

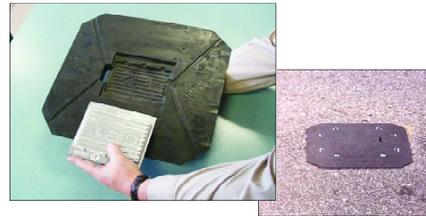
CONTROLLING TRAFFIC SPEED THROUGH ONTARIO CONSTRUCTION ZONES

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Purpose of the study

The Construction Safety Association of Ontario undertook a study of how portable variable message signs (PVMS) affect traffic speed in construction zones. The purpose was

- to quantify concerns raised by contractors about vehicles travelling through work zones at speeds far above the posted limit
- to determine whether using PVMS close to the work zone will cause drivers to slow down.



Tracking vehicle speed

CSAO used five Hi-Star NC-97 units (pictured above) to collect the following data:

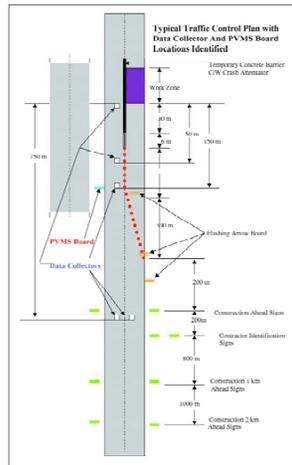
- number of vehicles
- individual speeds
- length of vehicle
- time/date each vehicle passed
- time between vehicles
- asphalt temperature
- surface moisture.

Each unit is capable of collecting data 24 hours a day for 7 days. It sits on the pavement in the middle of the lane, covered by a heavy rubber mat fastened to the pavement.

The five units were placed as follows:

- 2 units 700 to 900 metres from the start of the work zone, prior to any lane restrictions or delineating barriers
- 1 unit at the location of the PVMS board, 150 to 180 metres from the start of the work zone
- 1 unit 50 to 80 metres from the start of the work zone
- 1 unit within 3 metres of the start of the work zone.

The first two units were intended to measure the speeds of free-flowing traffic approaching the work zone. The remaining three units measured the speeds as vehicles encountered the PVMS board and approached the work zone.



Introducing the message screen

CSAO introduced the message sign (PVMS) in two distinct phases.

Intervention strategy 1: A PVMS located 150 to 180 metres from the start of the work zone repeatedly cycles two messages at 4-second intervals:

**HIGHWAY WORK ZONE
MAX SPEED 80 KM/H**

Intervention strategy 2: Same as above, but a further message change is triggered by the radar-clocked speed of vehicles. If a vehicle exceeds the speed limit by more than 8 km/h, the message changes to 'MAX SPEED 80 KM/H' and flashes at 1-second intervals. The flashing continues until the vehicle passes or its speed drops below the 8 km/h buffer—at which time the two-message cycle resumes.

The study has three phases, each with seven days of data collection:

- Phase 1:** No PVMS. This was the control or 'baseline' phase, used for comparing data from the other phases.
- Phase 2:** Intervention strategy #1 (see above)
- Phase 3:** Intervention strategy #2 (see above).

At the end of each seven-day period, the data collection units were switched with fresh ones, and the data downloaded for analysis.

Test Site 1: Highway 416 / CPR Overpass Bridge Rehabilitation

Location: Two northbound lanes of Highway 416 (a 4-lane controlled access highway with a wide grass and tree median between the northbound and southbound lanes).

Test conditions: The two northbound lanes were reduced to one lane. The posted speed limit was reduced from 100 km/h to 80 km/h.

Table 1 at right shows the traffic speeds (as a percent of total volume) for vehicles approaching the work zone. Table 2 shows the speeds at the start of the work zone.

Test Site 2: Highway 416 / Rideau River Bridge Rehabilitation

Location: 8 km north of Test Site 1 on Highway 416.

Test conditions: Same as Test Site 1.

Table 3 at right shows the traffic speeds (as a percent of total volume) for vehicles approaching the work zone. Table 4 shows the speeds at the start of the work zone.

Preliminary results

The data in Tables 2 and 4 indicate that Intervention Strategy 1 had no impact on slowing traffic in the work zone. Intervention Strategy 2 (Phase 3 on Tables 2 and 4), however, appeared to have affected vehicle speeds. Since there were only two test sites, additional testing on other sites will be required to validate these findings.

2003 results

In 2003, CSAO has only collected baseline data without the use of either of the two traffic speed interventions. The purpose is to quantify the magnitude of the problem of vehicles travelling through work zones at speeds faster than the posted limit.

The new sites are on two-lane main and secondary highways, as well as four-lane divided highways. The construction work involves lane restrictions (on two-lane highways) or lane reductions (on four-lane highways). The construction work takes place close to moving traffic.

The tables at right ("Sample data from 2003 test sites") show a representative sample of the data collected to date on these new test sites. In each case, a large percentage of the recorded speeds exceed the posted (reduced) speed limit.

Note: The following tables show speeds during regular working hours, 7am to 7pm.

Table 1

Highway 416 - CPR Overpass
A Comparison of the Speeds of Vehicles Approaching the Work Zone at the Start of the Work Zone

Speed Range (km/h)	Phase 1 (No PVMS) (%)	Phase 2 (Intervention #1) (%)	Phase 3 (Intervention #2) (%)	Total Traffic (%)
20 to 30	0.00	0.00	0.00	0.00
30 to 40	0.00	0.00	0.00	0.00
40 to 50	0.00	0.00	0.00	0.00
50 to 60	0.00	0.00	0.00	0.00
60 to 70	0.00	0.00	0.00	0.00
70 to 80	0.00	0.00	0.00	0.00
80 to 90	0.00	0.00	0.00	0.00
90 to 100	0.00	0.00	0.00	0.00
100 to 110	0.00	0.00	0.00	0.00
110 to 120	0.00	0.00	0.00	0.00
120 to 130	0.00	0.00	0.00	0.00
130 to 140	0.00	0.00	0.00	0.00
140 to 150	0.00	0.00	0.00	0.00
150 to 160	0.00	0.00	0.00	0.00
160 to 170	0.00	0.00	0.00	0.00
170 to 180	0.00	0.00	0.00	0.00
180 to 190	0.00	0.00	0.00	0.00
190 to 200	0.00	0.00	0.00	0.00
200 to 210	0.00	0.00	0.00	0.00
210 to 220	0.00	0.00	0.00	0.00
220 to 230	0.00	0.00	0.00	0.00
230 to 240	0.00	0.00	0.00	0.00
240 to 250	0.00	0.00	0.00	0.00
250 to 260	0.00	0.00	0.00	0.00
260 to 270	0.00	0.00	0.00	0.00
270 to 280	0.00	0.00	0.00	0.00
280 to 290	0.00	0.00	0.00	0.00
290 to 300	0.00	0.00	0.00	0.00
300 to 310	0.00	0.00	0.00	0.00
310 to 320	0.00	0.00	0.00	0.00
320 to 330	0.00	0.00	0.00	0.00
330 to 340	0.00	0.00	0.00	0.00
340 to 350	0.00	0.00	0.00	0.00
350 to 360	0.00	0.00	0.00	0.00
360 to 370	0.00	0.00	0.00	0.00
370 to 380	0.00	0.00	0.00	0.00
380 to 390	0.00	0.00	0.00	0.00
390 to 400	0.00	0.00	0.00	0.00
400 to 410	0.00	0.00	0.00	0.00
410 to 420	0.00	0.00	0.00	0.00
420 to 430	0.00	0.00	0.00	0.00
430 to 440	0.00	0.00	0.00	0.00
440 to 450	0.00	0.00	0.00	0.00
450 to 460	0.00	0.00	0.00	0.00
460 to 470	0.00	0.00	0.00	0.00
470 to 480	0.00	0.00	0.00	0.00
480 to 490	0.00	0.00	0.00	0.00
490 to 500	0.00	0.00	0.00	0.00
500 to 510	0.00	0.00	0.00	0.00
510 to 520	0.00	0.00	0.00	0.00
520 to 530	0.00	0.00	0.00	0.00
530 to 540	0.00	0.00	0.00	0.00
540 to 550	0.00	0.00	0.00	0.00
550 to 560	0.00	0.00	0.00	0.00
560 to 570	0.00	0.00	0.00	0.00
570 to 580	0.00	0.00	0.00	0.00
580 to 590	0.00	0.00	0.00	0.00
590 to 600	0.00	0.00	0.00	0.00
600 to 610	0.00	0.00	0.00	0.00
610 to 620	0.00	0.00	0.00	0.00
620 to 630	0.00	0.00	0.00	0.00
630 to 640	0.00	0.00	0.00	0.00
640 to 650	0.00	0.00	0.00	0.00
650 to 660	0.00	0.00	0.00	0.00
660 to 670	0.00	0.00	0.00	0.00
670 to 680	0.00	0.00	0.00	0.00
680 to 690	0.00	0.00	0.00	0.00
690 to 700	0.00	0.00	0.00	0.00
700 to 710	0.00	0.00	0.00	0.00
710 to 720	0.00	0.00	0.00	0.00
720 to 730	0.00	0.00	0.00	0.00
730 to 740	0.00	0.00	0.00	0.00
740 to 750	0.00	0.00	0.00	0.00
750 to 760	0.00	0.00	0.00	0.00
760 to 770	0.00	0.00	0.00	0.00
770 to 780	0.00	0.00	0.00	0.00
780 to 790	0.00	0.00	0.00	0.00
790 to 800	0.00	0.00	0.00	0.00
800 to 810	0.00	0.00	0.00	0.00
810 to 820	0.00	0.00	0.00	0.00
820 to 830	0.00	0.00	0.00	0.00
830 to 840	0.00	0.00	0.00	0.00
840 to 850	0.00	0.00	0.00	0.00
850 to 860	0.00	0.00	0.00	0.00
860 to 870	0.00	0.00	0.00	0.00
870 to 880	0.00	0.00	0.00	0.00
880 to 890	0.00	0.00	0.00	0.00
890 to 900	0.00	0.00	0.00	0.00
900 to 910	0.00	0.00	0.00	0.00
910 to 920	0.00	0.00	0.00	0.00
920 to 930	0.00	0.00	0.00	0.00
930 to 940	0.00	0.00	0.00	0.00
940 to 950	0.00	0.00	0.00	0.00
950 to 960	0.00	0.00	0.00	0.00
960 to 970	0.00	0.00	0.00	0.00
970 to 980	0.00	0.00	0.00	0.00
980 to 990	0.00	0.00	0.00	0.00
990 to 1000	0.00	0.00	0.00	0.00
Average Speed of All Vehicles	102.17 km/h	102.17 km/h	102.17 km/h	102.17 km/h
Average Speed of All Vehicles Exceeding 80 km/h	102.17 km/h	102.17 km/h	102.17 km/h	102.17 km/h

Table 2

Highway 416 - CPR Overpass
A Comparison of the Speeds of Vehicles Approaching the Work Zone at the Start of the Work Zone

Speed Range (km/h)	Phase 1 (No PVMS) (%)	Phase 2 (Intervention #1) (%)	Phase 3 (Intervention #2) (%)	Total Traffic (%)
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60 to 70	0.00	0.00	0.00	0.00
70 to 80	0.00	0.00	0.00	0.00
80 to 90	0.00	0.00	0.00	0.00
90 to 100	0.00	0.00	0.00	0.00
100 to 110	0.00	0.00	0.00	0.00
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140 to 150	0.00	0.00	0.00	0.00
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