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Revision 1

Active school warning signs – Guidelines

1 Purpose

This *Traffic note* provides guidance for road controlling authorities (RCAs) on the use of active school warning signs - that is those warning signs that have an electronic display component which becomes active when children are likely to be present on or near the roadway. It should also be read in conjunction with *Traffic note 37* 40km/h variable speed limits in school zones ⁽¹⁾. Active school warning signs should be implemented in conjunction with other complementary initiatives such as neighbourhood accessibility plans ⁽²⁾, school travel plans (see *School travel plan coordinator's guide* ⁽³⁾) or a local authority travel behaviour change strategy.

Active school zone warning signs were approved by notice in the *NZ Gazette* on 24 July 2008 and subsequently incorporated into the Land Transport Rule: Traffic Control Devices through the 2010 amendment to that rule.

2 Background

In 2004 Land Transport New Zealand (now NZ Transport Agency (NZTA)) approved a trial of active school warning signs in Timaru District and Invercargill City. This initial trial was inconclusive and in 2006 approval was given to extend the trial to sites in Dunedin City.

The Dunedin City trial aimed to assess the effectiveness of these 'active' school warning signs on driver awareness of the risk posed by school activity and any subsequent impact on road user behaviour, including the effect on vehicle speeds. The results demonstrated strong community support for the signs, reduction in speeds at 'high' speed sites and an increase in motorists' awareness of the signs.

Roads around schools are often perceived as dangerous for children due to high traffic speeds, manoeuvring vehicles, parked vehicles and other features which restrict a driver's visibility. Often there can be a mixture of pedestrians, cyclists and drivers using the same road. In particular, the risk at the beginning and end of the school day is seen as much greater than during other periods of the day and there is a need to manage and minimise this risk.

One disadvantage of any permanently displayed sign is drivers tend to ignore it or fail to see it, particularly if they pass the same sign regularly without requiring any action in response to it. Active signs incorporate flashing lights and/or lit (LED) components which are displayed only when relevant. Introduction of these types of signs may heighten the visibility of these signs compared with standard (non-flashing) warning signs thereby enhancing driver awareness of the risk.

Internationally, flashing lights have been used to give additional emphasis to the warning or instruction given on a sign. In New Zealand the use of these lights has been restricted to variable message signs including those installed on Auckland and Wellington motorways, some roadwork vehicles, variable speed limits in school zones and advance warning of traffic signals. In many situations however, the cost of a full variable message sign cannot be justified.

For this reason the trial of less costly warning signs (rectangular in shape with two yellow orange flashing lights and yellow/green children symbols on a black background) was conducted. The *Dunedin active school warning signs trial: evaluation report*⁽⁴⁾ (the Evaluation report) prepared by Dunedin City Council provides details and sets out the results of the Dunedin City trial. The trial results are embodied within this note.

3 Objectives of active school warning signs in school zones

Active school warning signs on roads near schools are intended to meet the following objectives:

- provide a safer environment outside schools during times of peak school activity
- reinforce driver expectation of the likely presence of children
- reinforce driver awareness of a school where the visibility of the school or its entrance is limited
- encourage active modes of travel (walking and cycling) to school.

School zones are parts of roads near schools which include both:

- (a) the length of roadside used for short-term parking, bus stops, crossing facilities and school entrances etc before and after the hours when the school is in session (called the 'hazard area'), and
- (b) the distance from the warning sign to the hazard area in each direction (which depends of the speed of approaching traffic).

The Dunedin trial attempted to assess whether these types of signs had any effect on increasing driver awareness to school activity on or near the road, including reducing driver reaction time and vehicle stopping distances and speeds. The trial included schools where the average vehicle speed was higher than 45km/h as well as schools located adjacent to congested urban roads. Three types of evaluation measures were used to assess the effect of these signs - vehicle speed surveys, driver awareness and pedestrian delay surveys.

Feedback from the schools has indicated the objective to increase active modes of travel to school has not happened to date. Achieving this objective will most likely require a package of activities.

4 Complementary school travel initiatives

Active school warning signs should be implemented as part of a package including engineering, education and enforcement to reduce speeds and the risk to children around schools.

The active school warning signs could be installed as a component of the following complementary initiatives.

4.1 Neighbourhood accessibility planning

Neighbourhood accessibility plans seek to ensure, at the neighbourhood level, the provision of safe and sustainable transport modes focusing on active and shared modes. Further information can be found on the NZTA website at:

<http://www.nzta.govt.nz/resources/neighbourhood-accessibility-plans/index.html>

4.2 School travel plans

The preparation and implementation of a school travel plan is a process of developing a package of measures to encourage the choice of safe and sustainable transport options for travel to and from school. Further information can be found on the NZTA website at:

<http://www.nzta.govt.nz/resources/school-travel-plan-coordinators-guide/docs/school-travel-plan.pdf>

The NZTA education website will also provide useful resources. This can be found at:

<http://www.education.nzta.govt.nz/home>

4.3 Integrated planning

There is not necessarily a single best option for providing safety for children travelling to and from school. The NZTA's *Integrated planning toolkit* presents a wide range of transport and land use relevant tools, processes and concepts. It encourages linkages and enables the identification of ideas that may not be familiar to the user. The toolkit can be found at:

<http://www.nzta.govt.nz/planning/process/trial-ip-toolkit/>

5 Selection criteria

5.1 Selecting sites and appropriate traffic control devices

Figure 1, based on *Traffic note 37* and the Evaluation report, is a flow chart of recommended selection criteria for the use of traffic control devices at school sites.

In urban areas there are several sign variations that can be used depending on the type of environment, including school activity, crash history and speed profile.

In rural areas, the selection of a suitable sign type can be more limited. The 40km/h variable speed limit is generally not regarded as appropriate in most open road speed areas (that is, where speed limits are greater than 80km/h). However, in these areas active warning signs could be suitable to encourage slower speeds during periods when children are present.

5.2 Area and site-specific treatments

Active school warning signs have the potential to cover an area incorporating a number of schools in addition to a specific school site. Where there are schools in close proximity and where school times vary, RCAs may choose to select an area-wide or route treatment for schools rather than undertake individual school site improvements. In such instances, it may be more appropriate to use active school warning signs rather than 40km/h variable speed limit signs which are more specific to individual schools. If this is the case, it is recommended the RCA plan a sign regime (including times of operation for active signs) for the area covering the different school locations and develop safer routes for children to travel. Further information on this can be obtained from the Evaluation report, neighbourhood accessibility plans and the NZTA website.

5.3 *Prioritising sites*

Once the type of traffic control device has been identified, its appropriateness and clarity within the surrounding environment and proximity to other schools and message systems determined, the site, area or route should be prioritised for implementation. This prioritisation process is managed through local policy based on factors such as traffic volumes, school roll number, ages of school pupils, crash data and speed of through traffic. Further information, including a suggested rating system for finding suitable sites and then prioritising each one, can be found within the Evaluation report.

5.4 *Other signs*

The possible use of active school warning signs must be considered in conjunction with other existing or proposed signs in that area (for example a pedestrian crossing sign). Their use in conjunction with, or within close proximity to, other variable or flashing signs (such as a 40km/h variable speed limit sign) needs to be carefully considered to ensure the intended (combined) message to drivers is consistent and will not be confusing or ineffective.

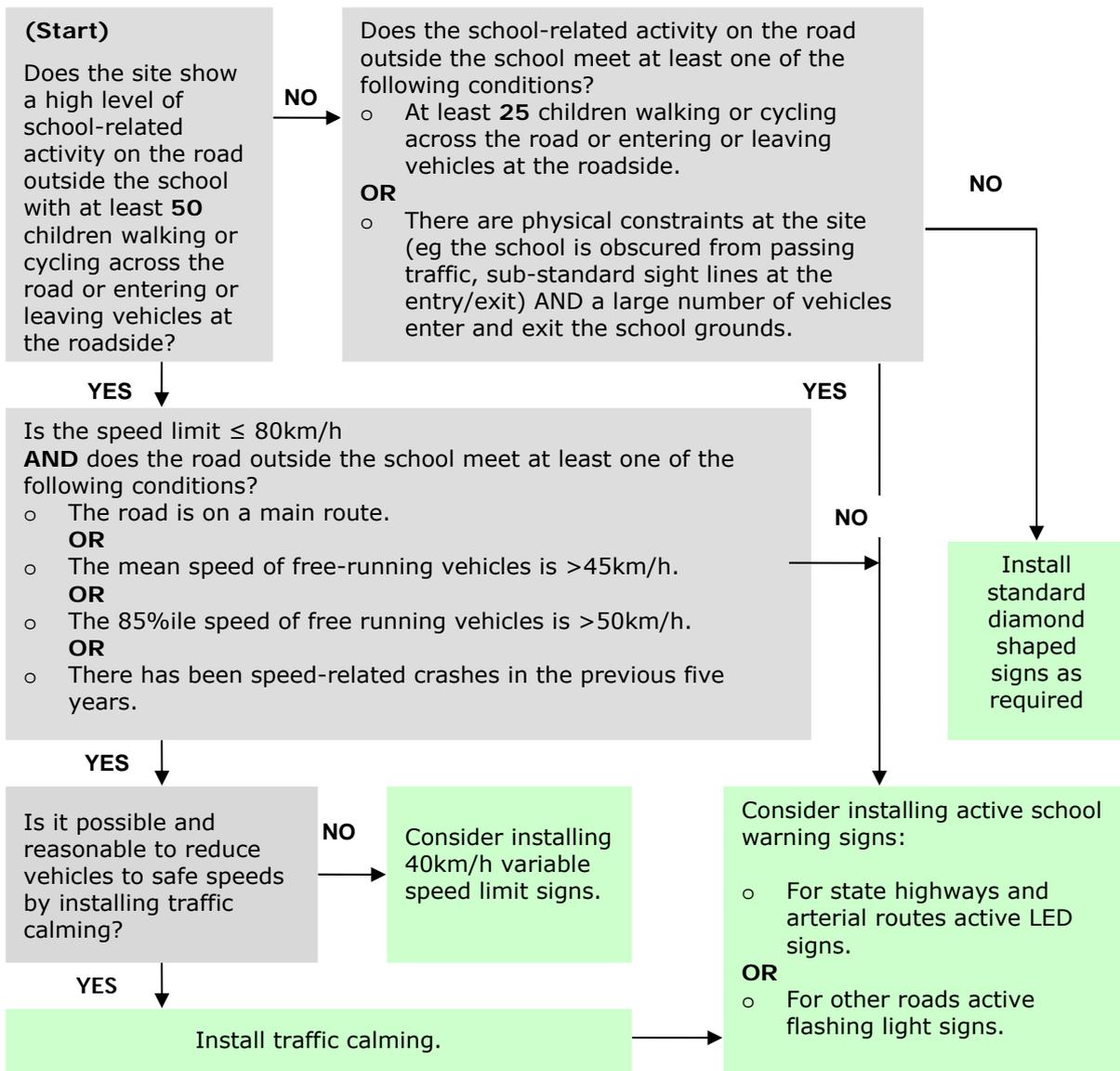


Figure 1: Selection criteria for the appropriate use of traffic control devices near schools

6 Best practice guidelines

Factors required for the successful operation of an active school warning sign are:

- coinciding times of operation with on-road school related activity (see section 6.4)
- good visibility of the signs by motorists
- long-term commitment to their correct use.

6.1 Signs – general principles

Standard reflective diamond shape school warning signs should be installed on all roads where there is an entrance to a school (unless they are replaced by active school warning signs as set out below). The standard sign is depicted in figure 2. Other signs may be used in these locations such as 'school pedestrian crossing' or 'school bus route'.

Active school warning signs should be installed in place of the standard sign where additional awareness of children is considered necessary in and around schools in areas and sites meeting the criteria set out in figure 1



Figure 2: Standard school warning sign

6.2 Active school warning signs

The type of school warning signs used to indicate a school zone should be prioritised by risk using the selection criteria shown at figure 1. Where the RCA determines an active sign is appropriate there are two versions of sign – flashing light and full LED displays.

6.2.1 'Children' symbol and 'school zone' with backing board with two flashing lights (active –flashing light type)

The 'children' symbol and the words 'school zone' depicted in figure 3 are reflectorised, fluorescent yellow-green in colour while the sign has a plain black, unlit background. There are two orange flashing lights located on the top of the sign at each side which light alternately when in use. Outside school hours the board shows the 'children' symbol and the words 'school zone'.

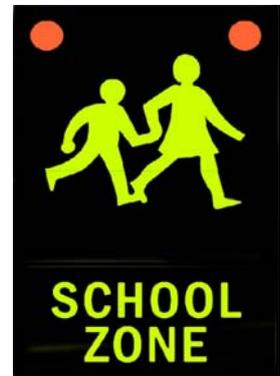


Figure 3: Active – flashing light school warning sign

6.2.2 'Children' symbol and 'school zone' with full LED display (active LED type)

When activated, the 'children' symbol and the words 'school zone' depicted in figure 4 are displayed using light emitting diodes (LEDs) on a black unlit background. Two orange flashing lights (which may be LED) are located in the top left and right corner of the sign. When the sign is activated the two lights are not illuminated unless the RCA has set an appropriate condition which would trigger them to be illuminated. This condition could be that an approaching vehicle is detected (by a radar unit mounted in or beside the sign) exceeding a pre-set speed. The orange lights will then flash alternately for a short period until the vehicle has passed the sign. Such a pre-set speed will depend on the speed limit and the circumstances relating to a particular school.



Figure 4: Active – LED school warning sign

When the symbol and text LEDs are turned off this sign displays a black rectangular panel.

Where the selection criteria (figure 1) suggests the use of an active sign could be appropriate the RCA can consider either option. The 'active – LED' sign may be considered over the 'active – flashing light' sign if the RCA determines the risk is higher. This may be based on traffic volumes, road hierarchy and whether they are part of a set of signs in an area treatment or are site-specific. For example, if an RCA is developing an area treatment, the 'active – LED' signs may be placed on the highest risk road (that is the one with higher vehicle and pedestrian volumes) while the 'active – flashing light' signs might be located on roads with lower risk sites.

For both of the above signs the orange lights must be of sufficient brightness to draw attention to, but not distract from, the sign or dazzle drivers. They must operate by flashing alternatively at a rate of 1 hertz.

Further technical and operational information for these signs is provided in appendix A.

6.2.3 40km/h variable school zone speed limits (see Traffic note 37)

If active school warning signs are proposed near other variable message signs (such as 40km/h variable speed limit signs depicted in figure 5) a careful evaluation of all relevant factors (and options) needs to be undertaken. This is important to avoid the signs' messages being confused or their effectiveness being compromised.



Figure 5: Variable 40km/h speed limit sign

6.2.4 Different (permanent) speed limits near school

If the school is located near roads with different (permanent) speed limits, then a careful evaluation of all the children's routes and options for improvement should be undertaken so that the cost of each option can be established. If a 40km/h variable speed limit is placed over roads with more than one underlying "permanent" speed limit, then (in addition to the 40km/h variable signs) special variable speed limit signs will be needed where the 'permanent' speed limits change. These special signs will be blank when the 40km/h speed limit signs are on but they need to show the 'permanent' speed limit at all other times. Most 40km/h variable speed limits are located on main traffic routes. If the annual average traffic flow on the road is more than 500 vehicles per day, then these signs indicating a change of permanent speed limit must be installed on both the left hand side and on the right hand side (or on a solid median) [see clause 8.1(2)(a) of the Land Transport Rule: Setting of Speed Limits 2003]. If this is the case, then four of these special signs will be needed, possibly placed back to back.

6.2.5 Children on or near the roadway

Both standard diamond shape and active school warning signs could be considered where the RCA considers there are likely to be school children on or near the roadway. Special consideration should be given where children often congregate near a school on sections of road without footpaths or where children gather at a recreation reserve abutting a road which has a speed limit higher than 50km/h. RCAs should also investigate the provision of adequate footpaths and other pedestrian or cyclist facilities in these cases.

6.3 Layout of signs

The active school warning signs should be positioned as illustrated in figure 6.

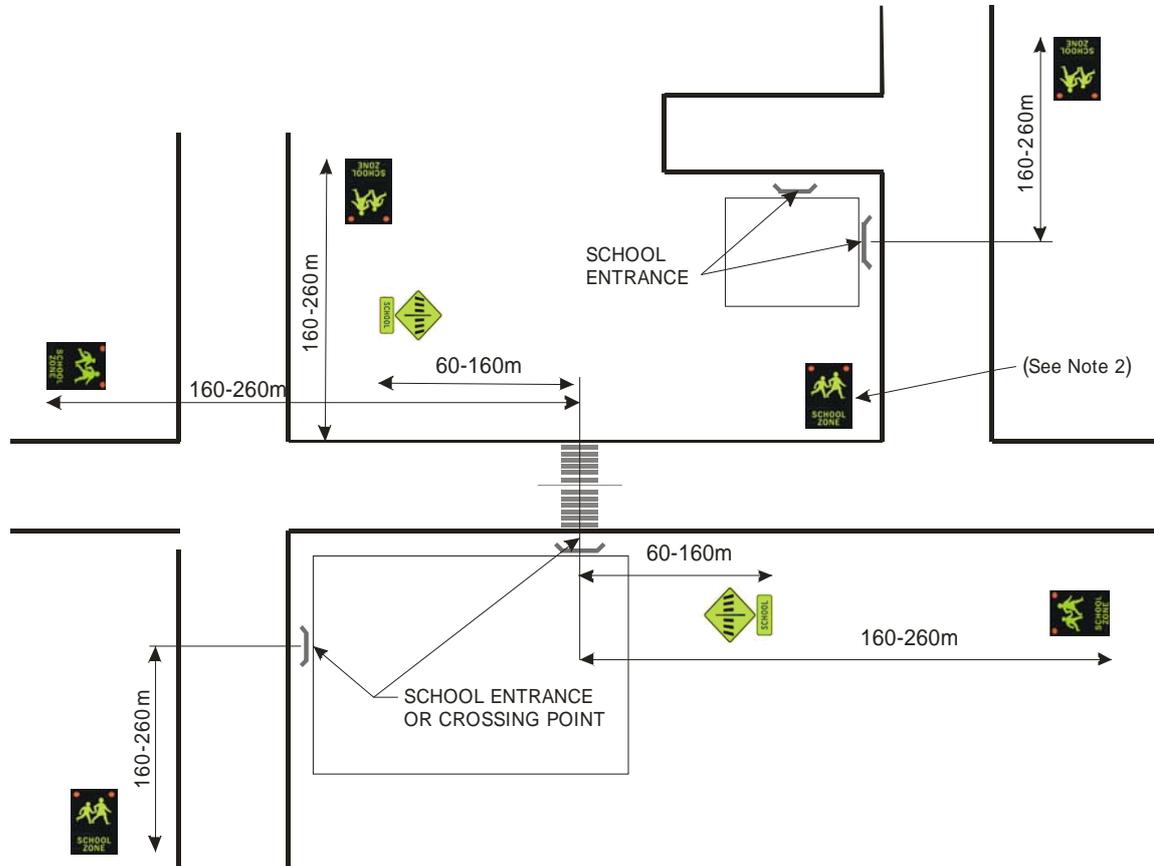


Figure 6: Example of a road and area layout for the use of active warning signs

Note 1: If a formal pedestrian crossing is present (ie a zebra crossing) then a diamond shaped pedestrian crossing warning sign must be installed in addition to the active warning sign. Active warning signs can be installed within 160m-260m from the school entrance or informal crossing point, to give a school zone length of 320 to 520 metres. The length of the school zone will be the sum of:

- the length of roadside used for short term parking, bus stops, crossing facilities and school entrances etc before and after the hours when the school is in session (called the 'hazard area'), and
- the warning sign approach distance from each direction (which depends of the speed of approaching traffic). For higher speeds, the warning sign needs to be located further in advance of the hazard area (see appendix A). If there is a cluster of schools then the school zone could be longer than 520 metres.

Note 2: Where a second school is located on a side road close to the main road junction and is reasonably obvious to drivers who turn from the main road then this active warning sign may not be necessary and could be replaced by a standard diamond shaped reflective sign.

6.4 Times of operation

As previously stated, where signs are used continuously to highlight a particular activity occurring only during short periods of the day, drivers become accustomed to their presence and may not adapt their driving during times of high risk. With this principle in mind, and supported by information provided within the Evaluation report and *Traffic note 37*, it is recommended that the times of operation for active school warning should be as follows:

- Before and after school:
 - 35 minutes before the start of school until the start of school
 - 20 minutes at the end of school, beginning no earlier than 5 minutes before the end of school.
- During times when school activities may create additional risk to children (eg early finish times, school functions) the signs should be active for at least 10 minutes and normally not more than 30 minutes.

Times of operation must be agreed between the school and RCA.

6.5 School commitment and activity

It is essential schools are formally involved in the decision to introduce active warning signs. For these signs to be effective and remain so they must only be switched on when activity relating to the school is occurring on or alongside the road to highlight risk and to achieve the desired outcomes.

Conditions of operation of the active signs should be agreed between the school and RCA and should include the following requirements:

- The signs must only be activated by a person authorised by the school principal.
- The signs must not be used at times of day where there are no children present.

7 Acknowledgements

Dunedin City Council has developed additional notes on the trial and evaluation of active school warning signs, including detailed information on prioritising sites for their use, and technical information on their installation. Road controlling authorities and other parties interested in these types of signs are welcome to approach them seeking a copy of this information.

The NZTA acknowledges the valuable input of Dunedin City Council, Timaru District Council, Invercargill City Council, Auckland City Council and the former Transit New Zealand with regards to both the information supplied and the review of these guidelines.

References

1. NZTA/Land Transport New Zealand, *Traffic Note 37, 40km/h variable speed limits in school zones – guidelines*.
2. Dunedin City Council *Dunedin active school warning signs trial: Evaluation report*, October 2007.

Appendix A: Technical and installation information on active school signs

A Locations of signs in relation to the school activity

The active warning signs can be used in addition to permanent 'pedestrian crossing' signs or in place of 'school children' signs. Where a formal pedestrian (zebra) crossing is marked the diamond shaped 'pedestrian crossing' sign must still be placed in its normal position in advance of the crossing. (See figure 2 in section 6.3.)

A school warning sign (either the standard diamond shape reflective or one of the active types) should be located where approaching drivers have an uninterrupted view of it over a distance of at least 120m in rural areas and at least 60m in urban areas. The sign should be erected in advance of the hazard area (which can include the pedestrian crossing point, school entrances, bus stops, and short term roadside 'drop off and pick up' parking) by not less than the distance shown in the following table:

Operating speed	Distance
50km/h	65m
60km/h	80m
70km/h	100m
80km/h	120m
90km/h	140m
100km/h	160m

Where there are several schools in close proximity an area treatment may be more suitable. Specific details on sign placement may be at the discretion of the RCA and can be prioritised with respect to risk and criteria as outlined in section 5.

B Sign specifications

Active – flashing light (with reflective symbol and text)

(minimum size as specified for sign W19-2.2 (with symbol W16-4 'children'))

Shape and size:	rectangle 700 x 900mm
Background:	black
Symbol:	children - 600mm wide x 480mm high retroreflective, fluorescent yellow-green
Text:	'SCHOOL ZONE' 100mm high/14mm stroke width retroreflective, fluorescent yellow-green



Figure A1: Active – flashing light

Note: The size of sign used in the trials in Dunedin, Timaru and Invercargill was larger (900mm wide x 1200mm high) and this size can be used in 50km/h areas if considered appropriate. Larger sizes may be used, particularly where the speed limit is above 50km/h or there is a wide or divided carriageway.

Active – LED (light emitting diodes)

Shape and size:	rectangle 700 mm wide x 1000 mm high
Background:	black
Symbol:	children - 600mm wide x 480mm high yellow LED
Legend:	'SCHOOL ZONE' yellow LED, letters 160mm high/25mm wide



Figure A2 Active - LED

Note: This is the minimum size as specified in the Gazette notice. Larger sizes may be used, particularly where the speed limit is above 50km/h or there is a wide or divided carriageway.

C Flashing light specifications

The lights should:

- be placed in the top left and right hand corners of the sign
- be coloured orange
- be at least 60 square centimetres each in area
- be set to flash alternately at a rate of 1 hertz, and
- have cowls installed if sun strike is likely to be an issue.

There may be a need to have an indicator light that can be seen from the rear of the sign from the school or crossing point to indicate when the lights are operating.

D Power supply

Options to be considered for supplying power to the active sign units include:

- solar power (which worked well within the trial process) and is generally most suitable for rural areas)
- linking the battery for the sign to an adjacent street light
- run the signs by cable from the school's power supply.

E Installation of the signs

Signs can be attached to power poles so the units have a solid base. Where new support structures have to be erected they should be at least 100mm diameter with a foundation design that will prevent twisting yet remain frangible.

They should be mounted high enough to provide a suitable clearance above the footpath or ground so they are less likely to be tampered with. MOTSAM recommends a clearance of 2.5 metres above footpaths. However if the support pole is located close to the kerb where large vehicles (such as buses) are likely to stop, then a higher mounting height of 4.4 metres or more may be needed so that the sign is not damaged by high vehicles.

Signs should be placed so the driver's view of them is not obscured by vegetation. If necessary, trees located near the roadway should be pruned regularly to maintain the effectiveness of these signs.

At some sites where there is a special need to highlight the presence of the school to drivers, a duplicate active school zone warning sign can be placed on the right hand side of the road or on a solid median.

F Activation of the lights and LED displays

There are different types of activation systems depending on the sign type and operation. These include:

- automatic activation by wireless control. An antenna is placed on the outside of the school building and connected to the control box. Ideally there should be a direct line of sight from the antenna to the receivers (located on the signs) - while this is more effective, it may not be essential. However, at some sites there could be difficulty obtaining reception for the units and care will be needed to place them so this can be achieved. Checks should be made for possible interference from other nearby electronic equipment
- manual activation by hand held remote control units
- activation from a control box by wired connection direct to the signs.

The control box or activation unit should be located at a secure place within the school grounds where only authorised personnel can have access to it.

G Programming systems

If a programming system is used, it needs to allow for any variations to normal school operating hours including holidays and events that may be held at the school outside normal hours. The activation units need to be programmed to allow information to be entered into the system for set school activity times, holidays and daylight saving time changes together with a manual override system to allow for one-off special events.

The times when the signs operate should coincide with the school activity times as agreed in writing by the school and RCA.

A time-out facility should be installed so that the signs automatically switch off after a maximum time (possibly 1 hour for normal use and possibly 30 minutes for one-off events) if the unit has not been manually switched off.

The programming system can be completed by installation of specific software. Further information can be obtained from Dunedin City Council or the sign supplier.

H Maintenance

It is essential that regular checks are made to ensure the active device is working correctly. The RCA needs to ensure that appropriate inspection and maintenance systems are in place as part of its agreement with those authorised to operate the system. The respective maintenance responsibilities of the RCA and the school should be clearly set out in this written agreement.