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DRIVER BEHAVIOUR AT STOP SIGNS

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ABSTRACT

In August, 1974, the definition of the STOP sign in New South Wales was changed to correspond with accepted international practice. Driver behaviour was observed at ten open, free-flowing, orthogonal intersections posted with STOP signs and at two similar intersections posted with GIVE-WAY signs. Observations were carried out once before and twice after the date of the change. The behaviour of the drivers approaching the signs was recorded in relation to that of the other drivers with whom they interacted.

The proportion of drivers who actually stopped at the STOP signs initially increased and then fell below the original level. The final proportion was similar to that observed at the GIVE-WAY signs which were not affected by the change in regulations. The proportion of drivers who yielded as required at STOP signs showed little initial change, but subsequently increased. A similar pattern was observed at GIVE-WAY signs and in the final survey the proportions were approximately equal. The marked similarity in driver behaviour between the two sign types might suggest the need for a re-evaluation of the placing of STOP signs.

DRIVER BEHAVIOUR AT STOP SIGNS

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DRIVER BEHAVIOUR AT STOP SIGNS

INTRODUCTION

This report is concerned with the changes in driver behaviour at STOP signs associated with the changes in required yielding at those signs as from August 2, 1974.

Before that date, the priorities at STOP signs were the same as at uncontrolled intersections, i.e. the driver was required to give-way-to-the-right and, if turning right, to yield to opposite traffic. The change in regulations brought the meaning of the STOP sign into line with the standard international practice of yielding to all traffic approaching from the right and/or left. The priorities were thus made similar to those applicable at GIVE-WAY signs, which had not been altered.

Observational surveys of driver behaviour were conducted once before and twice after the date of change as part of a study to monitor the effects of the change in meaning. Surveys were conducted at selected STOP and GIVE-WAY sign locations. In the analysis, data collected at the GIVE-WAY signs were used as a form of control, as no change was made to the required behaviour of drivers at these signs.

The report outlines the survey method and analyses the results on the basis of the proportion of drivers who stopped before entering the intersection, and the proportion of drivers who yielded to other vehicles, given that they were required to do so by the Regulations.

The Regulations

Prior to August 2, 1974, the driver of a vehicle approaching an intersection and faced by a STOP sign, was required to bring his/her vehicle to a standstill at the stop line painted across the road. The driver was then permitted to continue through the intersection, subject still to a "give-way-to-the-right" rule. If he/she intended to make a right turn, then the requirement that it be made "with safety" necessitated that the driver yield to any opposing traffic with which he/she might otherwise have collided. These priority rules were the same as those for an uncontrolled intersection, the only difference being that the STOP sign required the driver to stop before entering the intersection.

From the above date, the regulations applicable at STOP signs required the driver of a vehicle faced by a STOP sign to stop, and subsequently yield to any other vehicle which was upon or near the intersection, and with which the driver's vehicle would have otherwise collided. In situations where two opposing vehicles approached an intersection, and both were faced by a STOP sign, each driver was required to yield to the other, if their paths crossed. However, the requirement to make a right turn "with safety" still applied, thus minimizing the ambiguity. The effect of these regulations brought the net meaning of the STOP sign into line with standard international practice, which required the vehicle to stop, and then to yield to all vehicles approaching from the right and/or left.

The priorities at GIVE-WAY signs which were not changed, required that a driver yield to any other vehicle which approached the intersection from the left and/or right. The driver was not however required to stop before entering the intersection.

Thus the yielding requirements at STOP signs changed from being the same as at uncontrolled intersections, to being similar to those applicable at GIVE-WAY signs, whilst the requirement to stop, only at STOP signs, remained unchanged.

SURVEYS OF DRIVER BEHAVIOUR : METHODOLOGY

In the period July 1 - 12, 1974, one month before the change in regulations, the first survey of driver behaviour was conducted (Stage 1). This preceded the public education campaign that was conducted by the Department of Motor Transport's Traffic Accident Research Unit informing the public of the change in meaning of the STOP sign. This campaign ran for the fortnight immediately prior to and following the date of change. The second survey (Stage 2) was conducted in the period September 9 - 18, approximately one month after the change and the third survey (Stage 3) in the period December 5 - 13, four months after the change.

Observation Sites

The locations where observations were made were as follows:

- (a) 10 unchannelized, 4-arm intersections, posted with STOP signs on two opposing approaches to the intersection. Eight of these were right-angled, and two slightly skewed.
- (b) 2 right-angled, unchannelized, 4-arm intersections, posted with GIVE-WAY signs on two opposing approaches to the intersection.

The 12 locations were spread throughout the Sydney Metropolitan Area. They were selected at short notice and on the basis of similarity in:

- topography
- sight distance to STOP or GIVE WAY sign.
- sign conspicuity with low visual distraction
- type of traffic
- unimpeded traffic flow
- avoidance of heavy pedestrian flow

Each location was sampled at the same time of day in each of the three stages and where possible on the same day of the week. Table I lists the locations where observations were made.

It should be noted that two of the locations were not sampled at Stage 3. The site at North Sydney had had traffic control lights installed in place of the STOP signs, and the site at Redfern was affected by the installation of traffic lights at the adjacent main intersection

causing traffic to queue back across the intersection and block the required free flow. Additionally, the site at Bondi Junction was not sampled at Stage 2 nor that at Strathfield at Stage 3, owing to extensive road works at these intersections.

Collection of Data

At each location, one arm of the intersection posted with a STOP or GIVE-WAY sign was selected. Observers were discreetly placed at the intersection, the same observers being employed throughout the data collection. Each vehicle that approached on the selected arm of the intersection was designated as a case vehicle. Data were collected for each case vehicle that was involved in an interaction with at least one other vehicle, i.e. when any other vehicle was present at the intersection and could have had an effect on the behaviour of the driver of the case vehicle. (Refer to Appendix C for some examples of non-interactions and interactions.) Whilst one observer recorded the behaviour of the case vehicle involved, the other observer recorded the behaviour of each of the other vehicles involved in the interaction. One hundred interactions were recorded at each location at each stage and the following data items were collected.

For the case vehicle : deceleration
delay
manoeuvre

For the other vehicle(s) : position relative to the case vehicle
manoeuvre
order of manoeuvre relative to the case vehicle.

Copies of the data collection sheets are attached as Appendices A and B. This data collection procedure was adopted to permit consistent interpretation of correct or incorrect yielding sequences during the subsequent analysis. Two data items that could have led to a more complete analysis were omitted. These items, as suggested by Bryant (1972), were traffic flow rates in both the through road and the cross road, and the use of a vehicle or hand signal to indicate intention to turn.

Data Analysis

In all, data were collected for 2,600 interactions at STOP signs and 600 interactions at GIVE-WAY signs. A computer model was set up covering each possible combination of vehicle position and manoeuvre and a correct situational yielding sequence was determined. This was done essentially on the basis of each two-vehicle interaction involved in the total interaction. The correct sequence was adjusted for data that were collected before or after the change in meaning. Thus for each case it was determined whether the case vehicle was required to yield to another vehicle, and then whether it did so. The final output from this model yielded the following variables for each interaction.

- (i) Case vehicle details : Stopped/did not stop
- (ii) Required to yield/not required to yield
- (iii) Yielded/did not yield
- (iv) Manoeuvre
- (v) Number of Conflicts in the interaction.
- (vi) Number of Vehicles Involved in the interaction
- (vii) Number of Turning Vehicles in the interaction
- (viii) Stage

The Number of Conflicts refers to the number of times that the case vehicle crossed the path of any other vehicle at the intersection in the execution of the interaction. This should not be confused with the definition of an interaction in which the criterion was that at least one other vehicle was present at the intersection, but not necessarily crossing the path of the case vehicle. Stage was used to indicate whether the data were collected one month before, one month after or four months after the change in meaning.

The dependent variables used in the analysis were as follows:

- (a) Stopping Compliance - defined as the proportion of case vehicles that stopped at the line marked on the roadway at STOP signs. (A similar definition was used at GIVE-WAY signs for Stopping Performance);

(b) Yielding Compliance - defined as the proportion of case vehicles required to yield that did so in the appropriate manner. It should be noted that in some interactions, the case vehicle might not have crossed the path of another vehicle. In fact in some interactions, even when the path of the case vehicle did cross that of another vehicle, the case vehicle might not be required to yield to that other vehicle. (See Appendix C for some samples.) Interactions in which paths did not cross (zero conflicts) or the case vehicle was not required to yield, given the prevailing yielding requirements, were excluded from this analysis.

The independent variables (iv) to (vii) were used as indications of the complexity of the situations in which the case vehicle drivers found themselves.

The two compliance measures were extracted firstly as a function of Stage, and then as a function of Stage and each of the other independent variables. A logit transformation was performed on the compliance measures in order to overcome their inherent non-normality when expressed simply as a proportion. An additive effect model in the logit scale was then tested, to determine whether any interaction existed between Stage and each of the other variables. This was achieved by calculating a chi-square statistic on the tabulated values, the logits being weighted by the inverse of an estimate of each cell variance. For further details of this technique, reference should be made to Snedecor and Cochran (1972).

RESULTS

The overall numbers of vehicles observed have been tabulated in Table II. The results of the analyses are presented in Tables III to VIII. The cell entries give the level of compliance and the total number of interactions on which the compliance was based. The results of the chi-square calculations are presented below each table.

Tables IIIA and IIIB indicate the overall stopping and yielding behaviour respectively, for case vehicle drivers observed at the STOP and the GIVE-WAY signs. Tables IV to VIII indicate the stopping and yielding behaviour for drivers at STOP signs only.

Compliance with Requirement to Stop

Stopping compliance at the STOP signs increased from 78.1% of the 1000 case vehicles surveyed one month before, to 96.0% of the 900 case vehicles observed one month after. However, four months after the change in meaning, only 62.4% of the 700 case vehicles surveyed stopped as required. This represented a considerable drop from the Stage 1 figure. The proportion of case vehicles that stopped at GIVE-WAY signs, even though there was no specific requirement to do so, also increased from 66.0% at Stage 1 to 81.0% at Stage 2. The proportion that stopped at Stage 3 was similar to the original level, a figure of 64.0%. These three figures are each based on samples of 200 case vehicles (Table II).

When the relationship in stopping compliance/performance between Type of Sign and Stage (Table IIIA) was tested, a significant interaction was established. This was explained by the considerable difference in stopping compliance between Stages 1 and 3 at the STOP signs, compared with approximately equal levels of stopping performance at these Stages at the GIVE-WAY signs (Figure 1).

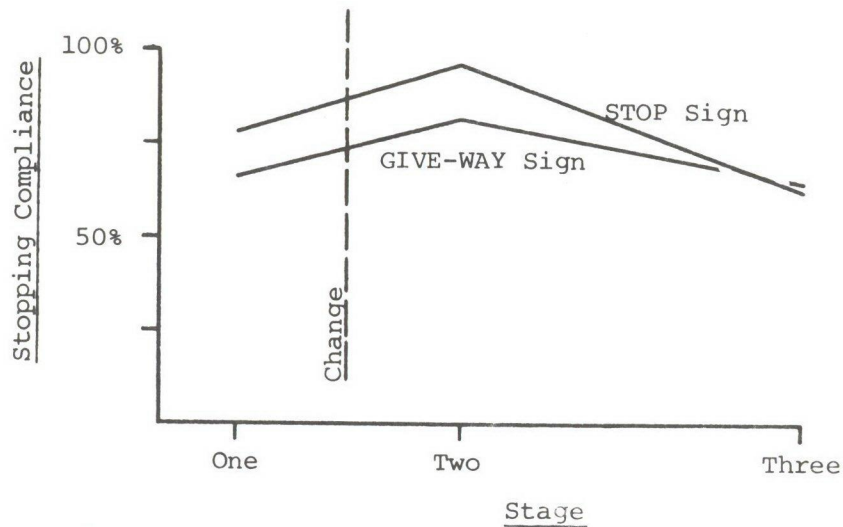


Figure 1: Stopping Compliance by Stage by STOP/GIVE-WAY sign.

Two of the independent variables, Number of Conflicts and Requirement to Yield, showed a significant interaction with Stage.

In the case of the Number of Conflicts, the significance was only marginal. Table VIIA presents the relevant details. The compliance of drivers not involved in a conflict with another vehicle (zero Conflict points), dropped to the figure of 36.0% at Stage 3, a much more severe drop than for the other Numbers of Conflicts (Figure 2).

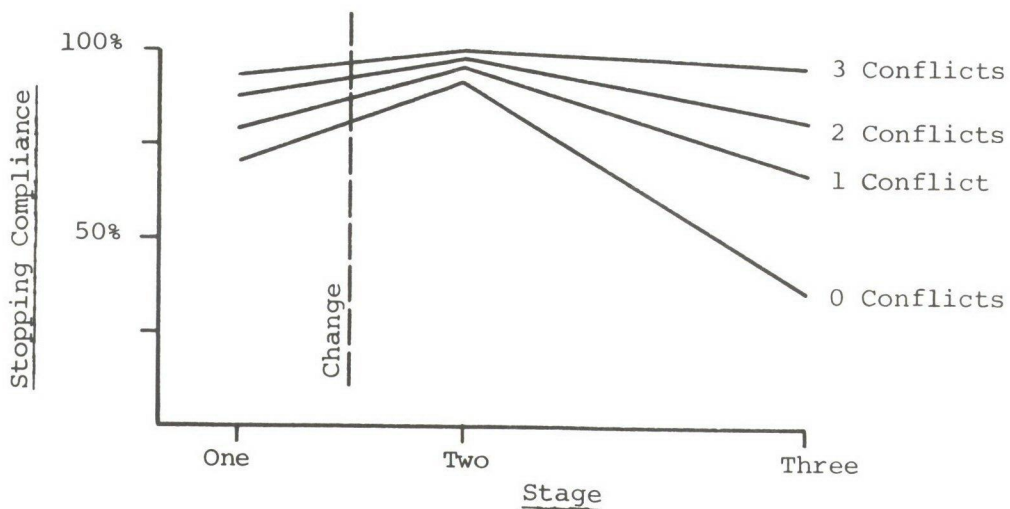


Figure 2: Stopping Compliance at STOP signs by Stage by Number of Conflicts.

In the case of Requirement to Yield (Table VIII), those vehicles at Stage 3 that were not required to yield exhibited a markedly different compliance when compared with the rest of the table. The Stage 3 figure of 35.5% for that group represented a considerable difference from the Stage 1 figure of 71.2% and that of those vehicles that were required to yield (Figure 3).

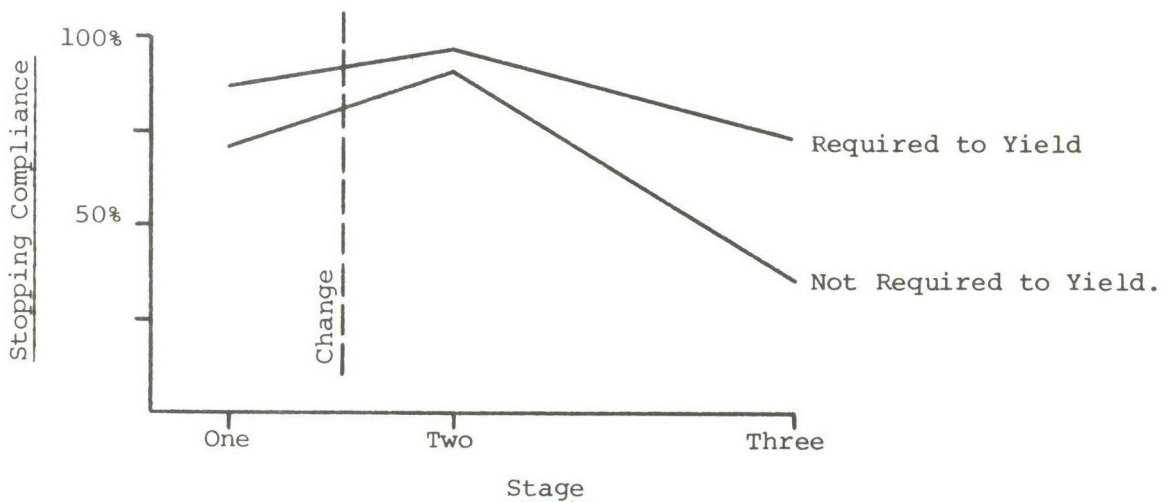


Figure 3: Stopping Compliance at STOP signs by Stage by Requirement to Yield.

No significant interactions with Stage were established for the other independent variables, Manoeuvre of the case vehicle, Number of Vehicles Involved, and Number of Turning Vehicles (Tables IVA VA, VIA). This implied that for each level of these variables, the change in behaviour across Stage was similar. For example, the pattern of change between Stages 1 and 3 in stopping compliance for drivers of case vehicles turning left was not significantly different from the pattern exhibited by right turning drivers nor those proceeding directly across the intersection. Thus for each of the different manoeuvres of case vehicles, the effect of the change in meaning of the STOP sign on stopping compliance was similar (Figure 4).

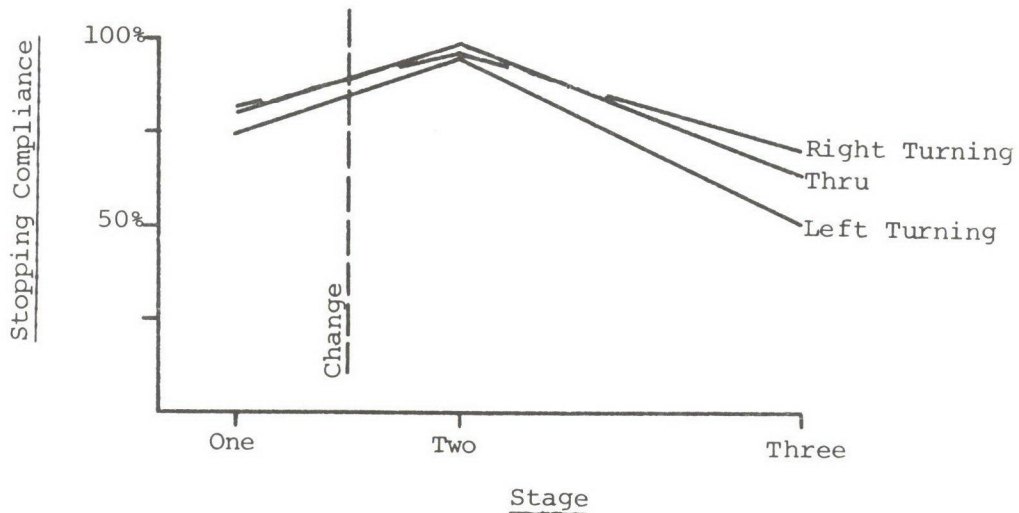


Figure 4: Stopping Compliance at STOP signs by Stage by Manoeuvre of case vehicles.

Similarly for each of the other two variables, the pattern of change across Stage within each variable was similar for each level of the variable.

Compliance with Requirement to Yield

At this point, it should be remembered that the change in meaning of the STOP sign was concerned specifically with the yielding criteria. Stages 2 and 3 differed from Stage 1 in the effective additional requirement that drivers yield to vehicles approaching from the left. At Stage 1, 445 of the 1000 case vehicles that were observed (44.5%) were required to yield to at least one other vehicle. At stage 2, this figure rose to 746 of the 900 vehicles observed (82.9%), an increase that might be directly related to the increased yielding requirements brought about by the change in meaning of the STOP sign. By Stage 3, 497 of the 700 vehicles observed (71.0%) were required to yield (Table II).

The level of yielding compliance was defined as the proportion of vehicles required to yield that did so. Vehicles involved in no conflict and/or not required to yield, were omitted from the following analysis. (Refer to definitions on page 8).

At Stage 1, the yielding compliance at the STOP signs was 78.2% of the 445 case vehicles required to yield. At Stage 2, yielding compliance was measured at 75.5% of the 746 vehicles required to yield. At Stage 3, the level rose to 89.5% of 497 which does indicate some improvement in correct yielding. This same pattern was exhibited by drivers at GIVE-WAY signs and no interaction between Stage and Type of Sign in terms of yielding compliance was determined (Table IIIB and Figure 5).

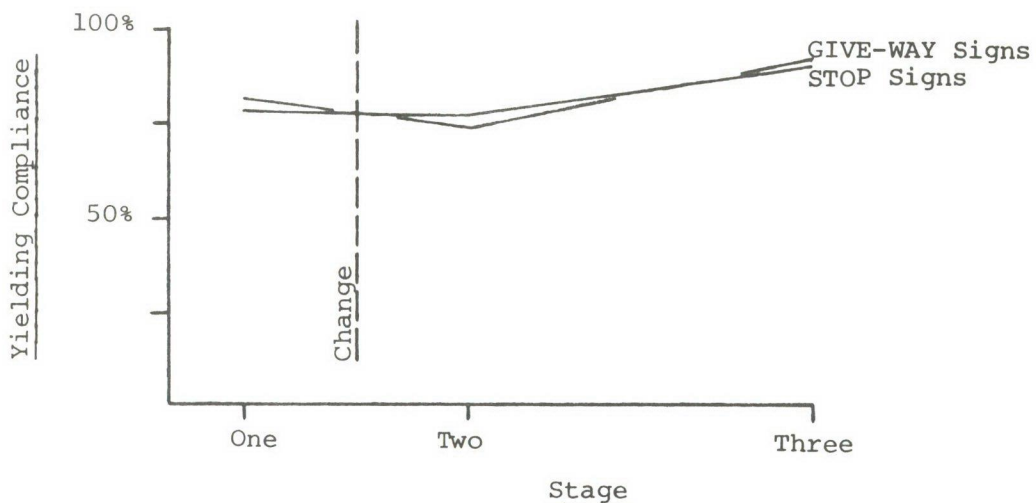


Figure 5: Yielding Compliance by Stage by STOP/GIVE-WAY sign.

No significant interaction with Stage was established for the other independent variables investigated, except for the variable, Number of Vehicles Involved (Table VB). In that case, the significant interaction was a result of a distinct improvement in yielding compliance at Stage 3 for vehicles involved in two-vehicle and three-vehicle interactions, and a marked drop at Stage 2 only, for four-vehicle interactions (Figure 6).

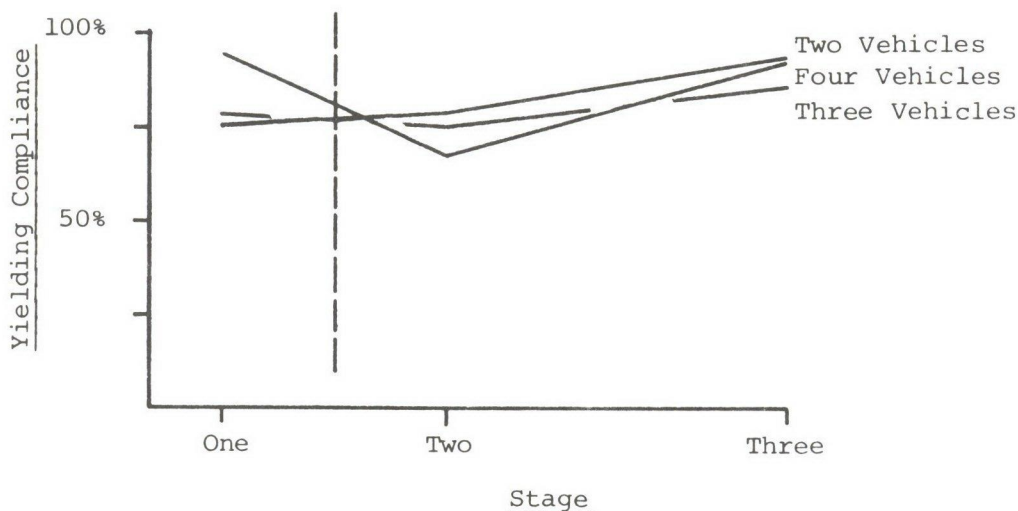


Figure 6: Yielding Compliance at STOP signs by Stage by Number of Vehicles Involved.

The non-significant interactions between Stage and each of the other independent variables indicated that the pattern of change within each of these variables in yielding compliance was similar for each level of that variable. Thus the changes in yielding behaviour exhibited by left turning drivers was not significantly different from the changes exhibited by right turning or through-proceeding drivers. Similar results were determined for Number of Turning Vehicles and Number of Conflicts (Tables IVB, VIB and VIIB).

Complexity and Compliance

As each of the independent variables investigated gives an indication of the complexity of the situation faced by each case vehicle driver, it is of value to consider the differences in compliance across the levels of each of these variables. This procedure is only justifiable when the variable did not interact with Stage, i.e. the performance pattern across Stage was similar over the different levels. In general, as the number of case vehicle conflicts or the number of turning vehicles increased, the complexity of the situation faced by the driver of the case

vehicle would have also increased. Similarly for the manoeuvre of the case vehicle, a right hand turn could be expected to be most complex, then proceeding straight ahead, and turning left least complex.

In the case of stopping compliance, for the Manoeuvre of the case vehicle and the Number of Vehicles Involved, as the situation became more complex, the stopping compliance increased. The Number of Turning Vehicles showed the same general trend, the compliance for one and two turning vehicle interactions being very close to each other. The measures of compliance are shown as Overall values in Tables IVA, VA and VIA respectively.

In the case of yielding compliance, for the three non-interacting variables, Manoeuvre, Number of Turning Vehicles and Number of Conflicts, the yielding compliance decreased as the level of complexity increased (Tables IVB, VIB and VIIB respectively).

DISCUSSION

The surveys of driver behaviour at STOP and GIVE-WAY signs in the Sydney Metropolitan area, conducted one month before, one month after, and four months after the change in regulations affecting STOP signs have indicated that changes occurred in more than just the yielding patterns.

Some changes in the yielding compliance levels across the 3 stages was expected. This was not only because of the overall change in legal requirements at STOP signs, but also as a result of the public education campaign, conducted by the Department of Motor Transport's Traffic Accident Research Unit, in the fortnights before and after the change. This campaign was conducted by way of the general media and leaflets that were distributed to the public through Registry Offices of the Department of Motor Transport (Appendix D). Schreiber and Sowerbutts (1975) found, in an interview study in the Sydney Metropolitan area, a significant improvement in the level of understanding of the meaning of the STOP sign after the education campaign. As a component of that information campaign, the regulations applicable at GIVE WAY signs also received mention. A significant improvement in the knowledge level for these signs also was reported.

The requirement to stop at STOP signs was not changed but was mentioned in the information campaign:

"The STOP sign now means more than just 'STOP'".

Additionally, as part of the information about the GIVE WAY sign, the following was stated:

"... you must slow down ... Of course, you must also stop if it is necessary to give way."

It was found that the proportion of drivers who stopped on approaching a STOP sign, improved from 78% before both the change and the information campaign to 96% immediately afterwards. However, a similar increase was measured in the proportion of vehicles that stopped at GIVE-WAY signs, from 66% to 81%, even though these vehicles were not necessarily required to do so. The similarity of the increase may well have been a direct effect of the information campaign associated with the change. The Stage 2 compliance figure of 96% was the same as was measured at STOP signs in Western Australia by the Main Roads Department (1973) in a survey conducted shortly after that State changed the meaning of their STOP signs to the internationally accepted meaning.

By four months after the change, the proportion of vehicles stopping at the STOP signs had dropped to 62%. This was approximately the same proportion observed at the GIVE-WAY signs, both before the change (66%) and also four months after (64%). Thus whilst the drivers at GIVE-WAY signs had returned to much the same stopping rate as originally observed, the drivers at the STOP signs had dropped their stopping compliance below the original level of 78%, to one that roughly corresponded with that of drivers at GIVE-WAY signs.

Those drivers at the STOP signs who did not conform to the overall pattern of stopping compliance were those who were not required to yield to another vehicle. This group was made up of those drivers who were involved in a conflict interaction but were not required to yield, and those who were involved in a zero conflict interaction.

The stopping compliance for the not-required-to-yield group at Stage 3 was only 35.5%. This compared unfavourably with their Stage 1 level of 71%, and the Stage 3 figure of 73% for drivers who were required to yield.

The new yielding priorities applicable at STOP signs after the change were explained in the information leaflet in exactly the same way as those applicable at GIVE-WAY signs. Thus whilst the priorities at the two signs were different before the change, they were explained as being the same after the change.

The proportion of drivers who yielded as required on approaching a STOP sign, dropped marginally from 78% before to 75% immediately after the change. However, when considering that the proportion of all observed drivers who were required to yield almost doubled, from 45% before to 83% immediately after the change, this drop is probably of no real importance. That the change in yielding compliance was so small would indicate that the additional yielding requirements were well conveyed to the public, and complied with to much the same extent as the old set of requirements. The yielding compliance exhibited by drivers at the GIVE-WAY signs surveyed also decreased from 84% before to 74% immediately after the change, although as mentioned no change was made to the yielding requirements at these signs.

The yielding compliance at STOP signs four months after the change had risen to approximately 90%. The proportion of vehicles that were required to yield at this stage had dropped to 71%, an indication that the usage patterns at the STOP signs may have changed. The improvement in yielding compliance at GIVE-WAY signs showed a similar increase to much the same level (92%).

In terms of yielding compliance at the STOP signs, those case vehicle drivers who were involved in four-vehicle interactions did not conform with the overall trend. This group showed a marked drop in yielding compliance from 94% to 67% one month after the change. This seems to only have been a temporary aberration, as by four months after the change these drivers had returned to their high, pre-change level of approximately 92%.

These interactions represented about 11% of the total number of interactions in which the driver was required to yield. Yielding compliance in the other interactions (two and three vehicles involved) improved as markedly four months after the change as the four-vehicle interaction group had dropped one month after the change. The yielding compliance four months after the change showed an improvement in all groupings of the data, to a consistently high level of approximately 90%. It was found that generally the overall Stage changes in compliance were reflected evenly in the different case vehicle manoeuvres. Thus left-turning drivers responded to the change in meaning in a similar fashion to those proceeding straight ahead and to those turning right. Additionally, in terms of the overall results, as an interaction became more complex, the stopping compliance improved whilst the yielding compliance decreased, a result that might well have been expected.

As only those case vehicles that were involved in an interaction with at least one other vehicle were included in the surveys, no detail is known of the compliance of drivers who were not confronted by another vehicle at the intersection. In the analysis of stopping compliance, they would have been included with those drivers who were not required to yield to another vehicle. There seems no reason to suggest that their stopping behaviour would have been better than the behaviour of those drivers who were recorded as not being required to yield. If they had been included, the total proportion of drivers not required to yield would have increased and thus the overall measure of stopping compliance would have been lowered, especially at STOP signs.

Since the change in regulations, STOP and GIVE-WAY signs are essentially only different in the requirement to stop, before entering the intersection. The behaviour at these signs in terms of yielding and stopping compliance, as surveyed four months after the change in

regulations appeared to be surprisingly similar. At both signs a high level of compliance with regard to correct yielding was measured, but this was not so when considering stopping especially for those drivers not required to yield. This latter point suggests that those drivers surveyed were reacting to the traffic requirements, rather than obeying the stop requirement before proceeding with their manoeuvres. As the actual technique of changing the meaning of the STOP sign was an all encompassing redefinition of all STOP signs, regardless of the traffic management requirements of an individual location, it is perhaps not surprising that drivers made individual decisions about their response to the situations that they faced, rather than strictly complying with the signs. This disregard for stopping at STOP signs by drivers who were not subsequently required to yield, suggests that apart from the indications of the sign, they perceived no need to stop, and did not do so.

On this basis, it might be cautiously stated that in the final survey, drivers observed at the STOP signs were treating the signs as GIVE-WAY signs. If the signs had been GIVE-WAY signs, those drivers who were not required to yield would not have been required to stop. In light of the fact that the locations were open intersections with good visibility of other traffic, the need to stop might be questioned. It may well be surmised that this was how those drivers who were not required to yield responded. Such a response to a traffic control sign, the primary purpose of which was normally to stop traffic in order to improve the overall safety of the intersection, would indicate a change in the perceived import of that particular aspect of the sign.

If this attitude were to be transferred to other STOP signs where the need to stop was of prime importance, such as intersections with limited visibility, the value of the STOP sign over say a GIVE-WAY sign would be negated. Thus, if STOP signs were used only at intersections where

the need to stop was imperative, and the GIVE-WAY sign were used at other intersections, an overall improvement in intersection safety may well be expected.

Drivers might need to be reminded of the meaning of the STOP sign, a warning sign to increase their own safety, rather than merely another traffic control device. The differentiation between the two sign types might then be re-established, the emphasis moving away from the yielding requirements, which seem to have been well accepted, and returned to the important aspect of the STOP sign, namely,

.... first STOP for Safety, and then proceed
in the approved sequence.

SUMMARY AND CONCLUSIONS

On August 2, 1974, a change in the Motor Traffic Regulations associated with the meaning of the STOP sign came into effect. After that date, drivers faced by a STOP sign were required to yield "right-of-way" to all drivers approaching from their left, in addition to the normal "give-way-to-the-right" rule. This change brought the New South Wales regulations into line with internationally accepted practice.

In the fortnights prior to and following the date of change, a public information campaign, conducted by the Department of Motor Transport's Traffic Accident Research Unit, was conducted to inform the public of the change. It equated the new yielding priorities with those applicable to GIVE-WAY signs, and also re-affirmed the requirement to stop at STOP signs, a requirement that was not changed.

Surveys of driver behaviour at STOP and GIVE-WAY signs in the Sydney Metropolitan Area were conducted before and after the change in meaning. The immediate effect of the change was an increase in the proportion of drivers that stopped at STOP signs from a level of about four out of five before the change, to almost all drivers afterwards. Four months after the change, the overall level of stopping at STOP signs had dropped below the pre-change level, to about two out of three drivers stopping. Thus the overall stopping compliance at STOP signs showed a marked increase followed by an even greater decrease. The proportion of drivers who stopped at GIVE-WAY signs showed a similar initial increase, but finally returned to much the same level as before the change. This level of two out of three drivers stopping corresponded with that finally

measured at the STOP signs. Those drivers at STOP signs who did not follow this pattern were those who were not required to yield to another vehicle. They exhibited a marked deterioration in compliance, only one in three drivers stopping, four months after the change.

Compliance with the prevailing yielding requirements immediately after the change remained at much the same level as before the change, at about three out of four drivers yielding correctly. In light of the fact that the proportion of drivers who were required to yield almost doubled, the maintenance of this compliance level would indicate that the general public were adequately informed of the new yielding priorities at the STOP signs. Four months after the change, yielding compliance rose to a uniform level of about nine out of ten drivers yielding correctly. A similar trend was observed at the GIVE-WAY signs with the final level of yielding compliance being higher than the pre-change level, and in fact matching that observed at the STOP signs.

The marked similarity in the driver behaviour observed at the STOP signs with that at the GIVE-WAY signs for both stopping and yielding, suggests that most drivers are not always differentiating between a STOP sign and a GIVE-WAY sign. STOP signs might well be taken more seriously if they were placed only where stopping was essential, for example at especially hazardous intersections. Replacement of existing STOP signs by GIVE-WAY signs at locations where stopping is not essential would probably enhance driver safety at hazardous locations by increasing driver respect for STOP signs, since drivers would come to understand that these signs were used only at such intersections. The final decision to use a STOP sign, rather than a GIVE-WAY sign, should depend on the individual safety requirements of a particular location, in conjunction with the overall traffic management philosophy in the vicinity.

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<u>SIGN TYPE</u>	<u>LOCATION</u>	<u>SUBURB</u>	<u>INTERSECTION</u>	<u>CASE VEHICLE APPROACH DIRECTION</u>
STOP	1	MANLY	Darley Road/Wentworth Street	NE
	2	WAITARA	Alexandria Parade/ Ingram Road	E
	3	NTH SYDNEY	Miller Street/Berry Street	W
	4	EASTWOOD	Rutledge Street/West Parade	N
	5	BONDI JUNCTION	Newland Street/Spring Street	S
	6	REDFERN	Redfern Street/George Street	S
	7	STRATHFIELD	Homebush Road/Redmyre Road	E
	8	BANKSTOWN	Rickard Road/Jacobs Street	S
	9	JANNALI	Georges River Road/ Carvers Road	E
	10	RANDWICK	Darley Road/Avoca Street	N
GIVE-WAY	21	BANKSTOWN	Chapel Road/French Avenue	W
	22	PARRAMATTA	Victoria Road/Sorrell Avenue	N

TABLE I : DETAILS OF 12 LOCATIONS AT WHICH DRIVER BEHAVIOUR WAS OBSERVED.

STOP SIGNS

STAGE	One Month Before	One Month After	Four Months After
VEHICLES OBSERVED	1000	900	700
VEHICLES STOPPING	871	864	437
VEHICLES REQUIRED TO YIELD	445	746	497
VEHICLES YIELDING AS REQUIRED	348	563	445

GIVE-WAY SIGNS

STAGE	One Month Before	One Month After	Four Months After
VEHICLES OBSERVED	200	200	200
VEHICLES STOPPING	132	162	123
VEHICLES REQUIRED TO YIELD	165	149	145
VEHICLES YIELDING AS REQUIRED	138	110	134

TABLE II Overall numbers of vehicles observed at STOP and GIVE-WAY signs, Sydney 1974.

<u>SIGN</u>	<u>STAGE</u>		
	One month before	One month after	Four months after
STOP	78.1% (1000)	96.0% (900)	62.4% (700)
GIVE-WAY	66.0% (200)	81.0% (200)	64.0% (200)

TABLE IIIA Proportion of case vehicles that stopped, at each stage, at STOP and GIVE-WAY signs.

($\chi^2 = 35.6$, 2.d.f., $p < .001$).

	<u>STAGE</u>		
	One month before	One month after	Four months after
STOP	78.2% (445)	75.5% (746)	89.5% (497)
GIVE-WAY	83.6% (165)	73.8% (149)	92.4% (145)

TABLE IIIB Proportion of case vehicles required to yield that did so, at each stage, at STOP and GIVE-WAY signs.

($\chi^2 = 2.3$, 2 d.f., N.S.)

NOTE: Figures in brackets are the numbers of vehicles observed in each category upon which the proportions are based.

<u>MANOEUVRE</u>	<u>STAGE</u>			
	One month before	One month after	Four months after	Overall
TURNING LEFT	73.9% (329)	94.1% (253)	50.3% (185)	74.9%
STRAIGHT THROUGH	79.3% (416)	97.6% (368)	64.5% (321)	81.1%
TURNING RIGHT	81.6% (255)	95.7% (279)	70.6% (194)	84.1%

TABLE IVA Proportion of case vehicles that stopped, at each stage, for each case vehicle manoeuvre at STOP signs.
($\chi^2 = 5.1$, 4 d.f., N.S.)

<u>MANOEUVRE</u>	<u>STAGE</u>			
	One month before	One month after	Four months after	Overall
TURNING LEFT	86.3% (136)	35.3% (156)	92.9% (70)	87.5%
STRAIGHT THROUGH	33.7% (160)	79.1% (325)	93.9% (249)	85.1%
TURNING RIGHT	64.4% (149)	65.3% (265)	81.1% (178)	70.4%

TABLE IVB Proportion of case vehicles required to yield that did so, at each stage, for each case vehicle manoeuvre at STOP signs.
($\chi^2 = 2.5$, 4 d.f., N.S.)

NOTE: Figures in brackets are the numbers of vehicles observed in each category upon which the proportions are based.

<u>NUMBER OF VEHICLES</u>	<u>STAGE</u>			
	One month before	One month after	Four months after	Overall
TWO	74.9% (574)	94.1% (373)	49.0% (337)	73.7%
THREE	81.5% (389)	97.1% (448)	69.6% (273)	84.1%
FOUR	91.9% (37)	98.7% (79)	91.1% (90)	94.2%

TABLE VA Proportion of case vehicles that stopped, at each stage, by the number of vehicles involved in the interaction at the STOP signs.

($\chi^2 = 7.0$, 4 d.f., N.S.)

<u>NUMBER OF VEHICLES</u>	<u>STAGE</u>		
	One month before	One month after	Four months after
TWO	75.4% (142)	77.9% (263)	93.4% (182)
THREE	77.7% (269)	75.5% (408)	85.8% (232)
FOUR	94.1% (34)	66.7% (75)	91.6% (83)

TABLE VB Proportion of case vehicles required to yield that did so, at each stage, by the number of vehicles involved in the interaction at STOP signs.

($\chi^2 = 13.1$, 4 d.f., $p < .02$).

NOTE: Figures in brackets are the numbers of vehicles observed in each category upon which the proportions are based.

NUMBER OF
TURNING VEHICLES

One month
before

One month
after

Four months
after

Overall

ZERO

74.5%
(212)

96.2%
(211)

60.4%
(154)

78.7%

ONE

80.1%
(463)

96.4%
(390)

61.8%
(293)

81.0%

TWO

76.9%
(299)

95.5%
(267)

62.7%
(217)

79.3%

THREE/
FOUR

84.6%
(26)

93.7%
(32)

75.0%
(36)

84.0%

TABLE VIA

Proportion of case vehicles that stopped, at each stage, by the number of turning vehicles in the interaction at STOP signs.

$$(\chi^2 = 4.16 \text{ d.f., N.S.})$$

STAGE

NUMBER OF
TURNING VEHICLES

One month
before

One month
after

Four months
after

Overall

ZERO

86.5%
(96)

82.4%
(193)

93.3%
(119)

86.5%

ONE

77.9%
(217)

74.3%
(335)

89.0%
(228)

79.6%

TWO

71.4%
(119)

71.4%
(199)

88.4%
(129)

76.3%

THREE/
FOUR

76.9%
(13)

66.7%
(18)

80.0%
(20)

74.5%

TABLE VIB

Proportion of case vehicles required to yield that did so, at each stage, by the number of turning vehicles in the interaction at STOP signs.

$$(\chi^2 = 1.4, 6 \text{ d.f., N.S.})$$

NOTE: Figures in brackets are the numbers of vehicles observed in each category upon which the proportions are based.

<u>NUMBER OF CONFLICTS</u>	One month before	One month after	Four months after
ZERO	69.9% (306)	91.6% (131)	36.0% (186)
ONE	78.3% (485)	95.6% (479)	66.7% (348)
TWO	88.1% (193)	98.4% (255)	81.1% (143)
THREE	93.7% (16)	100.0% (35)	95.7% (23)

TABLE VIIA Proportion of case vehicles that stopped,
at each stage, by the number of case
vehicle conflicts at STOP signs.

($\chi^2 = 12.81$, 6 d.f., $p \approx .05$).

<u>NUMBER OF CONFLICTS</u>	One month before	One month after	Four months after	Overall
ZERO	—	—	—	—
ONE	77.3% (256)	79.2% (456)	90.9% (331)	82.4%
TWO	78.0% (173)	71.8% (255)	37.4% (143)	77.6%
THREE	93.7% (16)	54.3% (35)	82.6% (23)	71.6%

TABLE VIIB Proportion of case vehicles required to yield that did
so, at each stage, by the number of case vehicle
conflict points at STOP signs.

($\chi^2 = 7.28$, 4 d.f., N.S.)

NOTE: Figures in brackets are the numbers of vehicles observed
in each category upon which the proportions are based.

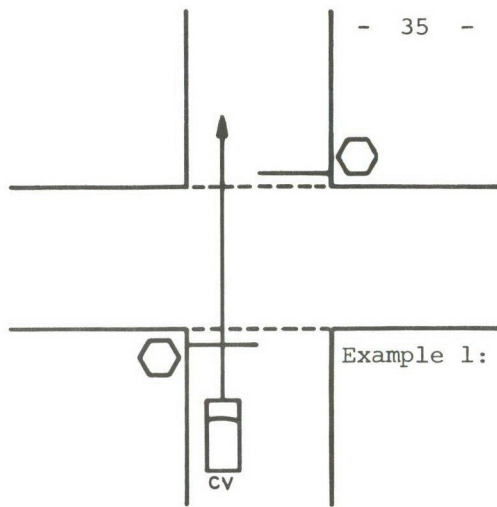
	<u>STAGE</u>		
	One month before	One month after	Four months after
<u>REQUIRED TO YIELD</u>	86.7% (445)	97.1% (746)	73.4% (497)
<u>NOT REQUIRED TO YIELD</u>	71.2% (555)	90.9% (154)	35.5% (203)

TABLE VIII Proportions of case vehicles that stopped, at each stage, by requirement to yield to another vehicle at STOP signs.

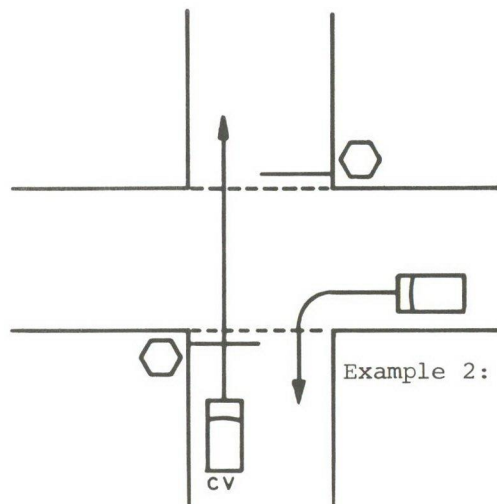
$$(\chi^2 = 6.72, 2 \text{ d.f.}, p < .05)$$

NOTE: Figures in brackets are the numbers of vehicles observed in each category upon which the proportions are based.

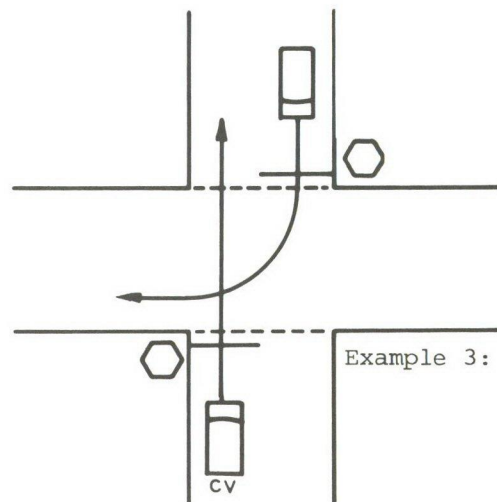
[illegible]



Example 1: Case Vehicle does not interact with any other vehicle (excluded from survey).

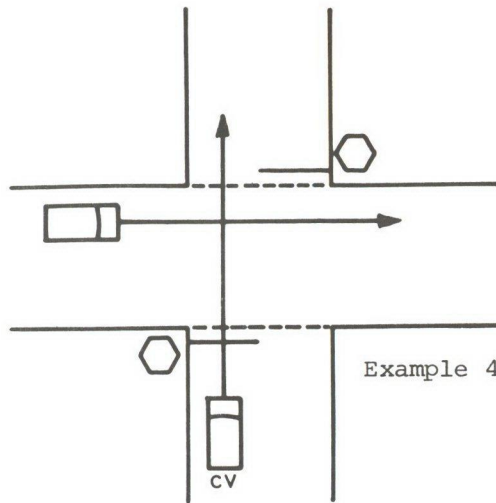


Example 2: Case Vehicle involved in an interaction, but no conflict occurs.

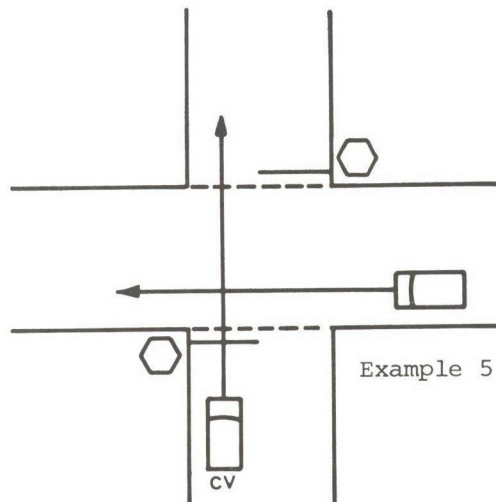


Example 3: Case Vehicle involved in an interaction, a conflict situation exists, but the case vehicle is not required to yield.

N.B. THE SYMBOL 'O' REPRESENTS A STOP SIGN



Example 4: Case Vehicle involved in an interaction, a conflict situation exists. Before the change, the case vehicle is not required to yield, but after the change it is so.

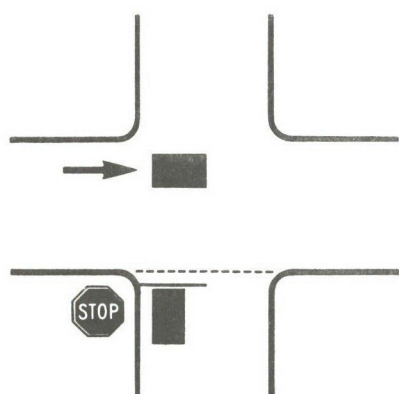


Example 5: Case Vehicle involved in an interaction, a conflict situation exists, and case vehicle is required to yield.

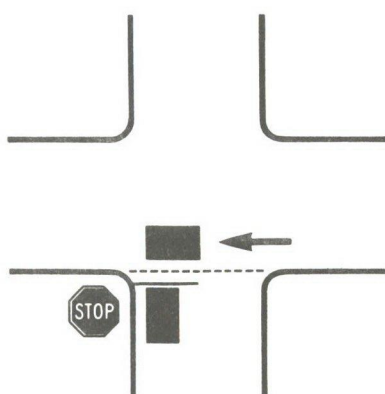
N.B. THE SYMBOL '○' REPRESENTS A STOP SIGN



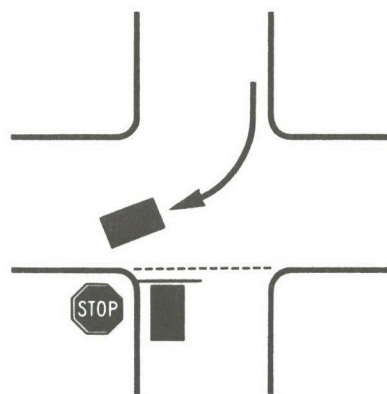
**From Friday, August 2nd,
the Stop sign means more than just 'stop.'
It also means give way in all directions.**



Give way to traffic on left.



Give way to traffic on right.

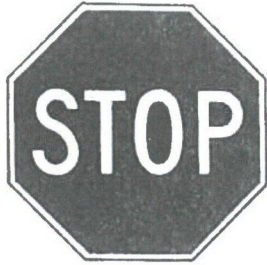


Give way to turning traffic.

Department of Motor Transport New South Wales

Sign Language

Traffic signs are important.
It's essential you know what they mean.



The Stop sign

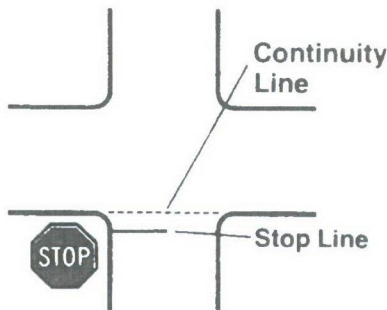
This sign means you must stop your vehicle – completely – before you cross the stop line on the road. From FRIDAY, AUGUST 2nd, you must give way to all vehicles on your LEFT as well as your RIGHT. And you must give way to any vehicle turning across your path.



The Give Way sign.

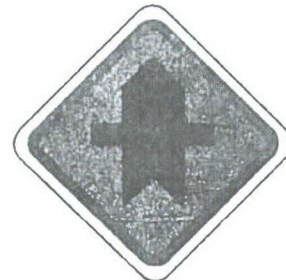
This sign means you must slow down when going through the intersection. Of course, you must also stop if it is necessary to give way. You must give way to vehicles on your LEFT as well as on your RIGHT. And you must give way to any vehicles turning across your path.

If you disobey these rules you could incur an 'on the spot' penalty of \$20 (or a Court could impose a maximum penalty of \$200). You'll also lose 4 points — this could mean you'd lose your licence.



How to tell which side streets are controlled.

Broken white lines painted across the entrance of a side street tell you that the side street is controlled by a STOP or GIVE WAY sign.



The Controlled Intersection Sign.

You may see this sign as you drive along a 'main' road. It also tells you the next side street is controlled by a STOP or a GIVE WAY sign.

Remember — the STOP sign now means more than just 'STOP'

Department of Motor Transport New South Wales