	EM				
	POSR				
	POSL				
	RCC				
OT					
MAT					
CAT					
PCS N					Crown of road | Wrong lane | Wanders
SH	CYC				
	PED				
	VEH				
PX	ATF				
	DNS				
	OTO				
	INV				
AA					Cyclists | Pedestrians | Drivers

Explanation of main fault headings abbreviations on driving test form

PRE	Precautions before starting engine; handbrake on gear in neutral
ACC	Uncontrolled use of accelerator pedal
CL	Uncontrolled use of clutch
FBR	Late and/or harsh use of footbrake in reducing speed stopping normally
G	Uncontrolled use of gears; not changing gear or selecting neutral when necessary, coasting at places other than on approach to X-roads, junctions and roundabouts
HBR	Not applying or releasing handbrake when necessary
ST POS	Incorrect positioning of hands on wheel or both hands off
ST OS	Erratic steering; overshooting the correct turning point when turning right; use of too much or too little steering
MO ANG	Inability to move off smoothly at an angle
MO HIL	Inability to move off smoothly on a gradient
MO LEV	Inability to move off smoothly on level
SP-	Inability to demonstrate normal progress, including undue hesitation in specific situations
ES	Emergency stop; slow reaction or lack of control
REV CON	Incorrect use of controls when reversing
REV MAN	Inability to manoeuvre with reasonable accuracy when reversing
REV OBS	Lack of observation just before or whilst reversing
TR CON	Incorrect use of controls when turning round
TR MAN	Inability to manoeuvre with reasonable accuracy when turning round
TR OBS	Lack of observation just before or whilst turning round
MIR SIG	Inadequate use of mirror before signallin ;
MIR DIR	Inadequate use of mirror before changing course
MIR OT	Inadequate use of mirror before overtaking
MIR S	Inadequate use of mirror before stopping
SIG O	Signal omitted where essential to safety
SIG W	Not in acoordance with Highway Code;late cancellation of indicators
SIG L	Signal too late to be of value
SNS ST	Non-compliance with Stop Sign
SNS KL	Non-compliance with Keep Left sign
SNS NE	Non-compliance with No Entry sign
SNS TRL	Non-compliance with Traffic Lights
CON POL	Non-compliance with signals given by Police or Traffic Wardens
CON SCW	Non-compliance with School Crossing Patrol sign
SNS DIR	Non-compliance with directional arrow(s) Road Markings
SIG ORU	Failure to take appropriate action on signals given by other road users (e.g: drivers and persons in charge of animals)
SP+	Speed generally too fast in prevailing road and traffic condition
XSP+	Excessive speed on approach to X-roads
RLR	Not looking right, left and right again BEFORE emerging at X-road.
EM	Emerging at X-roads without due regard for other traffic which is present or which can reasonably be expected to be present
POS R	Incorrect position before and/or after turning right at X-roads
POS L	Positioning too far from left before and/or after turning left at X-roads or hitting kerb

RCC	Cutting right hand corner at X-roads
JSP+	Excessive speed on approach to road junction
RLR	Not looking right, left & right again BEFORE emerging at a road junction
EM	Emerging at a road junction without due regard for other traffic which is present or which might reasonably be expected to be present
POSR	Incorrect positioning before and/or after turning right at a road junction
POSL	Positioning too far from the left before and/or after turning left at a road junction, or hitting kerb
RCC	Cutting right hand corner at a road junction
OT	Overtaking or attempting to overtake other vehicles unsafely
MAT	Failure to give adequate clearance when meeting traffic coming from the opposite direction
CAT	Cutting across in front of traffic closely approaching from the opposite direction when making a right turn
POSN	Hugging the middle of the road in normal driving; undue hugging of the near-side kerb
SHCYC	Shave, i.e. near-miss of cyclist(s)
SHPED	Shave, i.e. near-miss of pedestrian(s)
SHVEH	Shave, i.e. near-miss of stationary vehicle(s)
PXATF	Approaching pedestrian crossing(s) too fast
PXDNS	Does not stop when necessary at pedestrian crossing(s)
PXOTO	Overtaking at or when approaching pedestrian crossing(s)
PXINV	Beckoning pedestrians to cross at pedestrian crossing(s)
AACYC	Lacking in alertness and anticipation of the actions of cyclist(s)
AAPED	Lacking in alertness and anticipation of the actions of pedestrians, beckoning pedestrian to cross at places other than pedestrian crossing(s)
AADRI	Lacking in alertness and anticipation of the actions of driver(s)
H/B	Handbrake
ACC+	Excessive pressure on accelerator pedal
ACC-	Insufficient pressure on accelerator pedal
CL	Clutch
G	Gear
M/O	Move off
O/S	Over steer
U/S	Under steer
O/R	Observation to rear
Sig O	Signal omitted
O/F	Observation to front
X	Cross roads
J	Junction