

## ROAD SAFETY AUDIT FOR SCHOOL AREAS

Barbara Stolte Bezerra  
Antonio Clóvis Pinto Ferraz  
Departamento de Transporte  
Escola de Engenharia de São Carlos  
Av. Trabalhador Sãocharlense, 400  
São Carlos- SP Cep 13560-290  
e-mail: barbarabezerra@hotmail.com

### ABSTRACT

This paper shows a simple methodology to implement road safety audit for school areas, which already exist. Road safety audit is being used since 1980's in Great Britain, and now is become more popular around the world. The intention is show how simple could be an audit and the benefits that could bring to society. The principals steps are compose by the technician approach and the study of the neighborhood, which gives the basis to the diagnose elaboration. The technician approach involves their background and experience, and an efficient knowledge of the site by it details (physical and in different periods of day).

Moreover, the technician needs to obtain maximum information about characteristics from the road, school, drivers, parents and students. Contact with the director of school is important, because is the person who better know the problem, and could give a good clue how to solve it. Site visits are the most important steps for diagnose existing problems. Elaboration of sketch contains all physical and operation elements, to show the real situation, it will help to detection of hazard locations. This article presents two checklists, the first one could be used to check the proper design of the school areas, and the second one is used to check the condition of intersections near to school, and could be used as supplementary analysis to the first checklist.

## 1. METHODOLOGY

For diagnose of road safety in school areas is necessary to follow some technical procedures, to allowed the correct identification of the existent problems e its causes. The principals steps are compose by the technician approach and the study of the neighborhood, which gives the basis to the diagnose elaboration as shown in the Figure 1.

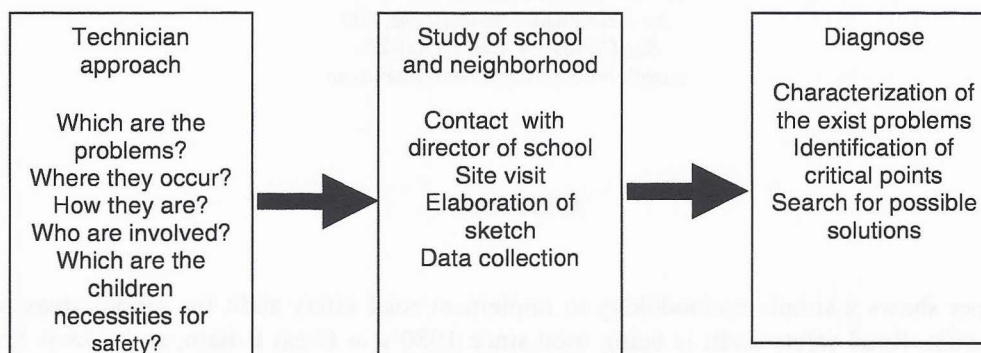


Figure 1: Steps for diagnose road safety problems in school areas

The technician approach involves their background and experience, and an efficient knowledge of the site by it details (physical and in different periods of day). Moreover, the technician needs to obtain maximum information about characteristics from the road, school, drivers, parents and students.

Contact with the director of school is important, because is the person who better know the problem, and could give a good clue how to solve the problem. The main information to be obtained on the school is the followings:

- Time of entrance and exit for students by grade
- Amount and characteristics of students
- Gates used in the access
- Main problems identifies relatives to students safety
- Solutions discuss by the school community
- Prior solutions and their results
- Available personal assistance for a possible diary operation for help student crossing
- Operation system for load/unload for parents that bring and take the children
- Internal parking for bicycle
- School transport

Site visits are the most important steps for diagnose existent problems. The procedures below are helpful for searching information:

- Road map of region: provide map from region (with streets), aerial photos, etc.
- Inspections: do many as possible, in different days
- Be a "child" to analysis the crossing – it is important to see yourself with 1.20 m.
- To observe the existent crossings

- Take pictures or film the site if is possible
- To check all crossings on the way to school, several times the critical points are not close to school, hence is important to know the principal paths to school and analysis them in a safety viewpoint
- Locate the gates: verify if where the gates are placed are the best to protect the children from the conflicts with vehicles, or if exist the possibility of change them to points more protect from the principal road
- Finding the detail of previous accidents: Where they occur? How they happen? What time? It was raining? Similar accidents? Which place happen more accidents?
- Interference in traffic performance: verify lost of fluidity in the periods of departure caused by parking maneuvers or agglomeration of children on the roadside.
- Amount of cyclists and conditions of routes
- Bus stop location: visibility and crossing conditions
- Illumination at night
- Another pole generator of traffic (shops, medical center, etc.)

Elaboration of sketch contains all physical and operation elements, to show the real situation, and should contain the following elements:

- Sketch of road system
- Localization of school
- Localization of the gates used to student access
- Road geometry, sidewalks, center islands, etc.
- Width of road and sidewalks
- Indication of slope and steep hill
- Area of influence of school in the road system
- Signs – vertical, horizontal and traffic signals and the conservation state
- Traffic signals timing
- Neighborhood profile
- Verify the conditions of the sidewalk
- Visibility conditions – obstacles: trees, parking, etc.
- Verify the main paths for pedestrians and cyclists and conflict points with vehicles
- Location of crossing points
- Bus stop location
- Black spots
- Count of vehicles and pedestrians

## 2. CHECKLIST

The following two checklists are the result obtained in this research. They could be used to check the proper design of the school areas and intersections. The intention is provide a simple checklist, feasible and reliable, making possible the implementation of road safety audit by the city hall traffic staff. A complex checklist is not recommended in incipient steps on road safety audit. First is necessary to show what is and what are the benefits to society. In this way making road safety audit more and more popular in Brazilian cities.



## CHECKLIST FOR SCHOOL AREAS

Aspects	Questions to be answered
School location	The school is located in potential hazard position? There is necessity to cross streets with high volume of vehicles?
Land Use	What is the main activity? Interfere in school? How?
Gates	The gates are located in a proper place for a safety crossing?
Lane Width	Is too extent? Is possible to cross in one step?
Street Circulation	Two way? Could be change for one way?
Traffic volume	Is high? How much? What kind of vehicles?
Sidewalk and central island	They are adequate? They have enough space to accommodate pedestrians with safety? Do crosswalks exist in area? If so, what is their condition?
Crossing facilities	Gaps to crossing enough? Does approaching traffic adhere to pedestrian rules at Crosswalks or are further traffic control measures necessary? (Crossing guard, pedestrian corridors, etc.)
Traffic Calming	Are traffic-calming measures effective at reducing vehicle speeds? Is traffic calming required?
Sidewalks Physical condition of sidewalk.	Is sidewalk width adequate for pedestrian volumes? Do objects exist on or near sidewalk that cause pedestrians to use street (i.e. canopies, patios, advertisement signs, etc.)?
Signs	Is posted speed limit appropriate for neighborhood activities? Is speed limit effective at controlling traffic speed? Is existing signage sufficient at notifying motorists of upcoming activities, or is some other traffic control device necessary? Visibility of signage from approaching traffic adequate?
Sight Distance	Any obstructions that could interfere with sight distance along route. Determine if adequate stopping
Visibility	Visibility of school and recreational areas by approaching traffic.  Does on-street parking exist near school? If so, will Visibility of children be obstructed by parked vehicles?
Glare	Severity of headlight glare during nighttime operations. Do areas exist along a road or at an intersection where sunlight reduces visibility?
Readability by Drivers	Check for sections of roadway having potential for confusion -alignment problems -old pavement markings not properly removed -streetlight/tree lines don't follow road alignment

## CHECKLIST FOR SCHOOL AREAS

## CHECKLIST FOR INTERSECTIONS

Aspects	Questions to be answered
Type	Are types of intersections selected appropriate for current and future traffic volumes as it relate to safety? Can intersection designs accommodate all design vehicle Classifications?
Visibility / Conspicuity on Approach	Does the horizontal and vertical alignment provide adequate visibility of the intersection? Do buildings, trees, etc. obstruct sight lines to the intersection?
Layout	Is layout of the intersection appropriate for the road function? Are the lane widths adequate for all vehicle classes? Are there any upstream and downstream features, which may affect safety? (i.e., "visual clutter", angle parking, high volume driveways) Junctions and access adequate for all vehicle movements?
Maneuvers	Are vehicle maneuvers obvious to all users? Are there any potential conflicts in movements? Do certain traffic movements need to be Prohibited/discouraged by using one-way streets, cul-de-sacs, chokers or medians?
Canalization	Are canalization features effective? Any areas of uncontrolled pavement that may require canalization features?
Auxiliary Lanes	Are they of appropriate length? Is decision sight distance for entering/leaving vehicles adequate? Are tapers installed where needed? Are they correctly aligned?
Islands	Presence of visual clutter on island affecting sight distance? Is an island required to channel vehicle traffic at the current location? Are the dimensions of the island adequate for the intersection (width, length, and turning radius)?
Sight Distance at Intersections	Is all sight distances adequate for all movements and road users? Are sight lines obstructed by signs, bridge abutments, buildings, or landscaping? Could parked vehicles temporarily obstruct sight lines, snow storage, seasonal foliage, etc.?
Marking sings	Are pavement markings clearly visible in day and night time conditions? Check retro-reflectivity of markings. Are all necessary pavement mark
Signs	Check visibility and readability of signs to approaching users. Check location and noise induced by signs. Check for any missing/redundant/broken signs. Is adequate warning provided for signals not visible from an appropriate sight distance?
Signals	Have high intensity signals/target boards/shields been provided where sunset and sunrise may be a problem? Check location and number of signals. Are signals visible? Are primary and secondary signal heads properly placed?
Signal Phasing	Are minimal green and clearance phases provided? Is a dedicated left turn signal required? Is the signal-phasing plan consistent with adjacent intersections?

## CHECKLIST FOR INTERSECTIONS



### 3. CONCLUSIONS

These checklists were used in a study of case involving six schools, where they showed to be feasible and easy to handle. These checklists were made for school that already exists, and further considerations need to be made for design future schools, specially pick up and drop off zones. Is very common in Brazil that old houses are transformed in schools, without studies of traffic engineering, impact on traffic and safety crossing to children. In this way introduction of simple checklists, with some concept about safety principles, it could be a guidance to a gradually change in behavior towards road safety design and operation.

### REFERENCES

Austroads (2002). **Road Safety Audits**, AU.  
\_\_\_\_\_(1994). **Road Safety Audits**, AU.

Conaset (2003). **Guia para Realizar una Auditoria de Seguridad Vial**, Chile.

Road Directorate (1997). **Manual of Road Safety Audit**. Ministry of Transport, Denmark.

UNB (1999). **Road Safety Audit Guidelines**. University of New Brunswick. Transportation Group. Department of Civil Engineering. Fredericton, New Brunswick, Canada.