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Operational Guideline 37

School Bus Stops in Rural Areas

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Contents

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1 POLICY

Main Roads WA will install *Children Warning* signs in rural areas where deemed appropriate, to enhance the safety of passengers and motorists alike. Main Roads WA will work with Public Transport Authority School Bus Services (PTASBS) to identify locations, providing design input to enable the approval of more formalised facilities where appropriate.

2 PURPOSE

The purpose of this document is to detail Main Roads WA's policy and guidelines for assessing School Bus Stops in Rural Areas.

The Policy and Guidelines shall be applied where assessment on safety and/or amenity grounds of a particular road indicates that a school bus stop is required.

3 SCOPE

This policy is to be applied to provide a consistent approach to limiting or approving the installation or relocation, where necessary, of school bus stops and the installation of Children Signs on all highways and main roads in Western Australia. Local authorities are encouraged to adopt similar standards for local roads.

4 BACKGROUND

School bus stops in rural areas are places where children are picked up and set down by school bus contractors. In rural areas they may take many forms depending on the level of sustained passenger demand and other factors detailed in this document. The locations are often not marked by a post such as a conventional bus stop, but rather by the presence of children (see picture below).

The safety problems are typically associated with buses stopping at a particular location with poor visibility or insufficient passing width, and not being able to pull entirely off a carriageway. Buses in these situations are at risk of being hit by a following vehicle or overtaking vehicle or an overtaking vehicle is in danger of colliding with on-coming traffic. The risks are greater on more heavily trafficked roads, particularly those carrying high volumes of heavy vehicles.

Policy relating to the location and designation of bus stops, as well as the matter of where they should best be located are therefore matters under continuous review. The process has involved seeking the views of Main Roads WA regional staff, canvassing other State Road and Traffic Authorities about the issue as well as reviewing relevant traffic laws and responsibilities.

4.1 Traffic Laws & The Provision of Signs / Bus Stop Posts

It is important to understand the laws that relate to the actions of buses stopping along rural roads to pick up and set down children. There are two parts – one that relates to responsibility for providing necessary signs to indicate stopping places and the second that relates to the action of stopping. They are detailed and discussed in the following.

The Commissioner of Main Roads is responsible, under the provisions of Regulation 297 of the Road Traffic Code 2000, for approving the installation and removal of bus stops and any other road signs. The Commissioner may also delegate that responsibility. Other pertinent sub-regulations are as follows:

- Regulation 162 *Restriction on stopping on crests, curves etc.*
- Regulation 168 *Stopping on a carriageway – heavy and long vehicles.*
- Regulation 176 *Parallel parking on a carriageway (except in a parking area).*

(Refer to the Road Traffic Code 2000 for a full description of these traffic regulations).

4.2 Criteria

The criterion for installation of Children Warning Signs and Bus Embayments on state roads or national highways are under the following conditions.

In all cases the safety of proposed school bus stop locations (including the possibility of safer alternative locations nearby) should be investigated prior to installing signage and/or embayments.

4.2.1 Children Warning Signs

Should be installed on main roads where there is limited visibility of the stopped bus. These distances are shown in Table 5.1 and 5.2, also refer to section 5.7 for School Bus Stop Signing.

4.2.2 Bus Embayments

Gravel bus embayments may be approved for installation at children's pickup points on main roads and highways where:

- The bus cannot stop completely off the sealed carriageway and/or stand 3 metres clear of the road centre on single carriageways.
  OR;

- An embayment can be justified based on traffic volumes, sight distance, heavy vehicle volumes and other criteria as in this Guideline.

Sealed bus embayments may be approved for installation at children's pickup points on main roads and highways where:

- Several children from various locations meet at such collection points and the longevity of the collection point can be ascertained through regional discussions with PTASBS. These locations also must be referred to Main Roads Rural Network Operations Management Manager for endorsement.

Note:

- Embayments shall be designed to ensure the safe ingress and egress of buses from traffic flow.
- Embayments shall be removed once they are no longer required.
- The cost of building or maintaining facilities is not met by Main Roads WA, however proponents must meet requirements set out by Main Roads WA prior to installation. Main Roads WA may maintain embayment surfaces if it aligns with other scheduled maintenance activities.

5 GUIDELINES AND ASSESSMENT – SCHOOL BUS STOPS AND EMBAYMENTS

This section outlines the guidelines for good practice for the safety assessment of locations for rural school bus stops considering factors such as crash history, visibility, roadway characteristics, traffic characteristics, school bus stop locations, signing, passenger waiting facilities and pedestrian facilities.

5.1 General

The location of school bus stops should be carefully evaluated to enhance the safety and convenience for school children using the facilities and/or for other road users. Generally, school bus stops should be located and designed to:

a) maximise the safety of school children and other road users; and
b) minimise the interference to traffic flow on the road system.

In general, the location and/or design of school bus stopping places should satisfy the design criteria contained in the traffic engineering and road design guidelines / manuals (e.g. AUSTROADS' Guide to Traffic Engineering Practice, AS 1742 Manual of Uniform Traffic Control Devices, Main Roads Road Planning and Design Manual etc).

Further considerations for good practice in relation to school bus stopping locations, design and safety should include issues such as:

- crash history in the vicinity of the school bus stop,
- visibility to / from the school bus stop activities,
- provisions for passing zones at the school bus stop,
- roadway characteristics in the vicinity of the school bus stop,

- traffic characteristics in the vicinity of the school bus stop,
- provisions for bus stop facilities at intersections and mid-blocks,
- signing specifically for school bus stops and crossing areas,
- provisions for passenger waiting facilities, and
- provisions for pedestrian facilities.

These issues are further discussed in the following sections.

5.2 Crash History

Crashes in most instances have multiple causal factors. Studies have shown that the three contributing factors in motor vehicle crashes (and their involvement) are:

- human factors (which are involved in around 95% of crashes),
- road environment factors (which are involved in some 28% of crashes), and
- vehicle factors (which are involved in around 8% of crashes).

Analysis of crash data at a particular site or road section may identify the causal factors and subsequently remedial treatments may be recommended.

Thus, the following crash criterion should be considered when assessing school bus stops:

- All crash data should be considered when assessing school bus stop locations.
- School bus stops should not be located in areas with a history of particular types of crashes (e.g. run-off the road crashes etc) which may place the school bus stop activities (e.g. children waiting at stop, bus stopping etc) at risk.

5.3 Visibility Issues

5.3.1 Visibility

Drivers need sufficient visibility along a road to avoid collision, especially with respect to events such as stopped school buses, children crossing etc.

The optimum locations for school bus stops are locations on sections of a road with a straight alignment and uniform gradient. School bus stops should not be located in unexpected situations and/or at locations with limited visibility, such as just around sharp horizontal curves, or just over crests etc.

The visibility of the school bus stop should be adequate so that:

- following vehicles can stop or slow down safely behind the school bus while the bus is entering or leaving the bus stop; and/or
- vehicles can safely pass the school bus while it is engaged in pick up/set down activities.

Thus, the following visibility criteria should be considered when assessing school bus stops:

- The school bus stopping location and its activities should be conspicuous to all road users.
- Where sight distance is restricted, school bus stops should be avoided in the vicinity of sharp curves or severe changes in vertical alignment. Ideally in relation to visibility issues, school bus stops should be located on sections of relatively straight and flat roadway.

Where school bus stops need to be located in less than ideal locations, other measures (e.g. signing, providing full pull-off areas for the bus etc.) should be considered for increasing the conspicuity of the hazard and improving safety. Where children are required to cross the roadway at such locations, serious consideration should be given to relocating the bus stop to a safer location and ensuring a safe travel path is provided for the children.

School bus stops and their associated activities should not be obstructed by vegetation, roadside objects, bridge abutments, etc. Where necessary, measures such as removing or selective clearing of vegetation, benching of embankments etc., should be considered for increasing the conspicuity of the site and improving safety.

The school bus stop and its activities should be adequately visible in all relevant lighting and weather conditions. Where visibility is deficient under one or more of such conditions and safety may be compromised, other measures such as signing, delineation etc. should be considered to warn motorists of the potential hazards associated with the school bus stop activities during adverse weather conditions.

5.3.2 Stopping Sight Distances

Approach sight distance appropriate to the approach speed should be provided on each approach to the bus stop. This is the minimum distance that is required by the driver of a vehicle to observe the school bus at the bus stop, children crossing at the bus stop, etc. in sufficient time to react and stop if necessary, before entering the conflict area.

Generally, the same stopping sight distance criterion is applied to all passenger vehicles and buses/trucks where the driver's eye height is 1.1m and 2.4m, respectively. This is based on the assumption that even though buses and trucks generally require longer braking distances, the bus/truck drivers are generally able to see the vertical features of obstructions substantially farther ahead due to their higher position. The only exception is where vertical obstructions are on the inside of curves, where the greater eye height of the driver is of no value in compensating for the longer stopping distances. In such situations, longer stopping distances should be provided for buses/trucks (Refer Table 5.2). However, site specific assessments for heavy vehicle routes should be undertaken to determine if additional stopping distances need to be considered.

Thus, the following visibility criterion should be considered when assessing school bus stops:

- Adequate stopping sight distances to the school bus stop and its activities should be made available to approaching drivers, especially if children are required to cross the roadway.
- Where the minimum stopping sight distance is not attainable, other measures, such as signing, providing a high friction surface etc, should be considered for increasing the conspicuity of hazards (i.e. stopped bus and children) and reducing crash risk. Refer Tables 5.1 and 5.2 for minimum stopping sight distances.
- It should be noted that stopped buses within the traffic lane, on or near a crest or curve may also be in breach of Traffic Legislation. That is, a driver must not stop on or near a crest or curve on a length of road that is not in a built-up area unless the driver's vehicle is visible for 150m to drivers approaching the vehicle and traveling in the direction of travel of traffic on the same side of the road as the vehicle.

Speed (km/h)	Minimum Stopping Sight Distances (m)						
	Upgrade			Flat	Downgrade		
	2%	4%	6%	**0%**	2%	4%	6%
80	146	142	138	**151**	156	162	169
90	173	168	163	**179**	185	192	201
100	202	195	190	**209**	217	225	235
110*	202	195	190	**209**	217	225	235

Table 5.1 Minimum Stopping Sight Distances (Sealed Roads)

[SOURCE: AUSTROADS (2021) *Guide to Road Design, Part 3 - Geometric Design, table 5.5*], reaction time 2.5 seconds, coefficient of deceleration 0.36.

† Where there are more than 10% heavy vehicles additional stopping sight distance should be provided for trucks (Refer Table 5.2).
*Design speed is taken as 10km/h above posted speed limit except in 110km/h speed zones.

Speed Environment (km/h)	Minimum Stopping Sight Distance (m)*
	Flat (i.e. 0%)
80	**142**
90	**172**
100	**205**
110	**241**

Table 5.2 Minimum Stopping Sight Distances for Buses/Trucks

[SOURCE: AUSTROADS (2021) *Guide to Road Design, Part 3 - Geometric Design, table 5.6*],
*Distances to be further increased where heavy vehicles exceed B-Double configuration.

5.3.3 Passing of Stopped Buses

Safe and effective passing at bus stops on two lane roads require both adequate sight distance to opposing vehicles. Passing sight distance is needed to ensure that passing drivers have a sufficiently clear view ahead to minimise the possibility of collision with an opposing vehicle. The length of the passing zone needs take account of the length of the bus being overtaken and the speed of approaching vehicles.

Thus, the following visibility criterion should be considered when assessing school bus stops:

- Adequate passing opportunities should be available at school bus stop locations for following vehicles.
- To allow for safe passing of vehicles at bus stops, it may be necessary to provide embayment for buses to stop. It should be noted that in accordance with Traffic Legislation where there is a continuous dividing line or dividing strip the driver must position the vehicle at least 3 metres from any such dividing line or dividing strip.

5.4 Roadway Characteristics

5.4.1 Roadway Grades

Grades in the road cause speed disparities between vehicle types, leading to increased queuing and overtaking requirements. The increased overtaking requirements and reduced level of service can give rise to operational and safety problems at higher traffic flows.

The safety aspect of uphill operation also relates to speed disparities. Rear-end crashes can occur where the driver of a vehicle comes unexpectedly across a slow moving vehicle.

Thus, the following roadway criterion should be considered when assessing school bus stops:

- The school bus stop should be appropriately located in relation to the roadway grade and auxiliary lane facilities.
- School bus stops should be located in relation to grades such that adequate sight distance is achieved (refer Section 5.3.1 and 5.3.2) and school bus performance is not excessively retarded so as to become a hazard and/or impede general traffic flows. For example, where visibility is not an issue and where grades are very steep school bus stops should be avoided in sag curves or on the grade incline due to the difficulty and hazard of braking and/or accelerating amid general traffic.
- School bus stops should not be located within overtaking lanes or within tapering sections of auxiliary lanes (e.g. overtaking lanes, climbing lanes, descending lanes, turning lanes, passing bays, etc).

5.4.2 Lanes and Shoulders

Wide traffic lanes and shoulders provide drivers with increased opportunity for safe recovery when their vehicles run off the road, and also provide increased lateral separation between overtaking and passing vehicles. Additional safety benefits include reduced interruption from school bus stopping, emergency stopping and road maintenance activities, less wear at the bitumen edge, improved sight distance at critical horizontal curves, and possibility of improved pavement structural support/pavement drainage.

Thus, the following carriageway criterion should be considered when assessing school bus stops:

- Adequate road shoulders should be provided to improve safety at school bus stops.
- Wider road shoulder widths (e.g. 3.5 metres or wider, etc) allow bus's to stop clear of the traffic lanes. Where the route carries a high volume of heavy vehicles (e.g. greater than 10%) and/or the incidence of bus stopping is high, wider shoulders are desirable.
- Traffic Legislation states that the driver of a heavy vehicle, or long vehicle, must not stop on a length of road that is not in a built-up area, except on the shoulder of the road. Therefore, where larger (>7.5m) stopped school bus's either partially or fully obstructs the traffic lanes, widening of road shoulders should be carried out to provide full clearance to traffic lanes.

5.4.3 Road Surface Condition

Irregularities or defects in the roadway surface could adversely affect the controllability of the vehicle and thus could increase the chance of driver error and the likelihood of a crash.
Thus, the following criterion should be considered when assessing school bus stops:

- The road surface material at the school bus stop should be suitable for bus performance under all weather conditions.
- Where the road surface performance at the bus stop is deficient under wet weather conditions (e.g. low skid resistance, etc) and safety of the bus and passengers may be compromised, consideration should be given to a more appropriate surface material (e.g. gravel, bitumen, etc).

5.5 Traffic Characteristics

5.5.1 Traffic Volume, Speed and Composition

High traffic volumes on a two lane road may result in a higher level of bunching of vehicles and/or lower operating speeds, which may in turn cause unnecessary risk taking by motorists due to such factors as frustration, impatience, etc. This risk taking may affect or compromise the safety of other road users.

Roads with high traffic speed and a large proportion of heavy vehicles present a higher risk situation to road users. Thus, the following traffic criterion should be considered when assessing school bus stops:

- Provision should be made for the school bus to stop clear of the traffic lanes especially where traffic volumes, speed environments and/or the percentage of heavy vehicles, towing vehicles etc, are high.

The factors influencing the traffic efficiency and road safety on roads due to school bus operations are typically:

- traffic volumes during school bus operation times
- speed environment
- traffic composition (e.g. high proportion of heavy vehicles, towing vehicles, etc)
- frequency of school bus stopping
- lengths of time school bus stopped
- probability of passing vehicles (i.e. gaps)
- terrain
- road conditions

Where the traffic efficiency and/or road safety are compromised due to the school bus operations by one or more of these factors, consideration should be given to the provision of pick-up/set-down facilities (or similar) for the school bus.

School bus stops should be discouraged in high speed environments (e.g. greater than 100 km/h), particularly on major roads (e.g. arterial roads, etc), and/or where the proportion of heavy vehicles, towing vehicles, or similar, using the route during school bus operations, are considered to be high (e.g. greater than 10%). Heavy vehicles, towing vehicles etc, present a higher risk situation, especially to children waiting at the roadside or crossing the road (e.g. eye heights, stopping distances, clearances etc).

Where school bus stops are located in such environments, other measures such as appropriate bus stopping facilities, children's waiting facilities/areas, and children's travel paths/crossing locations should be provided considering the traffic composition and speed. For example, these initiatives

include the provision of a facility for bus re-entry into the traffic stream at bus stopping areas, ensuring that the location of waiting children is conspicuous to all motorists, the provision of a waiting area that is appropriately distanced from the traffic lanes and the provision of a safe crossing of the carriageway for children.

5.6 School Bus Stop Locations

5.6.1 At Parking Bays

There are many locations along routes that provide for safe ingress and egress of vehicles including buses. Examples include parking bays and rest areas, which are good locations for considering for school bus stop use.

5.6.2 At Driveways

Driveways are often wide enough to provide a pull off provision for a bus stop and can be appropriate for school bus stop use. Consideration of sight distances for safe ingress and egress is required at these locations.

5.6.3 At Intersections

As stopped/stopping buses cause conflicts in traffic, locating bus stops at intersections minimises the conflict area and potential impact speeds. However, the effect of bus stops on intersection sight distance requirements and the visibility and location of pedestrian crossings should always be considered. Investigation into the volume of traffic on the side road, available parking and turn around areas are also factors to consider.

From the bus passenger and pedestrian safety viewpoint, a bus stop located on the departure side of the intersection into the side road is safer than one located on the approach side as children cross behind the bus where they can be seen. In this position, the bus does not block the view of traffic controls and other intersection traffic.

Other advantages of the departure side bus stop include:

- reduced bus conflicts with turning vehicles;
- not inhibiting through road movements;
- not inhibiting sight distances at intersections; and
- easier bus re-entry into slow moving traffic after passenger loading / unloading.

Thus, the following intersection criteria should be considered when assessing school bus stops:

- The school bus stop should be located on the departure side of intersections, children's crossing locations, and property accesses, where possible.
- To avoid misinterpretation of a bus driver's intention to stop at the departure side of the intersection as turning left, the bus stop should be located approximately 50 metres beyond the intersection, particularly on side roads with higher traffic volumes.
- School bus stops should not be located opposite the terminating leg of a T-junction for safety and efficiency reasons.

5.6.4 At Mid-Blocks

As mentioned in the previous section, full pick-up/set-down areas can be provided where justifiable so buses can load and unload passengers clear of through traffic.

Where there is a possibility of buses from opposite directions arriving concurrently at a school bus stopping location on an undivided road, the school bus stops should be staggered or full pick up/set-down areas provided to avoid the creation of a bottleneck. In the former situation, the bus stops should be staggered with the rear of the buses opposite each other, so as to encourage children to always cross the road behind the school bus where sight distance between children and other traffic is best. When buses are not fully clear of the traffic lanes an appropriate stagger distance (i.e., between the rears of the stopped buses) should be provided to ensure other vehicles can safely pass.

Existing parking bays may also locations that can be safe locations for buses to pick up or drop off passengers.

5.7 School Bus Stop Signing

Traffic signs are provided to aid in the safe and orderly movement of traffic. It is therefore essential to ensure uniformity of applications of signs. Similar conditions should always be treated with the same type of sign, so that road users can readily anticipate the course of action required. The use of a sign which is at variance with its use elsewhere is confusing, and consequently creates a potentially hazardous situation.

Furthermore, the AS 1742 Manual of Uniform Traffic Control Devices also stresses the significance of loss in effectiveness of warning signs if used unnecessarily or too frequently. Their use should be restricted to the minimum and consistent with safety requirements. A warning sign should not be used if, under normal conditions, the motorist can be expected to see and appreciate the potential hazard ahead.

Thus, the following signing criteria should be considered when assessing school bus stops:

- A school bus stopping location should only be signed as a school bus stop where sight distance is restricted and cannot be sufficiently improved.

In accordance with the AS 1742 Manual of Uniform Traffic Control Devices, the Children sign (W6-3) should only be used in advance of school bus stops in rural areas where visibility for approaching drivers of any children waiting at the stop is less than 200 metres.

Children Sign (W6-3)

It is not intended that these signs be used at all school bus stops. To improve safety, the first consideration should be given to relocating the bus stop to a location with adequate visibility.

Where sight distance is adequate to the school bus stopping location (i.e. greater than 200 metres) these signs generally should not be used. In such situations it is considered that the signing on the school bus and the operation of the bus flashing lights during stops are more effective in alerting other road users of the likely presence of children than the use of permanent warning signs.

Note: To maintain credibility of these signs it is important that Children signs be removed as soon as the situation ceases to warrant such signing.

5.8 Passenger Waiting Facilities

Similar to bus bays the cost of waiting facilities is not met by Main Roads WA however proponents must meet guidelines and Main Roads WA design review and approval prior to installation.

5.8.1 Waiting Areas

Waiting areas for children are typically adjacent to the school bus stop and provide children with a safe area to wait for the school bus. The areas should be level, well drained and free from tripping hazards, and may be gravelled, sealed, etc. Shade provisions may also need to be a consideration in some locations.

Waiting areas are not provided at set down stops where children would normally just step off a school bus to walk (without waiting) to their destination.

Thus, the following passenger waiting criteria should be considered when assessing school bus stops:

- Where needed, waiting areas should be provided at school bus stops for school children to assemble and disperse.
- Children's waiting areas should be located as far as possible from the traffic lanes for their safety.
- Waiting areas should desirably be located beyond the clear zone.

5.8.2 Passenger Infrastructure

Bus shelters provide the children with weather protection. Shelter location is an important consideration because the shelter may restrict sight distances of drivers leaving side roads or property accesses, be within the clear zone for the speed environment, etc. If the shelter is located too close to the traffic lanes, the restricted space between the fixed shelter and the moving school bus can become hazardous to children.

Thus, the following passenger facility criteria should be considered when assessing school bus routes and school bus stops:

- Passenger shelters may be provided where there is a demonstrated need. The need should be determined from factors such as, passenger demand, stop permanency, passenger waiting duration, passenger convenience (e.g. from heat, rain, etc).
- The shelter should be located such that the bus driver is able to see the waiting children in time to stop the school bus.

- Speed environment and physical features should be considered in the location of the shelter in relation to the traffic lanes.
- Desirably shelters should be located beyond the clear zone so as not to become a hazard to road users.

5.8.3 Parking Facilities

Safe parking facilities (i.e. roadside parking, separate parking area, etc) should be available at school bus stops where parents assemble with vehicles to drop-off/collect children.

Parked/stopping vehicles should not create hazardous situations for any road users. Adequate area should be available to permit parents to park their vehicle, drop-off children and collect them safely with minimal disruption to traffic. Where needed, a separate parking facility should be considered.

Thus, the following parking criteria should be considered when assessing school bus stops:

- Provisions for safe parking facilities should be considered at school bus stops where parents assemble with vehicles to drop-off/collect children.
- Parking availability in all appropriate weather conditions (i.e. dry, wet, etc) and accesses of parking facilities (where applicable) needs to be considered.

5.9 Pedestrian Facilities

Pedestrian facilities such as crossings and refuges should only be provided where warranted. The warrants for these facilities are outlined in the Manual of Uniform Traffic Control Devices.

Generally, young children lack the skills and road sense that are typically acquired at a later age, which enable people to behave safely on the road. Thus, the following pedestrian facility criteria should be considered when assessing school bus stops:

- Where necessary, safe pedestrian crossing opportunities should be provided at the school bus stop.
- Safe crossing opportunities should be provided for children considering:
  - conspicuity of children at the side of the road,
  - visibility from both the driver's and children's viewpoints,
  - crossing distance.
- Where applicable, school bus stops should be located as close as practical to existing pedestrian crossing facilities. In such cases the school bus stop should be located on the departure side of the crossing, at a minimum distance of ten (10) metres from the crossing. If there is a need to locate the bus stop on the approach side of the crossing, the bus stop should be a minimum of twenty (20) metres from the crossing.
- Safe travel paths should be available for children to travel to/from the school bus stop.
- The need for children to walk along the edge of a vehicle carriageway should be avoided where possible, especially on roads where the traffic speed, volume and proportion of heavy vehicles are high. In such situations, travel paths at the maximum distance from the traffic lanes should be cleared/provided for children to access.

6 REFERENCES AND RELATED DOCUMENTS

Document Number	Description
	AS1742 Manual of Uniform Traffic Control Devices
	AS1742.2 Traffic control devices for general use
	AS1742.10 Pedestrian control and protection
	AS1742.12 Buses transit and truck lanes
	Road Traffic Code 2000
	Austroads (2016) Guide to Road Design Part 3 Geometric Design
	Main Roads Western Australia Technical Standards

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