



Republic of Uganda
MINISTRY OF WORKS AND TRANSPORT

A GUIDE FOR ESTABLISHMENT OF SAFE SCHOOL ZONES FOR UGANDA



May 2025



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Foreword



I am honoured to introduce the **“Guide for Establishment of Safe School Zones in Uganda.”** This is a comprehensive document that serves as a critical resource in our collective efforts to enhance road safety, particularly around school zones, where the vulnerability of school-going children necessitates our immediate attention and action.

Road safety is a public health concern in Uganda, with over 13 lives lost daily due to road crashes. This alarming statistic underscores the urgent need to prioritize the implementation of measures aimed at reducing these preventable tragedies. By focusing on school zones, we aim to create safer environments for our children, enabling them to travel to and from school with confidence and peace of mind.

The **“Guide for Establishment of Safe School Zones in Uganda.”** supports the establishment of Safe School Zones (SSZS) which is aligned with national policies and laws such as the Non- Motorised Transport Policy and the Traffic and Road Safety Act. This comprehensive guide outlines best practices in infrastructure development, traffic planning, and safety measures tailored specifically to school zones. Furthermore, it emphasizes the importance of education, awareness, and community engagement in promoting road safety, encouraging collaboration with existing frameworks such as Parish Development Committees, School Management Committees, and Road Safety Committees.

Improving safety on our roads is important for us to achieve the sustainable development goals and the fight against poverty.

I encourage all stakeholders, including government agencies, schools, communities, civil society organizations, and the private sector, to embrace this guide as a vital tool in our shared responsibility to protect school children and create safer road environments around school zones. Through a multi-sectoral approach and continuous evaluation, we can significantly reduce the risks faced by our children and make meaningful strides toward Uganda’s National Road Safety Action Plan target of reducing road traffic deaths and injuries by 50% by 2030.

I wish to express my heartfelt appreciation to all stakeholders who contributed to the development of this guide for establishment of safe school zones in Uganda for their continued support in ensuring safer road environment around school zones geared towards protecting our school going children.

Together, we can ensure that school zones in Uganda become safer spaces for our children, empowering them to grow, learn, and thrive in an environment free from the fear of road crashes.

I look forward to a successful implementation of these guidelines for the safety of our children and pedestrians around school zones.

A handwritten signature in black ink, appearing to be 'Edward Katumba - Wamala, Gen.', with a long horizontal line extending to the right.

Edward Katumba - Wamala. Gen.
MINISTER OF WORKS AND TRANSPORT

Acknowledgements



This guide was developed with the support of Safe Transport and Survivors Support Uganda (STASSU), formerly known as Hope for Victims of Road Traffic Accidents (HOVITA) with technical and financial assistance from Global Health Advocacy Incubator (GHAI) and the Global Road Safety Partnership (GRSP) respectively.

The technical working group consisted of Ministry of Works and Transport (MoWT), Ministry of Public Service (MoPS), Ministry of Education and Sports (MoES), Ministry of Gender Labour and Social Development (MGLSD), Ministry of Local Government (MoLG), World Resource Institute (WRI -Africa), Global Health Advocacy Incubator (GHAI), Safe Transport and Survivors Support Uganda (STASSU) formerly Hope for Victims of Road Traffic Accidents (HOVITA). These entities were selected based on their role and expertise in ensuring safety of school going children.

Special appreciation goes to Eng Robinah Nampeera and Eng. David Adibako, technical assistance from Dr. Emmerentian Mbabazi (WRI -Africa), James Katunguka Kiribata, Rutaraka Julius, Edward Kizito, Judith Natukunda Karara (MoWT), Christine Namara (MoLG), Akurut Judith (MoES-Education Standards Agency), Michael Tengeka (MGLSD), Peter Kirunda (MoPS), Jackie Okao (In-Country Coordinator -GHAI), Eng. Tony Mugenyi and his team from the Directorate of Engineering (MoWT), and Commissioner Katushabe Winstone (MoWT) for his leadership and coordination role in the successful completion of this guide.

I further thank the individuals who were consulted during the validation workshop and David Norman Watako, the consultant for his global reviews on road traffic safety and the successful establishment of the Safe School Zones study report.

I am delighted that stakeholders will find this guide as the cornerstone for infrastructure planning, design, construction and maintenance in safe school zones across the country.

I am optimistic that with the guide for establishment of safe school zones in Uganda, the advocacy and allocation of resources towards a functional safe school zones in Uganda will be a reality.



Bageya Waiswa
PERMANENT SECRETARY

Executive Summary

The “Guide for Safe School Zone Infrastructure” is a comprehensive document developed to address the critical issue of road safety around school zones in Uganda. The guide aims to mitigate the high incidence of road traffic crashes involving school children by providing detailed guidelines for planning, designing, and implementing safe school zones. This initiative aligns with Uganda’s National Road Safety Action Plan, which targets a 25% reduction in road traffic deaths and injuries by 2026.

Road safety in Uganda is a significant public health concern, with over 13 lives lost daily due to road crashes. The vulnerability of school-going children to road traffic injuries necessitates targeted interventions. The guide supports the establishment of Safe School Zones (SSZs) to protect students and other road users, aligning with national policies such as the Non-Motorised Transport Policy and the Traffic and Road Safety Act.

This guide provides an overview of required road infrastructure elements and regulatory measures for establishing safe school zones in Uganda. Its objectives include: serving as a detailed reference for planners and decision-makers; compiling regulatory measures and infrastructure elements for safe school zones; describing road infrastructure components schools should have; supporting stakeholders in engaging with safe school zone topics; and outlining basic principles for school zone planning and design in alignment with Uganda’s current legal and regulatory framework.

The guide’s key components include an overview of road safety in school zones, identifying risk factors such as vehicle speed, shared lanes, visibility of children, and road safety awareness. It defines school zones and safe school zones with specific criteria for urban, rural, and high-volume roads. Basic principles in school planning and designing ensure a suitable school service radius, land availability, effective implementation of road safety measures, connectivity with public transport, and logical in-school traffic management.

Designing safe traffic infrastructure involves prioritizing students’ travel needs, aligning with regulations, and maximizing infrastructure efficiency. Steps for designing new and upgrading existing school zones include safety audits and re-assessments. The guide also specifies designs for road signs such as “Children in the Road,” speed limits, pedestrian crossings, bus stops, and parking lot signs, along with performance specifications for sign plates, including materials, dimensions, and reflectivity.

Other basic infrastructure components covered include roadway design, parking locations, traffic signals, pedestrian refuge islands, bicycle lanes, and sidewalks. Smart traffic management solutions like changeable message signs and smart traffic signals have also been introduced. Road safety assessments involve methods for road safety audits, inspections, and iRAP Star Rating for Schools (SR4S), emphasizing the importance of pre- and post-construction assessments to ensure the effectiveness of safety interventions.

Education, awareness, and community engagement are highlighted as essential elements in promoting road safety. The guide encourages collaboration with existing frameworks like parish development committees, school management committees, and road safety committees.

In conclusion, the “Guide for Safe School Zone Infrastructure” is a vital tool for enhancing the safety of school zones in Uganda. By following the comprehensive guidelines provided, stakeholders can significantly reduce the risks faced by school children and create safer road environments. The guide underscores the importance of a multi-sectoral approach involving government agencies, schools, communities, and civil society organizations in its implementation and ongoing evaluation.

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Acronyms

1. **CSOs** - Civil Society Organisations
2. **DTRS** - Directorate of Traffic and Road Safety
3. **GHAI** - Global Health Advocacy Incubator
4. **GRSP** - Global Road Safety Partnership
5. **HOVITA**- Hope for Victims Of Traffic Crashes
6. **iRAP** - International Road Assessment Programme
7. **MGLSD** - Ministry of Gender, Labour and Social Development
8. **MLHUD** - Ministry of Lands, Housing and Urban Development
9. **MoES** - Ministry of Education and Sports
10. **MoLG** - Ministry of Local Government
11. **MoPS** - Ministry of Public Service
12. **MoWT** - Ministry of Works and Transport
13. **NMT** - Non Motorised Traffic
14. **SSZ** - Safe School Zone
15. **TSM** - Traffic Signs Manual
16. **UBOS** - Uganda Bureau of Statistics
17. **UNRA** - Uganda National Roads Authority
18. **UPF** - Uganda Police Force
19. **URDM** - Uganda Road Design Manual
20. **URF** - Uganda Road Fund
21. **WHO** - World Health Organization
22. **WRI** - World Resources Institute

Glossary

Boda Boda: Motorcycles commonly used for transportation in Uganda, often carrying passengers, including school children.

Buffer Zone: An area designed to separate different types of traffic, such as motorised vehicles and bicycles, to enhance safety.

Children Act, Chapter 59: Ugandan legislation providing for the care, protection, and maintenance of children.

Comprehensive School Safety Framework (CSS): A global framework supporting initiatives to make school facilities and communities more resilient to natural hazards.

Cycleway: A designated path for bicycles, separate from motorised vehicle lanes.

Directional Arrow Pavement Markings: Road markings indicating the direction vehicles must travel, typically used at intersections.

Glass Reinforced Plastic (GRP): A material used for making road signs due to its low value to vandals and durability.

Hump (W.24): A road sign indicating the presence of a raised hump to slow down traffic.

International Road Assessment Programme (iRAP): A program that assesses road safety and provides star ratings for roads, including school zones.

Median Strip: A dividing strip between lanes of traffic moving in opposite directions, often used in school zones for safety.

Ministry of Works and Transport (MoWT): The Ministry of Works and Transport is a Cabinet-level government ministry of Uganda that is mandated to plan, develop, and maintain an economic, efficient, and effective transport infrastructure and transport services by road, rail, water, and air, including road safety regulations and infrastructure.

National Child Policy 2020: A policy outlining the Ugandan government's commitment to protecting children's rights and ensuring their safety.

National Roads: Major roads that include urban trunk roads, urban main roads, inter-regional roads, and urban expressways (excluding urban expressways for school zones).

Non-Motorised Transport Policy: A policy promoting the use of non-motorised transport to reduce traffic-related risks for children.

Pedestrian Crossing (W 43): A road sign indicating a designated crossing area for pedestrians.

Raised School Crossings: Elevated pedestrian crossings are designed to slow down traffic and enhance safety for school children.

Refuge Island: A safe area in the middle of the road where pedestrians can wait before completing their crossing.

Road Safety Audits: Evaluations of road conditions to identify safety issues and recommend improvements.

School Safety Zone (SSZ): An area around a school with specific road safety measures to protect students.

Sidewalks: Paved paths for pedestrians, typically located alongside roads.

Speed Limit Sign (R49): A road sign indicating the maximum speed vehicles are allowed to travel in a specific area.

Glossary

Star Rating for Schools (SR4S): A tool designed by the International Road Assessment Program (iRAP) used to assess and improve the safety of school routes.

Traffic and Road Safety Act, 1998: Ugandan legislation providing the legal framework for road safety management.

Traffic Signal Design: The design and placement of traffic lights to manage vehicle and pedestrian flow at intersections.

Uganda Bureau of Statistics (UBOS): The national statistical agency responsible for collecting and analysing data in Uganda.

Uganda National Roads Authority (UNRA): The agency responsible for developing and maintaining Uganda's national road network.

Uganda Road Fund (URF): An agency established to finance the maintenance of public roads and road safety initiatives.

Variable Text Message Sign (S21): A supplementary road sign that can display different messages based on the time of day or traffic conditions.

Zebra Crossing (M33): A type of pedestrian crossing marked with white stripes on the road.

PART 1

GENERAL INTRODUCTION

1.1 Background

The Ministry of Works and Transport (MoWT) plays a crucial role in Uganda's road safety efforts. As the Uganda Government body responsible for planning, developing, and maintaining transport infrastructure and services, the Ministry oversees key initiatives to improve road safety across the country.

Data from the World Health Organization (WHO) estimates 7,315 deaths and 16 fatalities per 100,000 population in Uganda in 2021 in the Uganda Country profile (WHO, 2023). In 2022, the National Road Safety Action Plan was introduced to address these alarming statistics. This five-year plan aims to reduce road traffic deaths and injuries by 25% by 2026 (MOWT, 2022), emphasizing a multi-sectoral approach involving key stakeholders.

The causes of road crashes and incidents are multifaceted, involving human behaviour, vehicle conditions, and the state of road infrastructure. Among the vulnerable populations faced with these challenges are child pedestrians (HOVITA, 2023). Road traffic crashes and incidents involving child pedestrians often occur while crossing roads, being carried on motorbikes (Boda boda), or walking along the roads. The Ministry, through its various initiatives and in collaboration with other stakeholders, aims to address these issues comprehensively to create safer road environments, especially around schools.

Uganda's legal framework for pedestrian road safety includes the Non-Motorised Transport Policy (2012), the National Road Safety Policy (2014), and the Traffic and Road Safety Act 1998 (Amendment 2023). Interventions implemented to reduce pedestrian road traffic injuries in Uganda include pedestrian sidewalks, overpasses, traffic calming mechanisms, road safety campaigns, police enforcement, and road safety educational programs. However, the lack of infrastructure for pedestrians still remains a significant impediment to pedestrian safety, with only 2% of 40km/h+ speed limit roads assessed in the country having formal sidewalks (UNEP & UN-Habitat, 2022).

HOVITA (Hope for Victims of Traffic Crashes) is supporting the implementation of a project in Uganda, backed by the Global Road Safety Partnership (GRSP) and the Global Health Advocacy Incubator (GHA), titled "Reducing road fatalities and injuries among children and young people." This initiative is particularly crucial due to the increasing number of deaths among road users, including school-going children.

The major objective of this project is to advocate for the formulation of policies, guidelines, and regulations targeting the establishment and implementation of Safe School Zone areas in Uganda by 2024. This aligns with the Ministry's mandate to promote adequate, safe, and well-maintained transport infrastructure for the social and economic development of Uganda. It is within this project that this guide for school safety zones has been developed.

1.2 Justification

The increasing number of deaths among road users, particularly school-going children, necessitates the implementation of the Safe School Zone Infrastructure Guide in Uganda. This guide is crucial as it addresses the alarming rise in child pedestrian fatalities, aligning with the National Road Safety Action Plan (NRSAP) Action 2.8, which emphasizes the need for targeted interventions to enhance road safety for vulnerable populations. Furthermore, the guide supports the Parish Development Model (PDM), particularly Pillar 2 - Infrastructure and Economic Services, led by the Ministry of Works and Transport (MOWT, 2023). This pillar focuses on the construction and maintenance of safe community roads, empowering communities to identify and address their specific needs, thereby ensuring safer environments for school children and the broader community.

1.3 Problem Statement

Road safety in Uganda remains a significant public health concern despite the country's commitment to the 1st and 2nd Decades of Action for Road Safety. Statistics from the Annual Crime & Traffic Report by Uganda Police, 2023, indicate that road crashes and incidents claim over 13 lives per day (Uganda Police Force, 2024). The number of road traffic fatalities in Uganda has increased sevenfold over the past 25 years. This figure is further underscored by the Uganda Bureau of Statistics' (UBOS) Crash Severity Index for 2020, which reported 30 deaths per 100 crashes (Uganda Bureau of Statistics, n.d.). This brings the total of deaths from road traffic-related crashes and incidents to 3,663, a conservative estimate considering the incomplete death registration data. The Uganda Police report indicates that of crash cases registered in 2023, 3,269 were fatal, 5,803 were severe, and 3,177 were minor. On average, these figures highlight the gravity of Road Safety issues in Uganda. The 2023 Annual Crime & Traffic Report represents a total of 872 fatalities among children aged 18 years and below. This is equivalent to losing a whole school with an enrolment of 500 learners. The increasing deaths among road users, including school-going children, highlight the urgent need for this guide.

1.4 Legal Framework

This legal framework provides the foundation for developing and implementing a comprehensive school safety zone guide in Uganda, ensuring that the Guide is aligned with national and international road safety standards and best practices

A. International Framework

- United Nations General Assembly Resolution A/74/299 (2020): This resolution proclaimed 2021-2030 as the Second Decade of Action for Road Safety, aiming to reduce road traffic fatalities and injuries by at least 50% by 2030. It emphasises the need for global and national actions to improve road safety, including the creation of safe school zones.
- 1968 Convention on Road Signs and Signals: This convention aims to achieve international uniformity in road signs, signals, and markings, which is crucial for the development of safe school zones. It provides standards that can be adopted to enhance road safety around schools.
- 1968 Convention on Road Traffic: This convention sets uniform traffic rules to facilitate international traffic and improve road safety. It includes provisions that can be applied to manage traffic in school zones effectively.

B. Regional Framework

- African Road Safety Charter, 2016 African Road Safety Charter: This charter, which Uganda is encouraged to ratify, provides a framework for improving road safety across Africa, including establishing safe school zones.

C. National Frameworks

- 1995 Uganda Constitution (as amended in 2017): The constitution guarantees children's rights, including the right to education and protection from harm. Article 34 specifically addresses children's rights, which supports the creation of safe environments around schools.
- Traffic and Road Safety Act, 1998(Amendment 2023): This Act provides the legal framework for road safety management in Uganda, including provisions for road safety education, enforcement, and infrastructure development. It is fundamental in establishing regulations for safe school zones.
- Traffic and Road Safety Act, 1998(Amendment 2023): This Act provides the legal framework for road safety management in Uganda, including provisions for road safety education, enforcement, and infrastructure development. It is fundamental in establishing regulations for safe school zones.
- Roads Act, 2019: This act provides a comprehensive legal framework for the development, management, and maintenance of public roads in Uganda. This Act consolidates previous legislation, including the Roads Act Cap. 358 and the Access to Roads Act Cap. 350, to streamline road management processes.
- Local Government Act (Amendment), 2020: This act empowers local governments to implement policies and regulations that can enhance road safety in their jurisdictions, including around schools.
- Uganda National Roads Authority Act, 2006: This act established the Uganda National Roads Authority (UNRA), which is responsible for developing and maintaining the national road network, including designing and constructing safe roads and infrastructure around schools.
- Uganda Road Fund Act, 2008: This act established the Uganda Road Fund (URF) to finance the routine and periodic maintenance of public roads and road safety initiatives, which can include the development of safe school zones.
- Uganda Road Fund Act, 2008: This act established the Uganda Road Fund (URF) to finance the routine and periodic maintenance of public roads and road safety initiatives, which can include the development of safe school zones.
- Traffic and Road Safety (Speed Limit) Regulations, 2024: These regulations mandate reduced speed limits in urban and built-up areas, including school zones, to mitigate road crashes and enhance safety for vulnerable road users such as children.
- Uganda National Road Safety Action Plan (2021-2026): This five-year plan aims to reduce road traffic deaths and injuries by 25% by 2026. This strategy outlines targets for improving road safety, including reducing road crashes and fatalities and enhancing the safety of vulnerable road users. It emphasises a multi-sectoral approach involving key stakeholders.

D. Child Protection and Education Frameworks

- Children Act, Chapter 59: This Act provides for the care, protection, and maintenance of children. It includes provisions that can be used to advocate for safe school zones to protect children from road traffic injuries.
- National Child Policy 2020 (MGLSD-Uganda): This policy outlines the government's commitment to protecting children's rights and ensuring their safety, including in school environments.
- Ministry Of Education and Sport's Basic Requirements and Minimum Standards Indicators for Education Institutions 2010: These standards guide institutions in creating a conducive learning environment, including ensuring children's safety in and around school premises.

E. Other Relevant Frameworks

- The Public Health Act (as amended) 2021: This act includes provisions for public health and safety, which can be applied to ensure safe environments around schools.
- Occupational Safety and Health Act, 2006: This act provides for the safety and health

of workers, which can be extended to include the safety of children in school zones.

- Occupational Safety and Health Act, 2006: This act provides for the safety and health of workers, which can be extended to include the safety of children in school zones.
- Uganda's Non-Motorised Transport Policy 2012: This policy promotes the use of non-motorised transport, which can be integrated into the design of safe school zones to reduce traffic-related risks for children.
- National Land Use Policy year: This policy, adopted in 2013, provides a framework for the optimal utilization and management of land resources for sustainable development. This policy is particularly relevant for establishing safe school zones as it guides land use planning and development across the country. It emphasizes integrated land use planning, urban and rural development, transportation infrastructure, and community participation, all of which are crucial for creating safe environments around schools.
- Uganda National Land Policy year: These policies guide land use planning and development, which can include the designation of safe school zones in urban planning.
- National Physical Planning Standards And Guidelines 2011, The Physical Planning Guidelines and Standards in this document are therefore intended to guide the preparation and implementation of physical development plans, with the basic aim of ensuring orderly, coordinated and efficient development.
- Parish Development Model: seeks to bring services closer to communities and for communities to participate more in the identification and planning of their needsThe Non-Motorized Manual 2020
- The Non-Motorized Manual 2020
- The Highway Code 2023
- Urban Roads Design Manual 2023

1.5 Objectives

▶ 1.5.1 General Objective

The overall objective of this Safe School Zone (SSZ) Guide is to provide a comprehensive reference for the planning, design, and implementation of road infrastructure elements required for safe school zones in Uganda, in accordance with existing regulations and best practices.

▶ 1.5.2 Specific Objectives

The specific objectives of this Guide are as follows:

- To compile and present a detailed overview of the various road infrastructure elements necessary for creating safe school zones in Uganda, including bus stops, speed bumps, pedestrian refuge islands, and other safety features.
- To serve as a practical resource for planners, decision-makers, and other stakeholders involved in the development and approval of school zones, outlining “what to do” in terms of infrastructure requirements.
- To provide a clear and accessible summary of regulatory measures and design standards for safe school zones, facilitating their implementation across Uganda.
- To support Civil Society Organizations (CSOs) and other interested parties in engaging with and advocating for improved safety in school zones by providing a comprehensive reference of required infrastructure elements.
- To outline the basic principles for school zone planning and design, ensuring that safety considerations are integrated from the earliest stages of project conceptualization.

1.6 When to refer to the SSZ Guide?

The SSZ Guide is specifically tailored for use by organisations and individuals involved in various school zone-related projects. These projects may include the construction of new schools, modifications to existing school structures, road construction or upgrades near school zones, and comprehensive safety assessments for school-related investments and renovations.

Users of this Guide should consult it during all key phases of a project, which include:

1. **Planning:** Initial project conceptualisation and feasibility studies.
2. **Investment Preparation:** Securing funding and detailing project scope.
3. **Design:** Architectural and engineering design of the project.
4. **Construction:** Actual building or modification processes.
5. **Operation:** Management and maintenance post-completion.

The SSZ Guide is also critical for conducting safety audits and assessments. It provides for:

- **Road Safety Audits:** Evaluating existing or new road conditions to identify safety issues.
- **Road Safety Assessments:** Detailed analysis of school zones to recommend effective technical safety improvements.

This approach ensures that all aspects of school zone safety are addressed, from initial planning to the ongoing operation of the school facilities and surrounding areas.

1.7 Users of the Safe School Zones (SSZ) Guide

The SSZ Guide is applicable to use by design and construction engineers, road traffic and technical infrastructure specialists, policymakers, school inspectors, urban planners, school proprietors, and various individuals and organisations operating within related sectors.

1.8 Structure of the SSZ Guide

The SSZ Guide is comprised of the following sections:

Part 1. General Introduction: This section presents the Background, Problem statement, Justification, Objectives, Purposes and Target Users of this SSZ Guide.

Part 2. Overview of road traffic safety in school zones: This section provides the definitions of a school zone and a safe school zone, presenting major risks to children and students in traffic and some good practice models on safe school zones.

Part 3. Basic principles for school zone planning: This section presents the basic principles for laying out school zones and school gates to meet safety requirements when implementing conceptual projects on transport infrastructure planning, urban planning, residential area planning, and other related planning.

Part 4. Transport Infrastructure Design of a Safe School Zone: This part presents the following contents:

- i. Basic principles for safe school zone design;
- ii. Steps to be taken when improving and upgrading a safe school zone;
- iii. Technical measures on road safety enhancement in school zones.

Part 5. Methods of Road Safety Assessment in School Zones: This part introduces methods of road safety assessment in school zones.

Part 6. Education, Awareness Raising & Community Engagement: This part emphasizes the importance of community awareness to advocate for the implementation of safety interventions to improve the safety of school zones.



OVERVIEW OF ROAD SAFETY IN SCHOOL ZONES IN UGANDA

2.1 Risk factors causing road traffic crashes involving students

Students between the ages of 6 and 18 are vulnerable to traffic crashes and road traffic injuries due to their ongoing physical, psychological, cognitive, and behavioural development, making them more at risk than individuals in other age groups. The vicinity of school zones becomes particularly hazardous as they are hotspots for student pedestrian activity, especially during arrival and departure times when the traffic density of both pedestrians and vehicles surges. This heightened risk in school zones can be attributed to five key factors impacting road safety: vehicle speed, shared lanes for motorised and non-motorised traffic, visibility of school children, technical specifications of vehicles, road safety awareness and skills, and the physical road environment.

! Risk factor 1: "Vehicle Speed."

Vehicle speed is an important factor as higher speeds lead to increased road capacity but also a higher risk of traffic collisions, crashes, and fatal injuries to students walking in school zones.

As can be seen in Figure 1, the likelihood of fatal injury to pedestrians is 90% at a collision speed of 60 km/h, compared to only 10% if hit by a vehicle travelling at 30 km/h. Therefore, any failure to control vehicle speed in school zones could lead to increased force on victims' bodies during road crashes, significantly elevating the risk of serious and fatal injuries.

! Risk factor 2: "Shared lanes for motorised and non-motorised traffic."

Speed differences between motorised and non-motorised vehicles on the same lanes potentially lead to traffic collisions and congestion. Of note, different types of vehicles share lanes in school zones where a large number of students cycle (at a low speed) while motorised vehicles travel at much higher speeds. This lack of homogeneity of speeds leads to conflicts and crashes in school zones. How high the speed of the motorized vehicles is on the shared lane will determine the severity of the crash.

! Risk factor 3: "Visibility of school children."

Students have a small physique, which limits their visibility and reduces their ability to observe the overall traffic infrastructure elements and vehicles. This and their developing cognitive capacity affect their judgment, assessment, and prevention of road traffic risks. In addition, the small physique of students, particularly young children, also increases crash risks as they are less likely to be seen by other drivers, especially those driving large vehicles such as trucks and buses. Whereas some schools have made arrangements to provide traffic wardens, several schools are not provided with wardens, hence the challenges of visibility.

! Risk factor 4: "Technical specifications of vehicles"

Technical specifications of vehicles play a crucial role in the safety of students and school-going children across various modes of transport, including walking, cycling, riding on motorcycles (boda bodas), using commuter taxis, and school buses. For instance, motorcycles, particularly boda bodas in Uganda, are unsuitable for transporting nursery, primary and lower secondary school students due to their physical strength and physique. These motorcycles are designed to operate efficiently at a maximum speed of 25 km/h with a seating capacity of one passenger. This is because their braking systems may not be reliable at higher speeds, eventually increasing the risk of crashes. Only 9% of motorcycle riders have a licence to ride in Uganda (Uganda Road Fund, 2021). This portrays a lack of professional training among many boda boda riders, exacerbating the risk of crashes. In contrast, school buses are equipped with numerous safety features such as high visibility, GPS systems, secured seating arrangements, and compartmentalised designs to absorb energy during collisions, making them a safer option for student

Figure 1: Probability of Fatal Injury in road crashes in relation to vehicle speed



Source: World Health Organisation, 2004

Figure 2: Traffic Warden in School zone.



Source: <https://www.monitor.co.ug/uganda/lifestyle/reviews-profiles/for-26-years-he-has-helped-children-cross-the-road-1550164>

Figure 3: A boda boda rider carrying six schoolchildren



Source: The Independent: <https://www.independent.co.ug/experts-warn-against-placing-children-top-of-boda-boda-fuel-tanks/>

transportation. However, the technical specifications of buses, lorries and / or trucks, commuter taxis and private vehicles used for student transport often lack stringent safety standards, leading to higher crash rates. Poor vehicle maintenance, inadequate safety features, and driver errors are significant contributors to road traffic crashes involving students in Uganda. Ensuring that all vehicles used for student transport meet high safety standards and are regularly maintained is essential to reduce the risk of road traffic crashes.



Risk factor 5: “Road safety awareness and skills”

Young children and students are rarely the main target audience of road safety awareness-raising campaigns. Additionally, young children’s access to information about road traffic law is limited compared to other road user groups.

School students receive road safety education (i.e., safe walking, safe cycling, safe sitting on a motorcycle, road signs, etc.); however, the training program is neither effective nor practical, resulting in limited real-life skills application among students. In addition, students have less experience handling dangerous traffic situations than adults. As a result, they frequently make inaccurate assessments of traffic speed and misinterpret the intentions of other drivers. Additionally, they are easily distracted and may impulsively enter the street without checking for oncoming traffic.

Education for young children and students should be: continuous throughout primary and secondary school, rather than within one term or one module; should be tailored to different age groups; should be aimed not only at developing skills to navigate the road safely but more importantly, the right attitude towards road safety in general; and should target not only the children but also their teachers, parents and the community (Global Road Safety Partnership, 2022)

Rather than education solely focused on behavioral change of road users, awareness efforts should be targeted to different groups to ensure the entire system supports the safety of children. Efforts should for example be aimed at children and their caregivers to ensure children are more visible on the road by wearing reflective clothing; or at the community to advocate for and for local authorities to implement speed calming in areas with high child pedestrian levels (WHO, 2015)



Risk Factor 6: “Physical Road Environment”

Several schools are situated in busy trading centres where visibility is obscured by several parked vehicles and market areas. Motorists on the road hardly have any physical signs to help them identify a school zone, and this poses a risk of crashes in such areas. Several schools have been developed along the major highways, and no measures have been put in place to notify motorists of such new schools. For Locations where school zone traffic signs are installed, heavy vandalisation of the road furniture is evident, and the section remains unidentified as a school zone. Motorists often identify school zones on short notice and find crossing children as nasty surprises. Additionally, the maintenance of school crossings is often poor, rendering them absent for recognition by motorists.

2.2 Definition of School Zone and Safe School Zone

Defining safe school zones is essential for planners, designers, construction professionals, and policymakers. This clarity serves as a foundation for implementing measures that effectively reduce traffic risks for children and students in Uganda.

The definition of school zones is to determine the scope and boundary needed to identify problems and propose measures relating to school zone road safety in the planning, design, construction and operation stages of school and transport facilities.

Following a review of definitions of school zones in several countries around the world (such as Vietnam and the UK) and based on previous studies in Uganda, school zones and safe school zones used in this Guide are defined in more detail in the sections that follow.

2.2.1 Definition of “School Zone”

A school zone is an area within the vicinity of a school where special traffic rules and safety measures should be implemented to protect students and other pedestrians. Figure 4 illustrates the vicinity of a school with and without special safety measures suited to a school zone.

- 1. For urban schools:** A safe school zone means an area within a 300 m radius from the extreme edge of the school premises along the road, and the absolute protection area is within a 100 m radius of the school entry/ exit. (Figure 5)
- 2. For schools in rural and mountainous areas with low-volume and low- speed roads:** A safe school zone means an area within a 200 m radius from the extreme edge of the school premises along the road, and the absolute protection area is within a 50 m radius of the school entry/exit. (Figure 6)
- 3. For schools located along national, District or community access roads, roads outside urban areas, or high-volume roads:** A school zone means an area within a 500 m radius from the extreme edge of the school premises (including the playgrounds) along the road and the absolute protection area is within a 100 m radius of the school entry/exit. (Figure 7)

Safe school zones should be designed to operate at speeds of 30kph and below within the extents described above. A safe school zone is made visible by road signs and markings designed and installed to manage, to the greatest possible extent, the risk factors of traffic collisions and crashes and to keep children, students, and other road users safe.

¹ Illustrations in Figure 4 are part of a school area assessment undertaken before (and not part of) the development of this guide. Its inclusion here is to illustrate the changes in the road space before and after implementation of safety features for a school zone. The features illustrated here are the walkway protected by a buffer space and a raised crossing. Actual implementation of such features and their complementary signage should be as guided in section 4 of this guide.

Figure 4: Left: school zone without safety measures; Right: Proposed safety features in a school zone.



Photo Credit: WRI

Figure 5: Safe school zone radius from school gates in urban areas

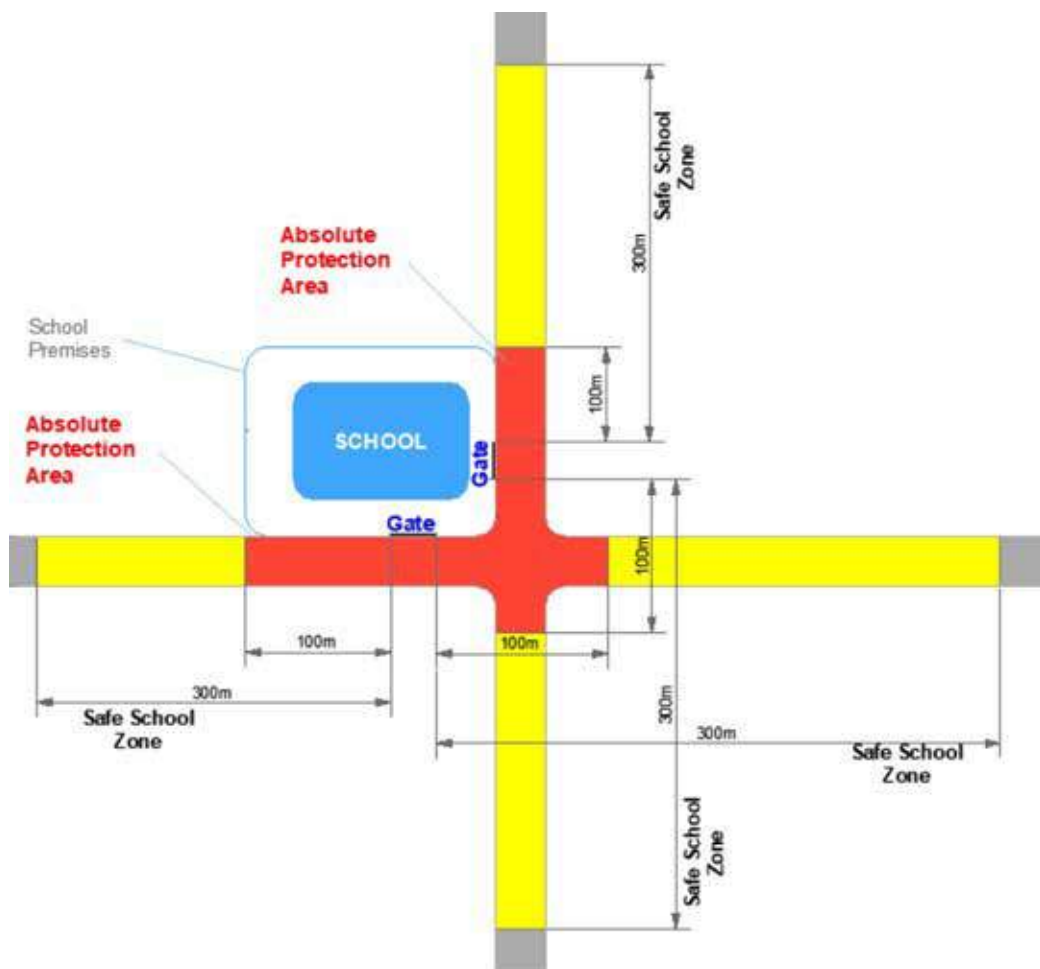


Figure 6: Safe school zone radius in rural areas with low speeds and traffic volumes

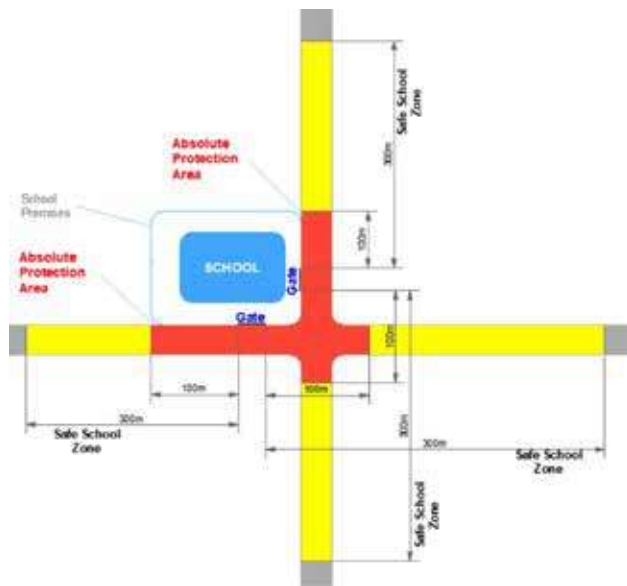
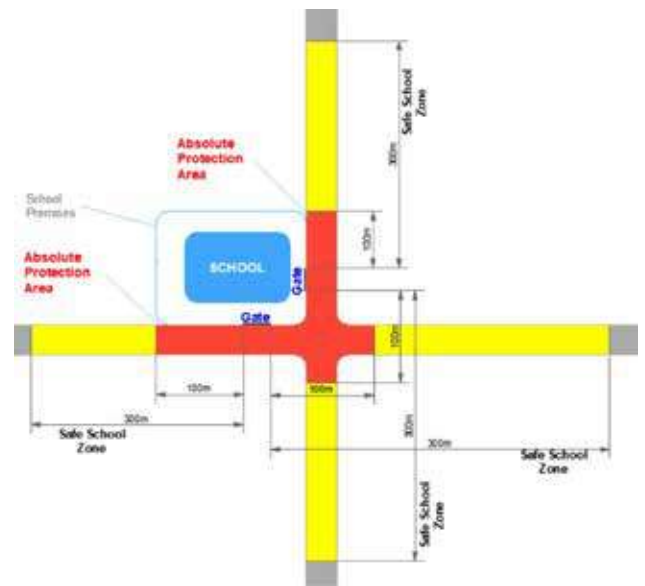
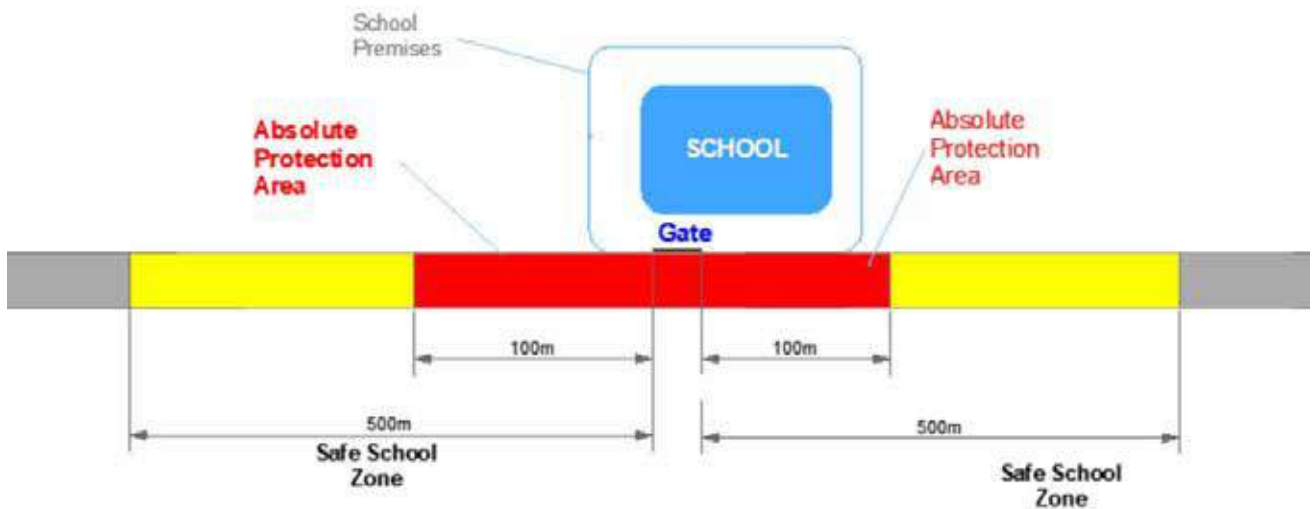


Figure 7: Safe school zone radius from school gates for schools located along national and rural roads outside urban areas



The same principle of distance will apply for school zones sited on the different roads outside the vicinity of intersections. An example of a school zone radius on a single carriageway road is shown in figure 8 for a school sited on a national road.

Figure 8: Safe school zone radius on a single carriageway road for a school sited on a national road



2.2.2. Definition of Safe School Zone

A safe school zone is made visible by road signs and markings (Figure 9) that are designed and installed to manage, to the extent possible, risk factors of traffic collisions and crashes, and to keep children, students, and other road users safe.

Figure 9: Basic infrastructure that should be visible within a safe school zone



2.3 Minimum requirements on road infrastructure in a safe school zone

The minimum requirements on road infrastructure in school zones differ depending on road classes as specified in the Uganda Roads Act, 2019 or its update:

The **Roads Act, 2019** classifies roads in Uganda into different categories. Here's a summary:

A. National Roads:

- Managed by the Uganda National Roads Authority (UNRA).
- Link ports, airports, border posts, district headquarters, towns, and trading centers.
- Facilitate trade, commercial activities, and national integration.
- Provide administrative and social services.

A. Urban Roads:

- Within urban council boundaries.
- Not part of national roads.
- Managed by urban councils.

C. District Roads:

- Provide access for rural populations to district administration headquarters, towns, hospitals, and schools.
- Vital for rural welfare and economy.
- Managed by district local governments.

D. Community Access Roads:

- Link communities and villages to other classified roads.
- Provide access to administrative, social, and economic services.
- Managed by local government councils.

The minimum requirements of road infrastructure in safe school zones are presented in Table 1 below.

Table 1: Minimum requirements of road infrastructure in safe school zones

No.	Work items relating to traffic safety	School location		
		National Roads	Urban Roads	District and community Access Roads
1	School zone sign	√	√	√
2	Speed limit sign	√	√	√
3	Road markings (including pedestrian crossing markings, rumble strips, directional markings and other relevant markings)	√	√	√
4	Raised Safety Platform/ Raised crossing/ Zebra crossing on top of a plateau hump	√	√	√
5	The sidewalk and width of the sidewalk	√	√	-
6	Median strip	√	√	-
7	Refuge island	√	√	-
8	Traffic light	√	-	-
9	Bicycle and NMT lane	√	√	-
10	Lighting system	√	√	√
11	Pick-up and drop-off area	√	√	-
12	Bus stop	√	√	√

Regarding minimum requirements on the road infrastructure of a safe school zone as presented in Table 1, to keep children and students safe in school zones, one should consider the school location, whether it is located in an urban, rural or mountainous area, along a national, district or community access roads, to set specific requirements based on 12 criteria as above.



BASIC PRINCIPLES IN SCHOOL PLANNING AND DESIGNING

When planning the location of new schools, particularly in urban and non-urban school zones, it is crucial to consider several key principles to ensure safety and accessibility for students. These principles are adapted to fit the specific needs and conditions of Uganda, drawing from general guidelines and studies conducted in other regions, such as Vietnam.

3.1 Ensuring a suitable school service radius

According to the National Physical Planning Standards and Guidelines (2011), the location of a school should be strategically chosen to optimise its service radius, which affects both enrollment and accessibility. This involves determining the appropriate distance for students travelling on foot and by bicycle:

- For primary schools in urban areas such as Kampala, walking distance will depend on the spatial distribution and the service radius should ideally not exceed 1.5 -2km to facilitate easy and safe walking conditions for young students. In more rural or non-urban areas, a minimum of 1.5 km is recommended, this radius can be extended up to 3-4 km, considering the lower density of population hence longer commuting distances.
- For secondary schools catering to older students who might travel longer distances, the service radius can be between 3.0 km and 5.0 km. This accounts for students who might use bicycles or even motorised forms of transport such as motorcycles.
- These guidelines ensure that the majority of students can reach school within a reasonable time without facing significant traffic hazards, which is particularly important in a country like Uganda, where road safety remains a critical issue.

3.2 Ensuring land availability for school planning and construction

According to the National Physical Planning Standards and Guidelines (MLHUD, 2011), when selecting a site for a new school, it is essential to ensure that there is adequate land not only for the building itself but also for other critical infrastructure: The land requirements for schools will defer depending on whether the education institutions is a day care, primary school, secondary school, tertiary institution or University. Further consideration on land requirements will be as to whether the institution is located in a rural vicinity where vast land can be accessed or urban where land availability is a challenge, in which case the vertical building manner should be harnessed.

Uganda's National Physical Planning Standards & Guidelines, 2011 requires that lower order training institutions like kindergartens and pre-primary schools have a minimum plot area of 2,000 sq m. The Location requirements for such Kindergatens and Pre primary school include should ensure there are access roads, avoids busy roads, not located near incompatible land uses such as bars, cinemas. Parking facilities are provided in high and medium income areas and no obstruction to normal vehicular traffic.

The Guideline further highlights that its difficult to devise standards of provision which apply in all situations but space allocation shall be as per the anticipated population as shown in the table 2;

Table 2: Minimum Land requirements for primary Schools

Facilities	Single-stream (Day)	Single-stream (Boarding)	Double-stream (Day)	Double-stream (Boarding)
Classrooms, hall, administration, etc.	1.0 ha	1.0 ha	2.0 ha	2.0 ha
Playing fields, gardens	1.5 ha	1.5 ha	1.5 ha	1.5 ha
Dormitories	-	0.4 ha	-	0.4 ha
Staff Accommodation	-	0.8 ha	-	0.8 ha
Total Plot Area	2.5 ha	3.7 ha	3.5 ha	4.7 ha

Source: National Physical Planning Standards & Guidelines

Recommended plot areas for day and boarding secondary schools are for a single stream mixed secondary school with Senior 1 - 6, 3.5 ha for double stream mixed secondary school while 4.5 ha is sufficient for triple stream mixed secondary school. This includes space for a senior football field encircled by running track, plus basketball, volleyball, netball pitches and demonstration gardens.

The establishments, standardisation, accreditation and supervision rules of Tertiary Institutions including colleges and Universities. are contained in the relevant laws and regulations with the Minimum land area required for colleges as 4 - 6 ha

These minimum land requirements (Figures 10 and 11) ensure that schools have sufficient space for recreational activities and safe internal circulation, reducing the risk of crashes on the school premises and promoting a conducive learning environment.

Locational requirements

- Site must have access roads.
- Avoid busy roads.
- They should not be located near incompatible land uses such as bars, cinemas.
- In high and medium income areas, parking facilities should be provided to manage vehicular traffic and eliminate obstruction to vehicular traffic flows.

Location Guidelines for Primary Schools

- They should be located within residential neighbourhoods and easily accessed by road
- In case pupils are dropped and picked by cars or public transport, facilities for safe collection and parking should be available.
- It is also important that applications for educational institutions include details of all relevant information to facilitate the responsible Urban Authorities determine the required acreage. It is also required that after land for educational facilities has been allocated, site layout plans and other drawings be submitted to relevant authorities for guidance, approval, monitoring and evaluation to avoid haphazard developments.
- All educational institutions should be integrated with major open spaces whenever possible to encourage the sharing of open spaces and play grounds with members of the public.
- Must not be in industrial area, wetland or forest reserve.

Figure 10. Location for rural primary and secondary school (figure 1.5 National Physical Planning Standards and Guidelines 2011)

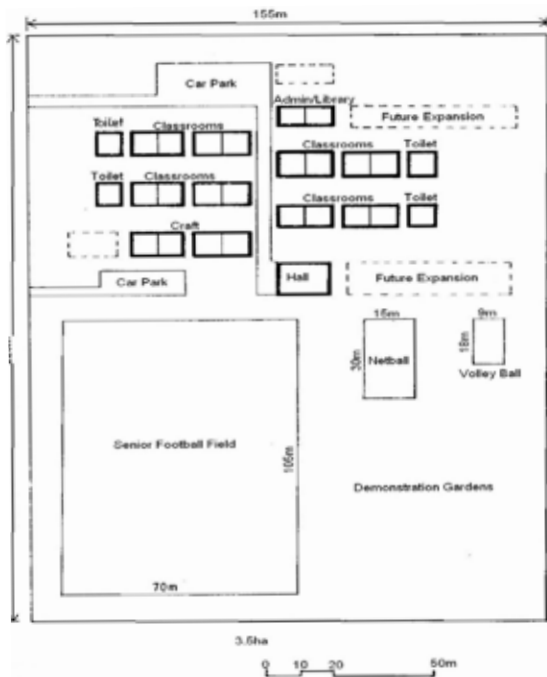
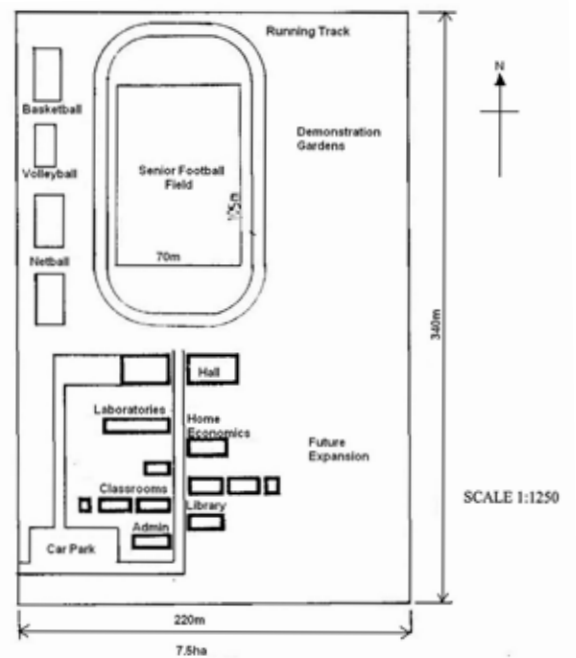


Figure 11. Location for urban day secondary school (figure 1.6 National Physical Planning Standards and Guidelines 2011)



Tertiary Institutions

These include colleges and Universities. Their establishments, standardisation, accreditation and supervision rules are contained in the relevant laws and regulations. Minimum land area required for colleges is 4 - 6 ha.

Guidelines for establishing Colleges

- i. Should be well served by public transport.
- ii. Should be free of pollution from noise, smoke, odour and dust.
- iii. Area for workshop buildings with heavy machinery and frequent deliveries should be located separately usually in single storey buildings.
- iv. Must not be in industrial area, wetland or forest reserve.
- v. Must have access to road network, physical infrastructure and quiet environment that promotes learning environment.

Guidelines for University Institutions

- A. 2 ha for open spaces and car parking exclusively.

These proportions ensure that schools have sufficient space for recreational activities and safe internal circulation, reducing the risk of crashes on the school premises and promoting a conducive learning environment.

3.3 Ensuring effective implementation of road safety measures around school premises

A school should not be sited in an area where its gates are directly connected to an expressway or major national road with operating speeds over 40 km/h. The location where its gates connect to the roads should be spacious enough to provide full visibility and ensure that, within 300 m (from a school gate) in both directions, measures and solutions can be established to improve road safety conditions for students such as in Figure 12.

3.4 Ensuring Road Safety Around Schools

▶ 3.4.1 Scope of Road Safety Measures

In the Ugandan context, road safety measures should be enforced within a 100 to 300-meter radius from school gates. This area should be meticulously planned to ensure the safety of students entering or exiting the school premises.

▶ 3.4.2 Layout of School Gates

To minimise traffic congestion around school gates, it is advisable to design multiple entrances based on the school's road network. Ideally, there should be separate gates for pedestrians, entry for motorcycles and non-motor vehicles, and an exit for the same. Cars should generally be restricted from entering schoolyard areas to enhance safety and reduce congestion. The design of these gates should accommodate the volume of students, teachers, and staff, ensuring ample space for safe and efficient traffic flow.

3.5 Ensuring connectivity with public transport modes

To alleviate traffic congestion and promote smooth transit in school zones, especially in urban areas like Kampala, school siting plans should include strategies to integrate walking and cycling with public transportation. Safe and accessible pedestrian and cycling routes should connect schools to nearby public transit stops and stations, facilitating easy and safe commutes for students.

3.6 Ensuring logical in-school traffic management

The internal layout of the schoolyard should serve dual purposes:

- **Playground for Students:** Adequate space should be allocated for students to play safely.
- **Parking Lot for School Community:** The parking area should be constructed following relevant standards, such as the National Physical Planning Standards guide in Chapter 4, which includes standards for vehicle parking, roads, footways, and cycle-way parking.

Figure 12: Students waiting to cross at a zebra crossing in Uganda



Source: <https://urbanmorph.medium.com/dont-dance-on-the-road-advice-on-navigating-kampala-s-transport-infrastructure-6939742c5430>

DESIGNING SAFE TRAFFIC INFRASTRUCTURE FOR SAFE SCHOOL ZONES

4.1 Design principles

The Design of safe traffic infrastructure in school zones shall be carried out in line with three basic principles as explained below:

4.1.1. Principle 1: Prioritising students' travel needs as the primary focus of relevance.

The aim of designing safe traffic infrastructure in school zones (such as in Figure 13) is to reduce the likelihood of collisions and crashes for students traveling to and from school, thereby enhancing road safety conditions within these areas. The benefits of the safety enhancements, however, will not only serve the students but also other road users and the surrounding community.

4.1.2. Principle 2: Alignment with related regulations

Designing safe traffic infrastructure in school zones should be in line with current principles and regulations on investment, management and operation of construction and traffic facilities, in addition to compliance with the MoWT's Traffic Signs & Road Marking Manuals, 2004 or its current update and other relevant guide lines.

4.1.3. Principle 3: Maximising the efficiency of traffic infrastructure operations

The infrastructure design solutions presented for the management of safety in school zones should efficiently enhance integration and connectivity with the surrounding road network, especially with public transport modes including paratransit and mass transit, walking and cycling.

Figure 13: Safe road design model for safe school zones



Source: Artistic impression by STASSU

4.2 Steps to Designing Safe School Zone infrastructure

4.2.1. For newly planned and built school zones

Design steps are carried out according to existing procedures and regulations on investment and construction. During each step, solutions to design safe traffic infrastructure in school zones can be explored and employed to put forward road safety solutions in a project's overall design plan.

4.2.2. For school zones or traffic facilities in school zones to be upgraded and renovated

Designing safe traffic infrastructure in school zones is carried out in 5 steps as follows:

STEP 1: Assessment of road safety in School Zones prior to Design and renovation

Road Safety Audits/ inspections or iRAP's Star Rating for Schools (SR4S) (iRAP, 2014) can be utilised to evaluate the road safety performance of school zones prior to design and renovation with assessment results to quantify and provide star ratings on road safety levels (where one-star is the least safe while five-star are the safest).

Star Rating for Schools (SR4S) is a tool designed to measure, manage, and communicate the risk children face during their journeys to school. SR4S assesses the safety of school routes by considering road design and its impact on pedestrian risk. It aims to improve safety for children traveling to, from, and around schools

This assessment enables Infrastructure designers and decision-makers to be aware of actual road safety levels in a school zone so that appropriate design, upgrading and/or renovation solutions can be developed. This step can be carried out independently or as part of a project's general status-quo survey.

These assessments can be an opportunity for the road authority, the community, local leaders and even school staff and children to collaborate through a walking inspection around the area and a debrief to agree (or gain an understanding) on the pertinent road safety concerns in any particular school zone. They are also an opportunity to start building community buy-in for proposed interventions.

STEP 2: Designing on Infrastructure

Based on the outcomes in Step 1 (Audit and iRAP Survey), designers can explore design solutions for safe traffic infrastructure in school zones as introduced in this Guide to enhance road safety, in line with the design principles and the operation of existing structures.

STEP 3: Construction of the Design from Step 2 above

Based on the approved design documents, deliver on-site construction works and measures to enhance road safety in school zones.

STEP 4: Re-assessment of road safety in school zones after upgrading and renovating

After Implementation of the design, evaluation shall be done to ascertain the effectiveness of the design in addressing the road safety needs. This can be done with any approved method say an inspection, iRAP's Star Rating for Schools upon completion of design, renovation and construction. The assessment results, compared with pre-treatment results, are indicators of road safety improvement and effectiveness of upgrading or renovation solutions delivered while informing additional measures (if needed) for better and more effective operation of relevant structures.

STEP 5: Monitoring and evaluation post upgrading and renovation

Specifically looking at road safety measures in school zones in the short and long term, this assessment process is often conducted in 3 - 12 months after the school zone improvement is completed to propose more effective management and law enforcement measures. A number of indicators to be monitored, should be agreed upon prior to construction and baseline data collected.

4.3 Design of road signs - school zone signage

4.3.1. Children in the road sign

Figure 14: Children in the road (W.45)



Source: Traffic Signs Manual, Vol 2, 2004 By MoWT

Road sign used: W.45 (Figure 14)

In case it is required to determine the length of a road section for which the school zone extends, a supplementary plate should be mounted underneath the W 45.

Purpose: To warn road users of potential dangers as they are approaching a road section where children often cross or gather on the road.

Location: The W.45 sign should be installed at least 200 m - 300 m from the school premises in urban sections and 500m - 1km from school premises in Rural sections. The school premises shall include all property owned/ rented by the school and currently used by the school children. These premises will include any sports play grounds, clinics, water sources, separated accommodation areas among others.

Figure 15: Hump (W.24)



Source: Traffic Signs Manual, Vol 2, 2004 By MoWT

Road sign used: W.24 "Hump"(Figure 15)

Purpose: For locations where school crossings are mounted on plateau humps, the W24 sign shall be installed to warn motorists about this hazard. This sign warns that there are one or more road humps ahead to slow down traffic. Serious accidents can occur if drivers are not warned.

Location: The sign will be positioned on the left hand side of the road in advance of the first hump.

4.3.2. Speed limits in school zones by using road signs

Figure 16: Maximum speed limit sign (R49)



Source: Traffic Signs Manual, Vol 2, 2004 By MoWT

Road sign used: R49 “Maximum speed limit”(Figure 16)

Purpose: To limit the speed of vehicles passing the school zones.

Location: The sign should be installed 150m - 250m from a school Premises in urban sections and 500m from school premises in Rural sections. The school premises shall include all property owned/rented by the school and currently used by the school children including play grounds. The sign should be fixed to a pole, with its mounting height (from the highest point of the road surface to the bottom of the sign plate) set at 1.8 m for roads outside residential areas and 2.0 m for roads within residential areas and where walkways and adjacent to the sign locations.

Notes: The traffic organisation and density in a school zone should be inspected and reviewed to determine an appropriate speed limit at 30Kph or below.

For purposes of emphasis and caution to motorists to drive carefully through this zone, a supplementary plate S21- variable text message maybe mounted below W45 indicating School Safety Zone(Figure 17)

Figure 17: Combined W.45 & S21- School Safety Zone



Source: UK Traffic Signs Manual, 2014

Recommendations: Approaching vehicles should travel with speeds not in excess of 30 km/h - in a school zone. For roads passing through school zones where vehicles can travel >50 km/h eg National Roads Class A & B, Gradual speed limit reduction signs shall be installed (such as: 80 km/h 50 km/h 30 km/h) as shown in the Figure 18. Vehicles should accelerate to the recommended speed limit \geq 30 km/h after leaving the school zone and the new speed limit should be posted to advise motorists on the safe speed.

Figure 18. Gradual reduction of posted speed limits



In school zones, the intensity of commuting pedestrians/ school children and vehicles is usually during student morning peak for arrival and afternoon/ evening for dismissal periods, during which speed limit signs can apply to increase the capacity of the route. In this case, the supplementary plate, S 21 “variable Text message” sign can be additionally installed to form a time-based speed limit sign, as shown in the Figure 19.

The time zones can be adjusted to show applicable school operating hours, where children are expected to use the road section and motorists are expected to take extra caution while driving through the same.

At the ending point of a school zone or along the route away from school gates, a specific location should be determined to install the R52 “End of maximum speed limit” sign(Figure 20) for vehicles to travel at a normal speed for that road category. The installation location depends on the volume of road users and vehicles running through a school zone. However, to ensure safety, the recommended location for the sign is \geq 150 m from school gates.

Figure 19. A time-based speed limit sign



For locations where the school zone is adjacent to another traffic generator, say a trading centre, mall or market, consideration for the installation of the R52 shall be made to cover the pedestrian volume arising from this occurrence. Hence, the sign shall be installed at a distance suitable to cover the trading centre/market influence area.

Figure 20: End of maximum speed limit sign (R52)



Source: Traffic Signs Manual, Vol 2, 2004 By MoWT

▶ 4.3.3 Pedestrian crossing sign

Figure 21: Specifications for sign W 43 “Pedestrian crossing location”



Source: Traffic Signs Manual, Vol 2, 2004 by MoWT

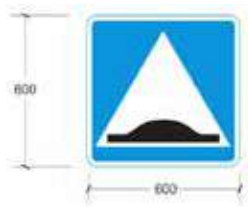
Road sign used: W 43 “Pedestrian crossing”(Figure 21).

Purpose: To allow pedestrians (including students) to cross the road where there is no pedestrian overpass in school zones.

Location: The sign should be installed together with pedestrian crossing markings in a way that they can be easily seen, without affecting the ability of pedestrians and people living with disabilities to travel safely, or causing potentially unsafe situation for vehicles on the roadway.

▶ 4.3.4. Hump sign

Figure 22: Hump sign (I.02)



Source: Traffic Signs Manual, Vol 2, 2004 by MoWT

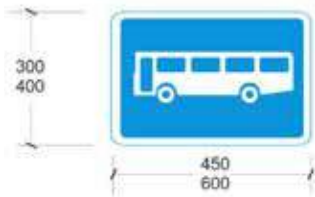
Road sign used: I02 “Hump”(Figure 22).

Purpose: For locations where raised(humped) crossings are installed, the sign marks the place where there is a hump. It shall be used for humps in both rural and urban areas.

Location: The sign is located on the left hand side of the road facing the traffic. Warning sign W24 may be needed in advance of the hump, depending on the visibility of the hump to approaching motorists.

4.3.5. Bus stop sign

Figure 23: Bus stop sign (I.05)



Source: Traffic Signs Manual, Vol 2, 2004 by MoWT

Road sign used: I05 “Bus stop”(Figure 23).

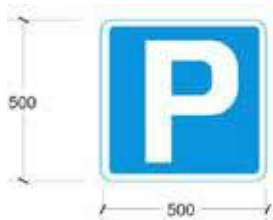
Purpose: To indicate the location of buses or bus stops in case there are public bus stations or school buses in school zones.

Location: The sign should be installed at a location where buses are expected to stop to load and unload students.

4.3.6. Parking lot sign

In case there is a parking lot in school zones:

Figure 24: Parking sign (I.04)



Source: Traffic Signs Manual, Vol 2, 2004 By MoWT

Road sign used: I.04 “Parking lot”(Figure 24)

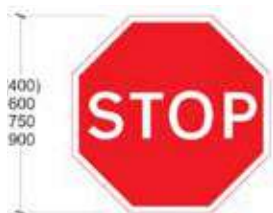
Purpose: To indicate the location of parking lots.

Location: The sign should be installed prior to a location where the road intersects with the point of access to a parking lot.

4.3.7. Stop sign

In case there are signalised intersections in school zones:

Figure 25: Stop sign (R.61)



Source: Traffic Signs Manual, Vol 2, 2004 By MoWT

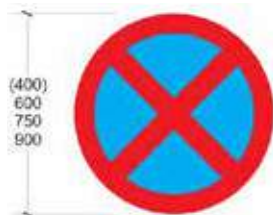
Road sign used: R61 “Stop”(Figure 25).

Purpose: To remind motorists and non-motorists to stop when reaching the sign or stop lines, with their ability to drive only based on availability of a safe gap in the traffic stream or green signals (either from traffic controllers or traffic lights).

Location: The sign should be installed at traffic signals with stop lines and pedestrian crossings to ensure students and pedestrians can safely cross the road. The Sign shall also be installed on unsignalised intersections facing into the minor road, to ensure traffic from the minor road joins in a safe gap into the major road.

4.3.8. “No stopping, no parking” sign

Figure 26: No stopping, no parking sign (R48)



Source: Traffic Signs Manual, Vol 2, 2004 By MoWT

Road sign used: R48 “No stopping, no parking”(Figure 26).

Purpose: To indicate a site where cars are not allowed to stop or park on both sides of a road.

Location: Depending on route-based traffic organisation, it is recommended that the sign is installed within a distance of < 500 m from school gates.

In case stopping and parking are not allowed at certain times, the supplementary plate S21 (Variable text message) shall be installed below R48 to give such information to the motorists.

4.4 Performance Specifications for the Sign Plates







4.4.1. Sign Plate Material

Glass Reinforced plastic (GRP) sheet is the preferred material, because of its low value to vandalism, hence signs will stay longer and unvandalised on the road. However, in locations where security is assured and less likely a chance for vandalism, aluminium alloy is the best option due to its resistance to corrosion. Cheaper alternatives for installation in areas with low vandalism areas are galvanised steel, plastic-coated steel, or steel treated with primer. The cleaning and preparation of steel plates needs to be of a very high standard, but even then there will always be a risk that the plate will corrode around the bolt holes or places where the coating has been damaged. With all materials, proper cleaning and degreasing is essential to ensure good adhesion of the sheeting. The back of the sign plate shall be painted grey, and the sign manufacturer's name and the date of manufacture shall be permanently marked on it. Manufacture and specifications shall conform to the recommendations of the MoWT's Traffic Signs Manual (Vol 1 & 2), 2004 & General Specifications for Roads & Bridge works, 2005 or their updates

4.4.2. Dimensions of the Sign Plate

Most warning signs are triangular and most regulatory signs are circular. The sign sizes shall depend on the approach speeds of vehicles operating on the road where the signs are to be installed. The general guidance in Table 3 shall apply to warning (triangular) & regulatory(circular) signs in school zones;

Table 3: Basic Traffic Sign Sizes in School Zones

Approach speed (Speed of motorists before the start of school safety zone)	Size of triangular signs Size of circular signs Side length (mm)	Size of circular signs Side length (mm) Diameter (mm)
≤ 50 km/h	720 	600 
>50 km/h and ≤ 80 km/h	900 	750 
> 80 km/h	1100 	900 

NB; The speed ranges indicated in the table are approach speeds just before the start of the school zones and hence, these should not be confused with the 50kph/ 30kph within the school zone.

4.4.3. Reflectivity of Sign Sheeting

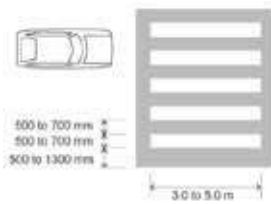
The performance of traffic signs is dependant on the quality of the initial installation and maintenance of the same. Traffic signs deteriorate by fading under the action of rain and sunshine on the outdoor environments where they are usually installed. Faded signs are unreadable by motorists and hence messages are not perceivable to motorists in time which can create nasty surprises and conflicts. Performance of traffic signs is further affected by different lighting conditions where messages on the faces are hard to read by motorists especially during night time and adverse weather eg Fog and rainy periods. On this background, Traffic signs to be used in School Zones (permanent and temporary), shall be fully reflectorised by making the sign face from retroreflective sheeting. This is a special type of reflective material that reflects light back to the light source, which in this case

is the vehicle headlight. All parts of the sign face except those coloured black must be made of reflective sheeting, so that the sign looks the same in both day and night. The preferred grade of sheeting shall be minimum of "High Intensity" grade and NOT Engineers grade to ensure timely visibility by motorists. Manufacture and specifications shall conform to the recommendations of the MoWT Traffic Signs Manual, 2004 & MoWT's General Specifications for Roads & Bridge works, 2005 or their current updates.

4.4. Design of road markings

4.4.1. Pedestrian crossing markings

Figure 27: Detail of M33 Pedestrian crossings



Source: Traffic Signs Manual, Vol 2, 2004 By MoWT

Marking type used: "M33 Uncontrolled (Zebra) crossing". (Figure 27)

Purpose: To determine scope of pedestrian crosswalks.

Location: The crossing must be sited as close as possible to where most school children want to cross. Pedestrian guardrail may be needed to channel school children to the crossing, whose need shall be ascertained through a safety inspection.

Figure 28 illustrates the basic signs and markings that complement the use of the uncontrolled zebra crossing. The crossing must always be marked with the information sign I01 Pedestrian Crossing. Drivers must be able to see these signs from at least 70 metres away (110 metres on roads with traffic speeds greater than 50 km/h). Warning sign W43 Pedestrian Crossing should be used where the visibility is marginal, but, if the visibility is well below the standard, and the

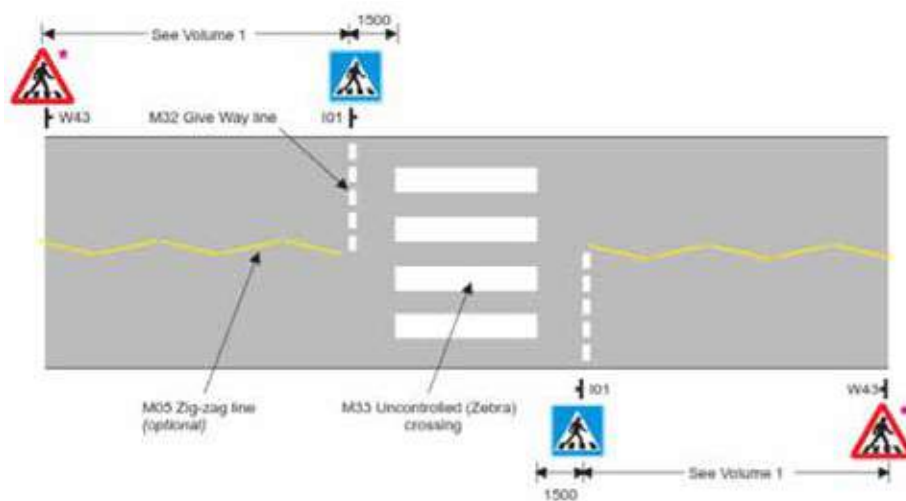
crossing cannot be re-sited, it will be necessary to reduce speeds by means of traffic calming measures, such as road humps. The distance between two pedestrian crossings on the same road section shall be greater than 150 m apart.

The minimum width of a pedestrian/ school crossing must not be smaller than 3 m, which, depending on the number of pedestrians, can be increased step-wise, by 1.0 m each step to make 4m, 5m, 6m widths. Pedestrian crossing markings should not be installed on unusual road sections (limited visibility, high longitudinal slopes, large turning angles, small radius curves, presence of unpredictable hazards, or on narrowing road sections).

For safe crossings by students and other pedestrians, W43 "Pedestrian crossing" warning sign shall be used prior to the M33 markings.

Drivers are required by law to stop for pedestrians on the M33 Pedestrian/school crossings. The point at which drivers must stop and give way to pedestrians shall be marked by the M32 Give Way line or M31 STOP Line depending on the traffic signs adjacent to the line. The M05 Zig-zag dividing line may be used to prohibit overtaking and parking on the approach to the pedestrian/ school crossing for with stop lines and traffic lights, or with rumble strip clusters installed prior to pedestrian crossings.

Figure 28: Specifications of Pedestrian Crossing Markings



Source: TSM, Vol 2, 2004

Placement of level pedestrian crossings be such that warning rumble strips are placed before the crossings to alert motorists about an upcoming hazard (pedestrians crossings). At Controlled junctions, where a distinct green signals are allocated for the different road user categories including for pedestrians. At signal controlled locations, a stop line is usually provided prior to the crossing point and the uncontrolled pedestrian crossing marking(M33I shall be replaced by M34 (Signal-controlled pedestrian crossing) and M32(Giveaway Line) behind the crossing, shall be replaced by M31(STOP Line) as shown in Figure 29. In brief M34 shall be used in place of M33 at a signal controlled junction to mark the safe crossing line for pedestrians.

Figure 29: Pedestrian crossing markings at a controlled intersection



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In addition, pedestrian crossing markings can be installed together with other pavement markings or road safety installations to improve safety conditions for students and pedestrians crossing the road, as shown in figures 30 and 31.

Figure 30: Road safety installations for pedestrians



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▶ 4.4.2 Raised School Crossings

Motorists in Uganda rarely respect M33 level crossings, therefore, for road crossings design in school zones, raised crosswalks are recommended, as they bring motorists and pedestrians to the same eye level. Raised crossings are normally a combination of a plateau hump with a zebra(M33) crossing installed on top of the hump (Figure 31). This is especially important to enhance the safety of children, since motorists tend to slow down as they approach raised humps. The height of such plateau humps is usually 100mm and are designed in such a way that they flush with connecting foot ways and cycle ways. The Design & Construction of humps including specifications for transitions shall follow the guidance of section 10.3.2 'Speed control zone' of the Uganda Road Design manual, 2010 or its current Update.

Figure 31: Raised crosswalk design



Artistic impression by STASSU

Humps are a serious hazard to motorists especially during rainy weather and night time and hence the visibility of Hump markings shall be enhanced by use of checkerboard markings M35. The hump must always be marked with the information sign I02. Warning sign W24 may also be needed in advance.

▶ 4.4.3 Rumble Strip Markings and Design

Purpose of rumble strips: To alert motorists about an upcoming hazard usually a hump, and they should drive more slowly. This serves as an option to calm aggressive traffic for those approaching school crossings and driving through school zones.

Rumble strips - Design requirements

Rumble strips shall be designed according to MoWT's Geometric Design Manual, 2010 or its current update.

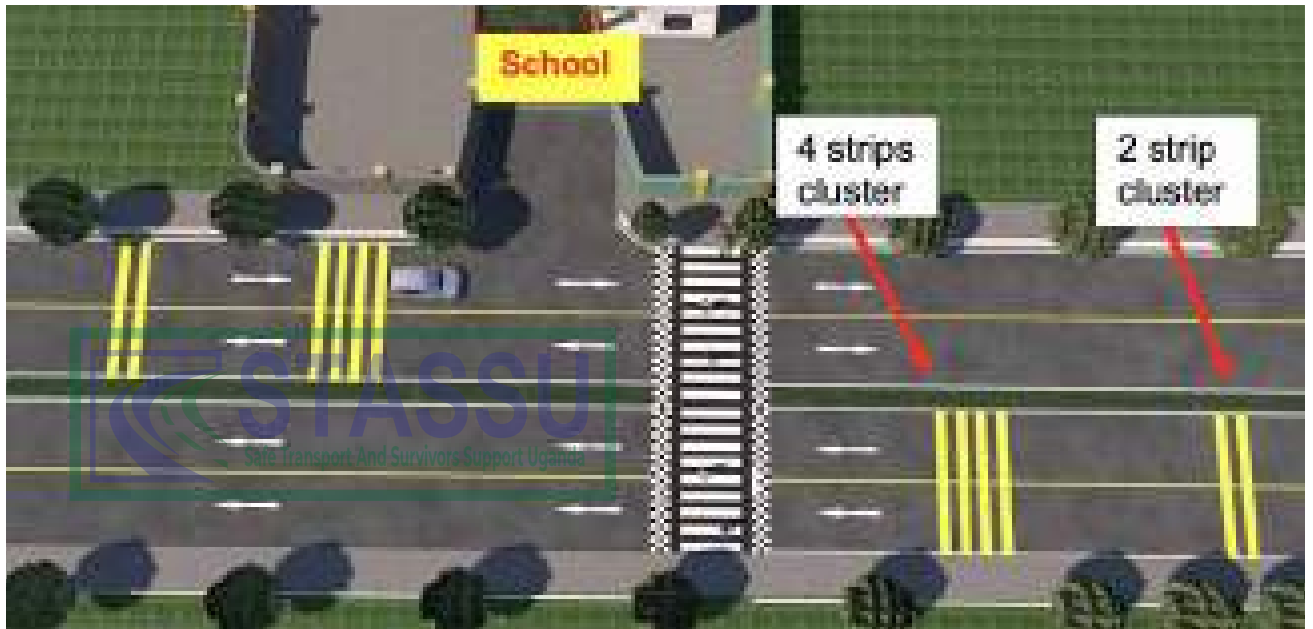
The following principles should be observed when using rumble strips:

- Rumble strips should normally be in groups of 4 strips preceded by a set of 2 strips;
- The height of the strips from the road surface shall be no more than 100 - 150 cm;
- The width of each strip shall be 0.5 m(50cm);
- For a school zone, a group of two(2no.) rumble strips shall be installed followed by a group of four (4no.) rumble strips preceding a raised (humped) crossing. The position of the raised crossing (humped) shall be carefully selected through an inspection and identified as per the most **preferred desire line** of the crossing students. Once the position of the crossing hump is fixed, the positions of rumble strips shall be accordingly fixed as per the recommendations of the Section 10 of MoWT Geometric Design Manual, 2010.
- The last set should be located 30 to 50 m before the raised(humped) crossing;
- Pre-warning sets can, if used, be located 20 to 80 m before the hazard depending on speeds;

Sample installation of rumble strips

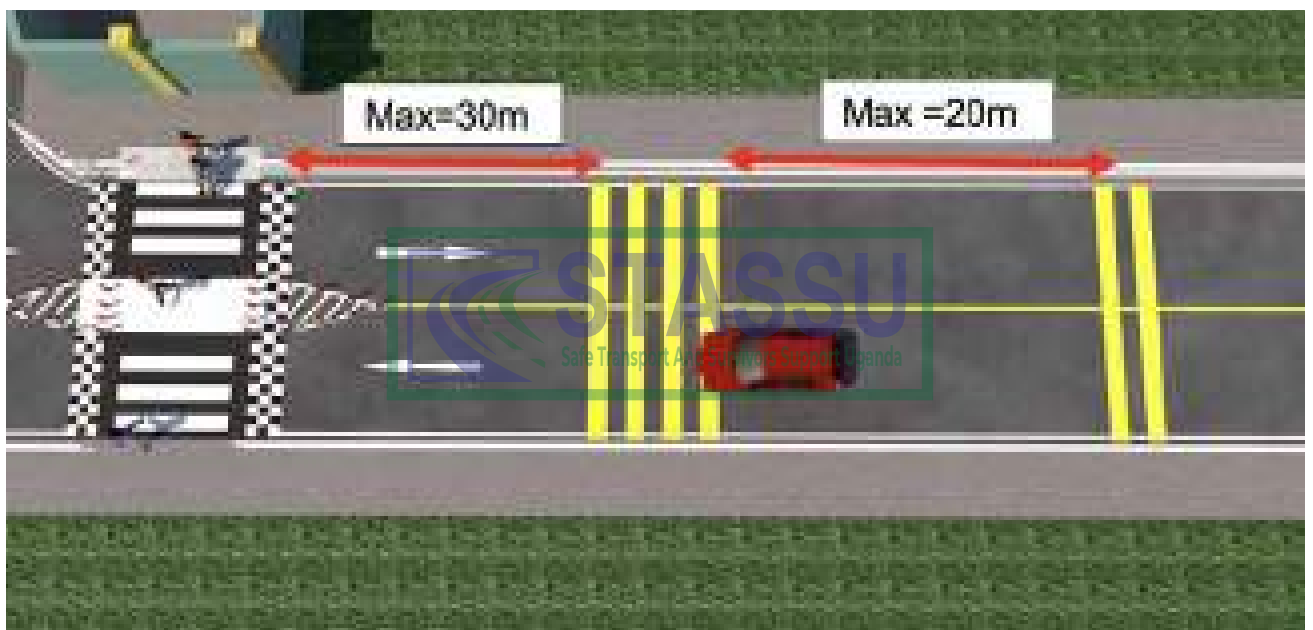
Rumble strips shall be installed across the road as clusters which are perpendicular to the road center line prior to the section where drivers should slow down (Figures 32 and 33). For roads with a divided carriageway/ median, rumble strips shall be installed on the approach lanes/ carriageway and not on the opposite lanes as shown in Figure 32.

Figure 32: Clusters of rumble strips on roads with medians (dual carriageway roads)



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Figure 33: Clusters of rumble strips on roads without medians (single carriageway roads)



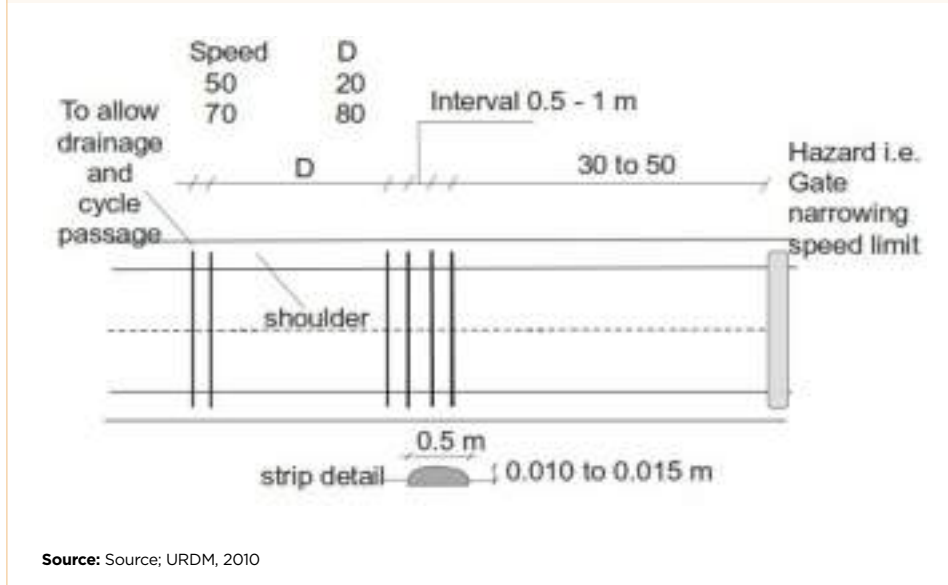
Artistic impression by STASSU

Depending on road conditions, there can be 1 to 3, or more, clusters of rumble strips while, for shorter road sections, fewer number of rumble strips and clusters can be installed. Each cluster can have either two(2) or four (4) strips as per specifications in Figure 34.

Markings for rumble strips

Rumble strips should preferably have yellow thermoplastic lines across the top for better visibility. Strips should continue across the full width of the carriageway, including the shoulders but be terminated so that they do not interfere with drainage. Yellow Thermoplastic traffic paint shall be used for marking rumble strips and this material shall fulfill the material requirements of the General Specifications for roads and Bridge works.

Figure 34: Design of Rumble strips

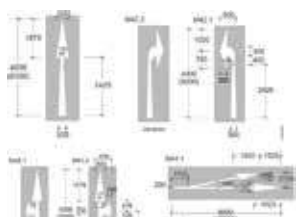


Source: Source; URDM, 2010

4.4.4 Directional Markings

In school zones, when there is a need to enhance clarity traffic organisation, the following symbol markings on the road surface can be used to guide the direction of traffic flow for lanes at an intersection.

Figure 35: Specifications of directional arrow pavement markings



Source: MoWT's TSM, Vol 2, 2004

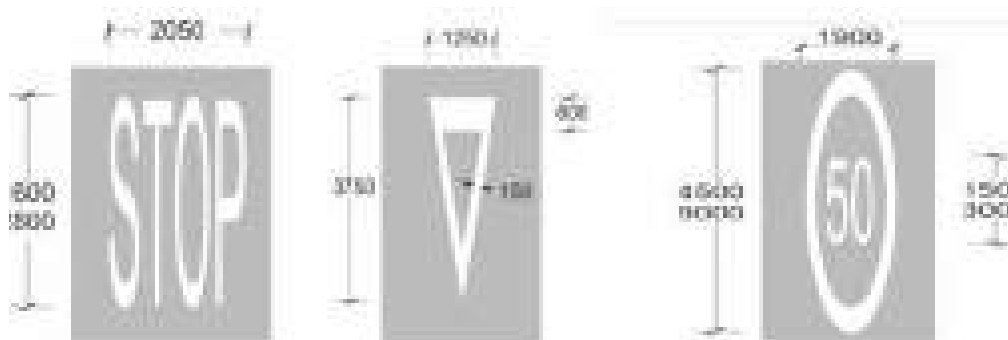
Marking type used: "Directional arrow pavement markings" (Figures 35 and 37)

Purpose: To indicate directions a vehicle must travel.

Location: Mainly used at intersections where lane changing and merging is allowed, and on multi-lane roads. Directional arrow markings can be used for one-way roadways to indicate the traffic flow direction.

In addition to directional arrows, text- or symbol-based pavement markings can be used as guidance to drivers where text-based markings are white-painted onto the road surface (Figure 36). The STOP painting is at a height of 1600mm in urban areas and 2500mm in rural areas (except for expressways); the speed limit markings are painted at a height of 4500mm in urban areas and 9000 in rural areas. The vertical distance between rows of texts or numbers is 1.0 m - 1.5 m, and the line width is 12 cm - 18 cm.

Figure 36: Text-based markings



Source: MoWT's TSM, Vol 2, 2004

Figure 37: A combined use of pavement markings



Artistic impression by STASSU

4.5 Design of other basic infrastructure components

4.5.1. Roadway design

To ensure effective implementation of road safety solutions in safe school zones (i.e, speed limits, lane markings), roads passing school zones must be solidly built with asphalt or concrete pavements. Best practice is to provide asphalt pavements in school zones. The thickness of Pavements should be calculated and determined based on the traffic volume and axle loading of motor vehicles driving through the school zones, ensuring that all calculations are based on the MoWT's Pavement Design Manuals and General Specifications for roads and bridge works.

4.5.2. Design of parking locations in front of school gates

Students are often times dropped off at and picked up from School gates, especially during pick-up hours when there is a significant surge of vehicles traveling through school zones. For efficient traffic management and prevention of traffic congestion around school gates, off road parking areas, must be designed so that parents of at least 50% of students can park their vehicles while waiting for their children. A sidewalk by school gates should be used, to the extent possible, to arrange parking space for parents.

The standard parking lot size is; 0.9m²/bicycle; 2.5m²/motorcycle; 25m²/car; Parking space, by vehicle categories, should be calculated and determined on a case-by-case basis depending on the population.

In designing parking areas, solid yellow center lines (M1) that indicate two-way traffic in opposite directions or edge lines (M21) to mark the outside edge of the roadway or separate lanes for motorised and non-motorised vehicles can be used according to Uganda Traffic Signs Manual, 2004 or its update. The M01 lines are single, solid and yellow lines which are 10 -15 cm in width each, while the M21 lines are single, solid and white lines which are 10-15 cm in width each.

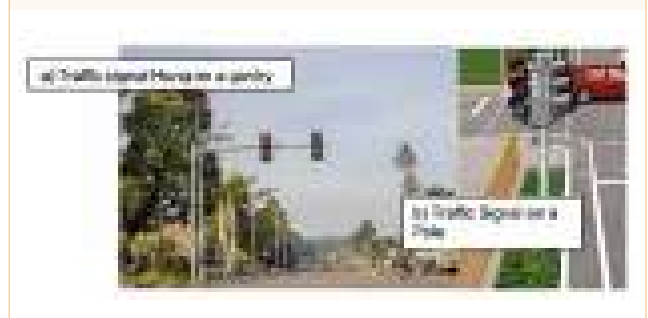
4.5.3. Traffic signal design

In case there is any at-grade intersection in a school zone, traffic signals should be installed as an extra safety measure. Basic technical specifications of traffic signals shall be in line with the MoWT's Geometric Design Manual, 2010 and Traffic Signs Manuals, 2004 or their current update, with priority settings for pedestrians and non-motor vehicles.

The light bulbs, which are 300mm in diameter, are installed on mast arm poles about 35 m - 45 m from stop lines, facing oncoming traffic and pedestrians.

When placed on a sidewalk pole, signal heads should be 1.7 m - 2.8 m off the ground while the pole should be 0.5 m - 2 m from the nearest edge of the roadway. When placed on a mast arm pole, signal heads should be 5.2 m - 7.8 m off the ground (Figure 38).

Figure 38: Traffic signal Design



Minimum interval for a green light in one direction should be 15 seconds. The walk interval should be at least 7 seconds in length. For narrow two-lane roads which are not priority roads and where pedestrian traffic is low, the interval can be reduced but must not be less than 4 seconds. The average pedestrian walking (crossing) speed is 1.2 m/s; for locations where people with disabilities (PWDs) are likely to cross the road, the walking (crossing) speed should be considered as lower than 1.2 m/s while other site conditions like grade and composition of defiant motorcycle traffic should also be considered to set suitable signal timing in school zones.

To ease road crossing, especially among persons with visual impairments, hard of hearing or disabilities, pedestrian detectors or pushbuttons shall be used. Pedestrian pushbuttons include: push buttons and blinking lights installed on the same pole on sidewalks where pedestrians wait before they start crossing the road.

Push buttons might come with locator tones which have a duration of 0.15 seconds and repeat at 1-second intervals. Pushbutton locator tones should be audible at 1.8 m to 3.7 m from the pushbutton, no more than 5 dBA louder than ambient sound but not higher than 89dB, and can be deactivated when the blinking light cycle ends. Site conditions must be evaluated properly before setting the sound level and installing push-buttons.

▶ 4.5.4. Design of pedestrian refuge islands

Pedestrian refuge islands illustrated in Figure 39, are important to discontinue the crossing length and ensure students and pedestrians safely cross roads that have at least 2 motorized travel lanes in one particular direction. Therefore, median dividers shall be installed at crossing points together with other safety installations, to enable students and pedestrians to observe & select the best safe gaps in the vehicle stream to cross the road.

The position of refuge islands must be such that they house the pedestrian crossing at the most preferred crossing point, identified through an inspection especially at peak times. "Pedestrian crossing markings (M33) and accompanying warning and information road signage shall be included in the design of the crossing.

The refuge island width is designed according to the median divider width as follows:

- For 2-lane roads, a refuge island should be wide enough to cater from turning movements. Consideration should be made of the available space, since urban sections are usually restrained in terms of right of way, however the width shall not be less than 1.5 m wide; if kerbs are built.
- For 4-lane roads, the minimum width shall be 3.0 m. In case of safety reinforcement, the minimum width shall be 4.0 m.

Assessment of the length of the school influence area and pedestrian traffic volume across a road will determine the length of a refuge island.

Safety of crossings at refuge islands can be enhanced using fencing, guard rails, concrete or steel bollards and other Safety installations. Safety installations must be designed to address both pedestrian safety and road aesthetics of the location. To achieve this, in addition to requirements on construction materials, it is necessary to decide colours of fencings, tactile paving that are reflective while still ensuring local aesthetics.

The normal height of raising for refuge islands is usually 5 to 10 cm above the level of the carriage way, preceded by chevron ghost markings and visibility improved by flexible reboundable bollards (Figure 39).

▶ 4.5.5. Design of bicycle lanes

Bicycle usage is increasing among school going children especially in the rural areas and is encouraged as a viable alternative in urban areas firstly by providing safe infrastructure for riders. Hence cycle lane design should be considered in the road design process of school zones. The first step when planning school zone infrastructure projects is to assess the demand and get some idea of journey patterns and volumes.

Figure 39: Refuge island design



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Improvements to existing infrastructure to incorporate bicycle lanes include:

- paved shoulders;
- wider outside traffic lanes in case a cycle lane separated from carriageway is to be provided;
- bicycle-safe drainage grates;
- adjusting manhole covers (if exists) to the grade; and,
- maintaining a smooth and clean riding surface especially in the shoulder.

These can considerably enhance the safety of a street or highway and provide for bicycle traffic. At some sections it may be appropriate to supplement the existing road system by providing specially designated cycle paths as shown in Figure 40.

Elements of Design for Bicycle Lanes

The conventional view is that cyclists in school zones especially in rural areas can use the shoulders, and this is acceptable provided that the combined volume of pedestrians and cyclists is low (<400 per day) and the shoulder is at least 1.5m wide.

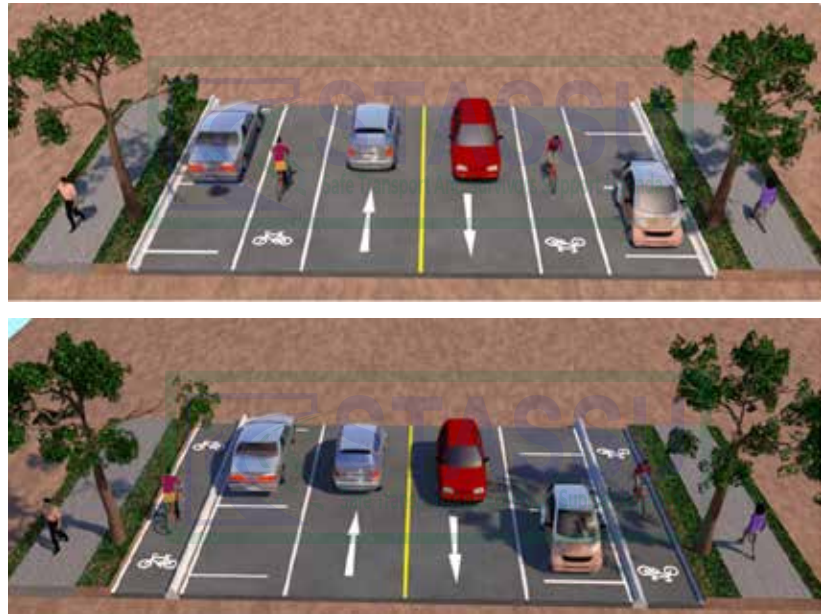
With heavier flows, and especially if there is high-speed traffic and / or a high proportion of heavy goods vehicles, it will be better to provide a separate cycle way or a combined cycle way and footway. Figure 41 shows the basic dimensions, and Table 4 gives recommended cycle way widths. Cycle ways need to have a smooth surface with good skid resistance.

Table 4: Recommended widths for cycle facilities (Source URDM, 2010)

Type	Minimum width (m)	Standard width (m)	Width for heavy (m)
Cycleway (separate from carriageway)	2.0	2.5	3.5
Combined cycleway and footway	2.0	3.0	4.5
Cycle lane (one way)	1.5	2.0	2.5

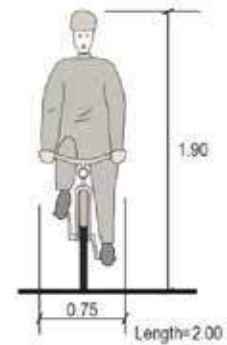
Source: URDM, 2010

Figure 40: Bicycle lane design- On road cycle lane & segregated cycle lane



Artistic impression by STASSU

Figure 41: Cyclist Dimensions



Source: URDM, 2010

In principle, the width of a bicycle lane is based on: design speed, traffic volume of bicycles and other vehicles sharing the same lane with bicycles, longitudinal slope, location of bicycle lanes in the cross-sectional plan of a road. Based on international best practices, the guidance in Table 5 can be followed to decide on the bicycle lane width and protection measures in school zones.

Table 5: Bicycle lane width and protection measures depending on the Speed & Volumes

Travel speed of motorised vehicles V 85% (maximum actual speed)	Type of bicycle lane/path	Bicycle lane width (m)	Notes
≤ 30 km/h (Traffic volume <2,000 motorised vehicles/day)	Shared lanes, used by bicycles and motorised vehicles.	Use the entire pavement width	Use support solutions to reduce motor vehicle speed (i.e., speed limit signs, rumble strips...); Use bike signs and symbols on pavements
≤ 30 km/h (Traffic volume < 2,000 motorised vehicles/day)	Physically protected bicycle lanes.	Minimum width of 2.0 m and buffer zone width of 1.0 m	One-way lane close to the left roadside, using chevron lines or raised intermittent kerblines representing the buffer zone according to the Uganda Traffic Signs Manual, Vol 2.
≤ 40 km/h (Traffic volume < 6,000 motorised vehicles/day)	Dedicated bicycle lanes	Minimum width of 1.5 m and buffer zone width of 0.5 m; Minimum width of 2.0 m, no buffer zone	One-way lane close to the right roadside, using the M11 (lane lines) and M52 (channelising chevron) lines according to the Uganda Traffic Signs Manual, Vol 2.
> 50 km/h	Separate cycle paths.	Minimum 2.0 m-wide one-way cycle paths; Minimum 3.0 m-wide two-way cycle paths.	Suitable for recreational and tourist cycling routes, roads on which motorized vehicles can travel at high speeds and the bicycle traffic is high, and lakeside and riverside roads.

Several improvements can be made around bike lanes to improve safety, these include provisions of flexible reboundable bollards, chevron markings, intermittent kerblines to improve visibility of cyclists in school zones (Figure 42).

Figure 42: Bike Lane layouts Options



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Pavement design of bike lanes:

The design of pavements in bike lanes should be based on the design speed of bicycles as can be seen in the Table 6.

Table 6: Pavement design of bike lanes according to the design speed

Type of bicycle	Type of pavement	Maximum speed
Conventional bicycles	Asphalt paving	20kph
	Tile paving	9kph

In a bid to improve road safety and visibility of cyclists, pavements in bike lanes can have coloured finishing that are different as compared to those of motorised vehicle lanes as shown in Figure 43. This helps in enforcement of the bike lane usage and prohibits motorised traffic access.

Figure 43: Pavement design of bike lanes



Source: WRI, 2021

Design of Longitudinal slope and slope length of bike lanes:

The level of comfort of cycling infrastructure is significantly influenced by the slope length and (uphill) longitudinal slope influence the level of comfort of cycling infrastructure since the majority of school commute cycling is human-powered. The longitudinal slope of a road and bike lane must not exceed 3.5%. Table 7 shows the appropriate slope length for a given longitudinal slope.

Recommended Clearances

Based on the recommendations of the MoWT’s Geometric Design Manual, the school zone cycle facilities shall have the clearances from any adjacent obstacle as noted in Table 8.

4.5.6. Sidewalks Design

In most of the school zones, the needs of pedestrians have largely been ignored, and this is one of the reasons why so many pedestrians and school going children are killed and injured on our roads. School children and other pedestrians have as much right to use the road as motorists, and roads must be designed with their needs in mind.

The first step is to identify major pedestrian generators (markets, shops, schools, etc.) and determine which are the most important pedestrian routes. The aim should be to develop a network of pedestrian routes and crossing facilities

Table 7: Longitudinal slope and slope length of a bike lane

Uphill Longitudinal slope (%)	Slope Length (m)
3.5	100
3	140
2.5	200
< 2	No Limits

Table 8: Minimum Clearance to Cycling Infrastructure

Type of obstacle	Recommended clearance (m)
Minimum overhead clearance	0.5
Clearance to wall, fence, barrier or other fixed object	0.5
Clearance to unfenced drop-off eg embankment, river, wall	1.0
Minimum clearance to edge of traffic lane for speed limit of;	
50km/hr	0.5
80km/hr	1.0
100km/hr	1.5

that is convenient to use and avoids conflicts with vehicular traffic.

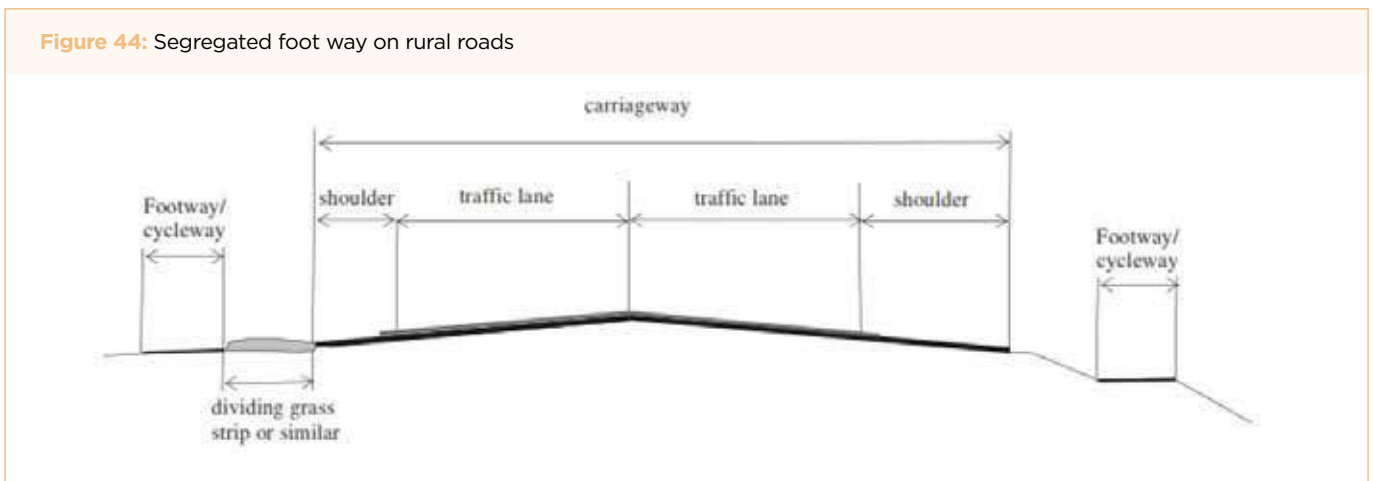
In order to ensure the safety for walking to school in school zones, it is necessary to identify the major villages where students commute from in relation to the location of the school. The design of sidewalks will then be affected by whether the roads in a school zone are urban or rural roads.

4.5.6.1. For rural roads without sidewalks for pedestrians

The conventional opinion of most road developers is that pedestrians, including school going children in rural areas can walk on the road shoulders. The shoulder should be at least 1.5m wide, although 1m is marginally acceptable if there are obstructions. This provision can be acceptable if resources are constrained, however there are safer options of providing a separate footway in school zones as will be discussed below.

In the case where pedestrians shall walk on the shoulders, its recommended that the shoulder surface should be well drained and be as smooth as the traffic lanes, or else pedestrians may prefer to walk in the traffic lane. The implication of this recommendation is that low-cost chip seal shoulders may not be a good investment.

Letting pedestrians use the shoulders is not entirely satisfactory, as there is nothing to protect the pedestrian from speeding traffic especially on narrow lanes and constant obstructions from parked vehicles. This concern is rampant on high-speed and / or high volume roads especially the national roads (Class 1a & 1b paved, Class II paved). In such situations, it is preferable to provide a separate footway several metres beyond the edge of the shoulder - and separated from it by a grass strip as presented in Figure 44.



The decision to provide walkways in road projects is usually contentious and Table 9 provides some criteria for the provision of footways. However, these should be used with caution since in some circumstances footways can be justified at lower pedestrian flows especially around school zones and crash hot spots. For school zones, it is strongly advised that walkways are provided on both sides of the road. Additionally, schools may consider provision of walkways outside their premises as per the requirements of Local Authority or Ministry of Education & Sports.

Table 9: Criteria for Provision of Footways

Location of Footway	Average Daily Vehicle traffic	Pedestrian/ Student flow volume per day	
		Speed Limit of 60-80 km/h	Speed Limit of 80-100 km/h
One Side Only	400 to 1400	300	200
	>1,400	200	120
Both Sides	700 to 1,400	1000	600
	>1,400	600	400

Based on guidance of the Uganda Road Design Manual, 2010 standard foot way widths are as follows;

- Absolute minimum width: 1m (two persons cannot pass each other)
- Desirable minimum width: 1.8m (two persons can pass each other closely)
- Light volume: 2.25m (two persons can pass each other comfortably)
- Heavy volume: 3.5m + (space for three persons)

4.5.6.2. For urban roads

Urban section sidewalks designed should meet 6 minimum requirements as follows:

1. Sidewalks must be accessible to people with disabilities as illustrated in Figures 45 and 46;
2. Pavements are not slippery and height changes should be small;
3. Ramps must be built at critical road junctions to enable access by people with disabilities, usually at a slope of $\leq 10\%$;
4. The pathway must be free of obstacles;
5. Sidewalk lighting systems must provide sufficient illumination without leaving road users dazzled or disrupting their vision;
6. Traffic junctions must have traffic signals and road signs, in addition to audio signals or braille symbols to support persons with visual impairments in crossing the road.

4.5.6.3. Technical requirements for sidewalks in school zones

- The width of sidewalks in urban school zones should be ≥ 2.0 m wide and at least ≥ 50 cm from the edge of the driveway.
- Support solutions could be used to ensure space and safety for pedestrians:
- Using 3.1a lines to define the pedestrian lane boundary on sidewalks;
- Using the 9.5 painted lines - either as texts, numbers or color lines on pavements; both in line with the Traffic Signs & Marking Manual, 2004

▶ 4.5.7 Safety Fences / guard rails in School Zones

In addition to installation of walkways, to ensure pedestrian safety from unwanted impacts of motor vehicles, support solutions can be used, such as safety guardrails. These safety guardrails can be installed at the outer edge of sidewalks, between the pedestrian lane and the driveway or shoulder is present (Figures 46 and 47).

Safety fences /guardrails are installed one after another, with open space at junctions and at crossing points. One more important use of safety fences is the training of school children in crossing at the formally designed crossing point, which is usually protected and with good visibility to motorists, hence ensuring safety in such zones. These installations are between 700 mm and 1,000 mm in height and should have no sharp edges in order to protect children and pedestrians in case of road crashes. The Design of safety fences shall be aesthetically appealing especially in urban sections with a good profile design and painting to avoid rust. The fence could also be in the form of planters with shrubs, brickwork with top planting space or flowers in a row, creating a more aesthetically appealing look. Planters can be in the form of brick work, concrete bowls, wooden planters among others.

Figure 45: Sidewalk access for people with disabilities



Artistic impression by STASSU

Figure 46: Design of sidewalks in a school zone



Artistic impression by STASSU

Figure 47: Safety Fences on sidewalks in school zones



Artistic impression by STASSU

▶ 4.5.8 Speed Management in School zones

According to the Annual Crime & Traffic Report, 2022, Speeding is listed among the top contributing factors leading to crashes. Whereas speed limit signage may be installed in school zones, motorists in Uganda rarely heed to advice of speed limits and barely give way to crossing pedestrians at designated crossings. Speed management is therefore crucial and road infrastructure should be built in such a way that it fits the speed for which it is constructed. This means that school zones meant to be navigated at 30 or 50kph should be provided with infrastructure that depicts safe school zone speeds and is deterrent to motorists driving above the safe speed limits. This can usually be achieved using several engineering measures as explained in the next section.

4.5.8.1 Chicanes, build outs and lane narrowings.

The space requirements for each of the speed management measures will differ and the design engineer will be required to conduct a swept path analysis to determine the specific space requirements for the intervention fitting the location and the traffic mix. Swept path analysis (usually software based) is a study which draws the detailed movement of a Design Vehicle for the particular roads, the extra sweeping of the rear tyres. It is important to simulate the movement of rear tyres (which usually sweep wider than front tyres of a vehicle) to determine the space requirements for the lanes and positions of kerbs in buildouts, chicanes and lane narrowings. Swept Path analysis can further study the movement of vehicle rear tyres (especially if the road has Heavy Goods Vehicles) to determine how wide the lanes and tapers should be at locations of turnings e.g. junctions, roundabouts and accesses. Figure 48 shows sample layouts of Chicanes and Build outs which can be used in school zones for speed management at low speed roads.

Figure 48: Build outs and Lane Narrowings / Chicanes

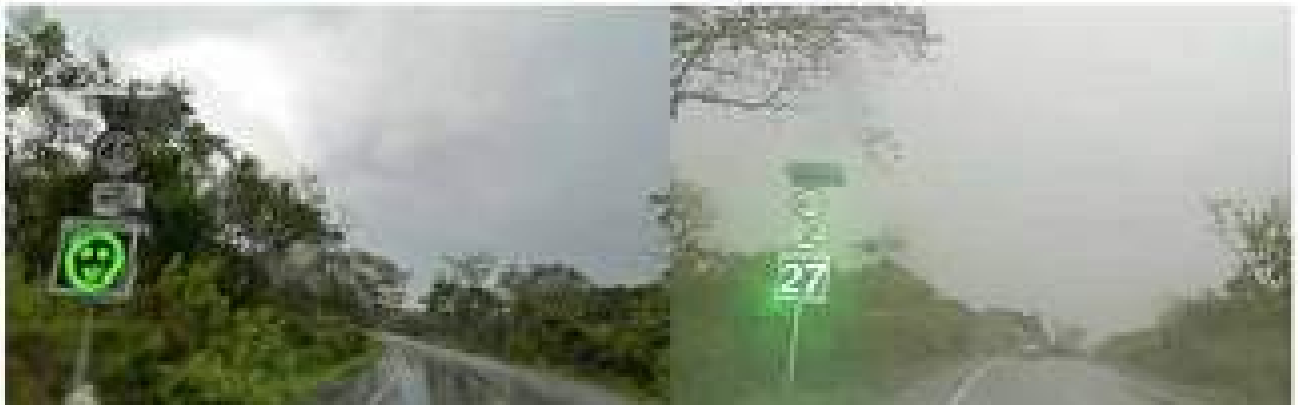


These elements use a horizontal displacement method to take operating speeds of motorists since they slow down while negotiating the curvature of road narrowing at the location. The space inside the kerb extensions can be used for landscaping and beautification especially in school zones located in urban sections. Since road narrowings can constitute a hazard to motorists especially during poor lighting conditions, associated warning signage should be installed in advance to warn motorists of this hazard and information signs to mark the actual location of this narrowing as per the recommendations of the Traffic signs Manual, 2004. Further illuminations can be achieved through use of road studs (especially flickering solar studs) and reflective reboundable bollards installed around the narrowing.

4.5.8.2 Vehicle Activated Speed (VAS)/ Radar Speed Signs

Radar speed signs are traffic control devices strategically placed on the roads to encourage speed reduction by notifying drivers of their current speed versus the posted speed limit. Radar speed signs instantly display a driver's speed, serving as a visual reminder of their current speed compared to the posted limit which helps drivers become more aware of their actions and encourages them to slow down especially through school zones. Radar speed signs act as a proactive measure to slow down speeding vehicles, especially in areas like school zones, residential neighborhoods, and high-risk areas where safety is a concern. Whereas their adoption is still low in Uganda, installation of these can go a long way in reducing conflicts in school zones. Figure 49 shows a sample installation of Vehicle Activated Signs (VAS) in Uganda.

Figure 49: Vehicle Activated Signs (VAS) for speed management



▶ 4.5.9. Design of smart traffic management solutions

Smart traffic management solutions can be adopted in a school zone, including smart parking lots, smart traffic signals and smart road signs, etc. However, this Guide only suggests smart traffic signals and smart road signs for reference purposes. Adoption of these solutions should be in line with industry regulations and standards.

4.5.9.1. Changeable message signs

Whereas fixed signs are helpful in school zones, several occasions may require changeable messages. Changeable message signs are electronic signs that show alternate messages on the same sign. These signs are used to show information which can be altered when required depending on traffic situations. Depending on the purpose, messages on a sign can be instructions, prohibitions, commands, danger warnings, or other warnings. The signs should not be used for advertising, or any illustrations. Flashing lights or moving parts should also not be displayed.

Messages are usually displayed within three lines of text, using up to 20 characters each. Spacing between characters in a word shall be 25% - 40% of the character height (x-height as per the MoWT's Traffic Signs Manual, 2004 or its update). Spacing between words in a message shall be 75% - 100% of the character height (x-height as per the MoWT's Traffic Signs Manual, 2004 or its update). The minimum character size is 300 mm when used in zones where the speed limit is 70 km/h.

In school zones, the volume of road users and vehicles often significantly surges during student drop-off/pick-up, as compared to other times in the day. Therefore, changeable signs can be used to change the driving speed on a route. For example, the speed limit should be 30 km/h during students' arrival and dismissal while, in other time periods, the driving speed can change suitably in accordance with the actual traffic situation on the route.

4.5.9.2. Smart traffic signals

If there is a signalised intersection in the school zone, given the same traffic characteristics in school zones as above, smart traffic signals can be used, with timing intervals programmed and adjusted according to the actual traffic volume on roads. Specifically, green and red intervals depend on the queue length on each road arm at junctions. When a queue is longer than the traffic capacity, potentially leading to traffic congestion, the traffic signals will be automatically adjusted for a longer green interval to allow more vehicles on jammed road segment to go through junctions, while still ensuring that the minimum green interval for one traffic flow direction is 15 seconds.

▶ 4.5.8. Mitigation of other road safety risks

Lighting & Kerb paintings

Uganda has several seasons around the year with some being rainy and others sunny/dry. However, the rainy season produces a lot of fog and limits visibility especially in the western, south western parts of Uganda and mountainous areas. It can get densely foggy at times, limiting visibility and increasing road safety risks. In addition to requirements on the use of reflective signals and road lines (mixed with glass beads), lighting solutions should be adopted from time to time, including installation of electric/ solar street lighting (Figure 50), in addition to active traffic calming measures such as painting or installation of rumble strips. Kerb lines should be painted in white and black to enhance their visibility to motorists in the travel lane adjacent to the walkway as per the URDM, 2010.

Figure 50: School zone street lighting



Artistic impression by STASSU

Figure 51: Sample flashing yellow signals



On several occasions, danger can be anticipated on busy school zones and therefore, flashing yellow signals(Figure 51) can be additionally installed as warnings to remind road users on a need to slow down or to approach with care. The signals can be maintained by connecting them to the main hydro electric power source or solar powered, where a solar plate is installed for each signal.

ROAD SAFETY ASSESSMENT IN SCHOOL ZONES

Section 4.2.2 noted, as part of the process to design and implement safe traffic infrastructure in school zones, assessments pre and post constructions. These assessments can be an opportunity for the road authority, the community, local leaders and even school staff and children to collaborate through a walking inspection around the area and a debrief to agree (or gain an understanding) on the pertinent road safety concerns in any particular school zone. They are also an opportunity to start building community buy-in for proposed interventions

There are a number of ways to assess road safety around school zones. Some are more formal processes required by law with legal procedural standards, such as road safety audits; while others can be used at any time to assess the physical road environment and behavior of users for risks that may lead to crashes or more serious consequences of a crash. Three assessment methods, accessible to any school zone safety stakeholder, are described in this guide.

5.1 Road Safety Audits

A Road Safety Audit is a systematic method of reviewing the design of a new road or a road improvement project from a safety perspective. It involves one set of professionals checking the work of other professionals. It should be carried out in line with the Uganda Road Safety Audit Manual. It has to be undertaken by at least three professionals- one representing the road owner such as a local government official; one representing the road manager such as a contractor; and a certified road safety auditor. The auditor should be independent and not have previously been involved in the design or construction of the road.

A road safety audit can be conducted at various stages of road development such as feasibility studies, preliminary design, detailed design and pre opening stage. Road safety audits can also be carried out during road works, on traffic management schemes, and on existing roads. The objective is to identify and evaluate potential safety issues at the particular stage of road development and suggest modification to mitigate these risks.

The principle behind conducting the safety audit at the road works stage is to ensure that the traffic management plan for each phase of construction is being implemented and that the road works sites during construction are safe for anyone passing through or near the site. The audit at the preopening stage is undertaken to ensure that safety needs of all road users are provided for.

A road safety audit is NOT a check on the compliance to road design manuals/ standards. It aims to go beyond standards to assess how the design is likely to play out in the given context, which includes local traffic conditions, likely road user behavior, and adjacent land use. A road safety audit considers the safety of all users - pedestrians, cyclists, motorcyclists, car passengers. The audit process does not focus on how road users are supposed to behave, rather it focuses on how road users will behave. Accordingly, the recommendations from an audit will typically encapsulate measures to direct user behavior through design interventions.

The principles of the safety audit are established through many years of experience of effective accident remedial programs and studies of the influence of design and traffic management on safety.

Road Safety Audits are proposed during the different stages of road development. However, school zone projects are usually small in scope and activities have short durations, which renders different stages of audits unpractical especially for single location improvements. In that case, it is preferred that at least one safety audit is conducted at the detailed design stage to check any existing concerns and recommend improvements before construction.

5.2 Road Safety Inspections

A Road Safety Inspection is also a systematic method assessing the safety of a road with the objective of identifying existing and potential safety issues and suggesting modifications in road infrastructure to mitigate these risks. A road safety inspection can be conducted before a road is taken up for redevelopment. Alternatively, an inspection can be conducted on existing roads even when there is no immediate plan for redevelopment, wherein the recommendations from the inspection will focus on minor modifications that can be implemented under regular road maintenance and upgradation. Figure 52 for example shows proposed minor improvements

following a safety inspection of the staggered intersection near Kampala Quality Primary school, on Bahai Road, Kampala.

The road safety inspection typically requires many site visit studies at different times of the day, to understand the road dynamics, local traffic conditions, user behavior and adjacent land-use. Road crash data is an important measure in a road safety inspection, in order to understand general trends, as well as to identify 'high risk areas' along the road (locations of concentrated crash risk).

Like the Road safety audit, a road safety inspection is NOT a check on the compliance to road design standards but should go beyond standards to assess how the road infrastructure plays out in the given context, and should consider the safety of all users - pedestrians, cyclists, motorcyclists, car passengers.

In the implementation of safe school zones infrastructure, road safety inspections should be undertaken to assess the existing safety concerns before design, following the completion of construction, and at periodic intervals to monitor the effectiveness of the interventions. They should include a member with technical road safety knowledge such as a traffic or road safety engineer from the road management authority or an external consultant, a member with knowledge about the road user behaviour preferably a traffic police personnel and other non- technical key stakeholders for the particular school zone such as the area local leaders and school management. The member of the road safety inspection team with the technical road safety knowledge should convene a briefing of the entire team before the inspection starts with the aim of relaying the importance of the safety inspection, some of the road safety elements to look out for while on site and safety precautions to be taken by the team during the inspection. The technical member should also listen to the comments and questions from the non- technical members and patiently provide or co-develop answers or solutions based on evidence and best road safety practice, reiterating the safe system principle "Humans can make mistakes but should not be punished with serious injury or death". Findings from the road safety inspections shall be arranged in a report and communicated to a technical person with knowledge of road design preferably a civil engineer, who will then arrange the technical drawings of the recommended solution to inform the construction phase. The road design engineer will further prepare bills of quantities to aid the developing agency or school management in making the investment decisions. The performance of interventions after construction will be assessed and monitored for effectiveness as per the recommendations in chapter 5.

Figure 52: Example of proposed safety improvements at intersection within a school zone



Source: Google Maps

5.3 iRAP Star Rating for Schools (SR4S)

Figure 53: Process of assessment, implementation and evaluation of safety improvements around schools.



Source: <https://starratingforschools.org/how-to/>

The International Road Assessment Program (iRAP) star rating for schools (SR4S) is an evidence-based programme of tools, training and support to measure, and communicate the risk children are exposed to on a journey to school (iRAP, 2014). It has been successfully implemented in 1,356 schools in 70 countries world wide. It is based on knowledge of the road features that affect pedestrian safety and using evidence based research on their impact on safety, calculates a star rating at spot locations with 1-star being the least safe and 5-star the safest. Figure 53 illustrates the process of implementing and evaluating safety improvements around schools.

The National Road Safety Action Plan, 2022 targets for roads including those

around schools to be 3-star or better. A sample of 25 locations around 12 schools assessed in Kampala showed 17 one star locations, 5 two star locations and only 3 three star locations. Exploration within the “demonstrator” tool of the star rating for schools system shows the key remedial measures needed to bring these locations to a minimum of 3 stars are:

- Designation of these areas as 30Kph and below zones
- Implementation of measures to ensure operating speed is 30Kph and below, such as raised crossings, speed calming devices and road diets.
- Implementation of sidewalks on both sides of the road

The SR4S process is aligned with this guide and there are free resources to train various stakeholders to ably participate in the assessments using the iRAP SR4S tools. Once stakeholders are identified to participate in the assessments around the schools, a joint training can be organised to allow a more interactive learning experience. It is also an opportunity for non- technical stakeholders to better understand the impact of the safety features highlighted in the minimum infrastructure requirements in section 4.

Road safety assessment are a crucial part of implementation of safe school zones and should be undertaken before, to identify the key areas requiring intervention and after to monitor and evaluate the impact of the interventions. Assessments should as far as possible be a participatory activity and training of stakeholders who chosen as part of an assessment team should be planned and budgeted for as part of the safety interventions.



EDUCATION, AWARENESS AND COMMUNITY ENGAGEMENT

School zone safety not only affects those accessing the school such as the students, school staff and parents, but also creates safer streets for the entire surrounding community and other road users on the surrounding road network. Awareness regarding the benefits and implementation of safe school zones must be carefully and widely undertaken.

6.1 Education

Education regarding school zone safety should be targeted primarily at empowering learners, schools and the community with the knowledge to advocate for the interventions proven to improve safety around schools and for school journeys such as speed calming, raised crossings, adequate and protected sidewalks, wearing helmets, seat belts and child restraints. Education should not be a stand alone campaign and its efficacy should only be evaluated in light of the interventions that they influence rather than the numbers educated. **The overarching aim of education programs should be to foster an appropriate attitude towards road safety rather than simply impart skills** (Global Road Safety Partnership, 2022).

Education regarding school zone safety should not only focus on the school but also target parents and the community. Currently civil society organisations are supporting the government's road safety education efforts. Safe Way Rightway for example, has facilitated the VIA Road safety Education program- which is specially designed for children and young adults and can be tailored to local environments- in the Albertine region. HOVITA is engaging several government agencies to implement a national road safety school community platform and strengthening the capacity of school communities to promote safe road usage with the following objectives:

- Enhance children's road safety knowledge and skills by integrating road safety activities into the school health clubs
- Enhance communities' road safety knowledge by training of trainers engagement on road safety promotion and safe school zones in order to ensure uptake and embedment of road safety knowledge and best practice.

For such education efforts to be effective, they should be tailored to different age groups and scaled to ensure that they run throughout a learner's primary and secondary education (Global Road Safety Partnership, 2022). They also need to be monitored and evaluated frequently to ensure that they are not only promoting the key principles for safe school zones but also influencing their implementation around schools in Uganda. Road safety is a shared responsibility and embedding road safety knowledge and skills in our schools and communities will require collaboration across multiple public, private and civil society stakeholders.

6.2 Awareness and Community Engagement

Community participation is necessary for the successful operation and public ownership of the school zone and the infrastructure there in. There are already existing frameworks that any person or organization planning to implement a safe school zone should draw upon and engage with to ensure community participation and awareness:

- **Parish development committee or ward development committee:** As per the Uganda government's framework of the parish development model, the parish development committee (PDC) supports the parish chief (or equivalent) to prepare, coordinate and manage action plans and their budgets. The PDC is also responsible for: mobilizing sensitizing and creating awareness on planned actions to the community; ensuring a participatory approach to the identification of needs and priorities of the village or parish; data collection on planned actions; and monitoring and evaluation of projects at village level.
- **School Management committees:** All schools are required to have a school management committee involving a community member, as well as parent and teacher association representative. The school management committee governs the efficient and effective implementation of school activities to ensure a conducive learning environment. Safety of learners on their way to and from the school is one of their priorities, and a vibrant school management committee can be invaluable in engaging with stakeholders of the school with regard to the implementation of safe school zones.
- **Road Safety Committees:** The National National Road Safety Action Plan (launched by MoWT in 2022) proposes the constitution of road safety committees at district level to coordinate road safety activities. It will be necessary to engage with this committee to ensure that the implementation of safe school zones in their jurisdiction are treated with utmost priority.
- **Civil society and community based organisations (CSO and CBO):** Civil society and community based organisations, especially those situated in the vicinity of a school zone in question, should be brought on board, given the right information, and any of their activities relating to the safe school zone, its implementation and related awareness raising coordinated to maximise the impact of awareness raising efforts.

Many of these frameworks except the school management committees and the CSOs and CBOs are new (introduced or implemented within the last two years) therefore their effectiveness in driving change towards safer school zones still requires monitoring and evaluation. While the requirement for school management committees has been in place for over 10 years, the strength of these committees to drive change varies. School management committees for some schools have demonstrated strength in advocating for a better environment for learners and staff while others seem to only exist on paper. The choice on the mix of the different frameworks to draw upon will depend on each school's local context. Individuals or organisations looking to implement a safe school zone are encouraged to first consider collaboration with existing frameworks as far as possible before developing their own engagement frameworks.

All these committees and civil society organisations can be leveraged as a starting point to engage the community with regard to creating buy-in and raising awareness of the need for school zones within the community. They can be invited to participate in the assessments and inspections noted in section 4.2.2, as well as supporting data collection, monitoring and evaluation efforts. They could also participate in any pilots or tactical urbanism interventions prior to the implementation of permanent interventions that are tailored to a particular school zone. It is crucial that lessons learned from leveraging any of new committees or CSOs to drive awareness of the need for safe school zones and influence safe school zone interventions be systematically documented and shared in order to build a body of evidence relating to their efficacy.

Appendix

Appendix 1: Bibliography

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Appendix 2: Examples of possible interventions around existing school zones



Nsambya Estate Road near St. Peter's primary school. Left- current situation; Right- proposed road diet intervention



Gaba Road in front of St. Peter's primary school. Left- current situation; Right- proposed road diet and traffic calming intervention

Appendix 2: Examples of possible interventions around existing school zones (cont.)



Robert Mugabe Road in front of Mbuya Church of Uganda primary school. Left- current situation; Right- proposed road diet and traffic calming intervention



Lugogo Bypass near Kololo Senior Secondary school. Left- current situation; Right- proposed road diet and traffic calming intervention

*Image Credits: World Resources Institute

**These illustrations in Appendix 1 are part of school area assessments undertaken before (and not part of) the development of this guide, therefore, their specifications may not be in line with the Uganda road signs and road marking manuals. Their inclusion here is to illustrate the changes in the road space before and after implementation of some safety features for school zones, including, walkways protected by a buffer space, raised crossings and covering of open drains. Actual implementation of such features and their complementary signage should be as guided in section 4 of this guide.

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Appendix 4: Attendance List for Validation of Safe School Zone Guidelines (cont.)

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Appendix 5: Attendance List for the Consultative Meeting with the Senior officials Ministry of Works and Transport on Safe School Zone Guidelines.

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