

Auditors need to focus on 3 key elements when applying Safe System principles to the road safety audit process:

- Crash Severity;
- Crash Exposure; and
- Crash Likelihood

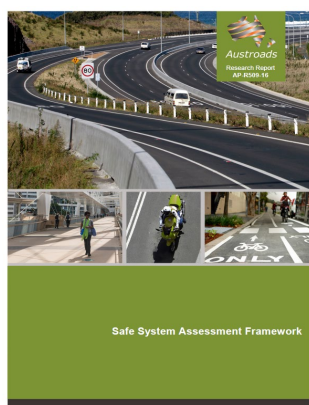
Auditors when applying the road safety audit process should provide emphasis to any road safety audit findings that have the potential to result in Fatal or Serious Injury (FSI) crashes.

- Head-on crashes > 70 km/h;
- Right-angle crashes > 50 km/h;
- Run off road impact object crashes > 40 km/h; and
- Crashes involving vulnerable road users > 30 km/h

Crash Exposure

For the application of crash exposure the revised audit process has adopted the crash exposure volume ranges provided in the *Austroads Safe System Assessment Framework*, which defines Crash exposure as: road users in what numbers and for how long are using the road and are thus exposed to a potential crash.

For the application of crash exposure auditors should refer the road user number ranges provided in Table 4.4 in the *Austroads Safe System Assessment Framework*.

[illegible]

The level of Crash exposure identified is categorised as either “**LOW**” “**MODERATE**” “**HIGH**” or “**VERY HIGH**”.

Crash Likelihood

The final element auditors need to consider for all findings with a potential FSI crash outcome deemed a **“FSI CRASH RISK”** is the overall level of Crash Likelihood.

This is defined in the Austroads Safe System Assessment Framework as: a group of factors affecting the probability of crash occurring, including issues such as the level of intersection control, speed, sight distance, geometric alignment, driver guidance and warning.

This should be considered by auditors by applying their road safety engineering experience, using the category of crash exposure identified in the previous step as a starting point and then consider various other aspects of each finding location to determine the overall level of Crash Likelihood.

This can either be the same, higher or lower than the level of crash exposure identified in the previous step. With the overall crash likelihood defined as either **“LOW” “MODERATE” “HIGH”** or **“VERY HIGH”**

This annotation is then displayed next to the additional annotation **“FSI CRASH RISK”** on applicable road safety audit findings.

E.g. **[FSI CRASH RISK | MODERATE]**

Safe System Finding Example

The photograph below shows an example of a site at an intersection with restricted Safe Intersection Sight Distance (SISD) on a road with a 110 km/h speed limit.



Crash Severity

This location has a right angle crash risk with a potential impact speed far in excess of > 50 km/h, hence it is a Safe System finding and it should have the additional annotation “**FSI CRASH RISK**” associated with the finding.

Crash Exposure

The traffic volume at the site is 3500 vehicles per day and when referring to Table 4.4 of the *Austrroads Safe System Assessment Framework* we can see that the level of exposure is found to be “**MODERATE**”

Table 4.4: Safe System matrix scoring system

Road user exposure	Crash likelihood	Crash severity
0 = there is no exposure to a certain crash type. This might mean there is no side flow or intersecting roads, no cyclists, no pedestrians, or motorcyclists.	0 = there is only minimal chance that a given crash type can occur for an individual road user given the infrastructure in place. Only extreme behaviour or substantial vehicle failure could lead to a crash. This may mean, for example, that two traffic streams do not cross at grade, or that pedestrians do not cross the road.	0 = should a crash occur, there is only minimal chance that it will result in a fatality or serious injury to the relevant road user involved. This might mean that kinetic energies transferred during the crash are low enough not to cause a fatal or serious injury (FSI), or that excessive kinetic energies are effectively redirected/dissipated before being transferred to the road user. Users may refer to Safe System: critical impact speeds for different crash types, while considering impact angles, and types of roadside hazards/barriers present.
1 = volumes of vehicles that may be involved in a particular crash type are particularly low, and therefore exposure is low. For run-of-road, head-on, intersection and other crash types, AADT is < 1 000 per day. For cyclist, pedestrian and motorcycle crash types, volumes are < 10 units per day.	1 = it is highly unlikely that a given crash type will occur.	1 = should a crash occur, it is highly unlikely that it will result in a fatality or serious injury to any road user involved. Kinetic energies must be fairly low during a crash, or the majority is effectively dissipated before reaching the road user.
2 = volumes of vehicles that may be involved in a particular crash type are moderate. For run-of-road, head-on, intersection and other crash types, AADT is between 1 000 and 5 000 per day. For cyclist, pedestrian and motorcycle crash types, volumes are 10-50 units per day.	2 = it is unlikely that a given crash type will occur.	2 = should a crash occur, it is unlikely that it will result in a fatality or serious injury to any road user involved. Kinetic energies are moderate, and the majority of the time they are effectively dissipated before reaching the road user.
3 = volumes of vehicles that may be involved in a particular crash type are high, and therefore exposure is high. For run-of-road, head-on, intersection and other crash types, AADT is between 5 000 and 10 000 per day. For cyclist, pedestrian and motorcycle crash types, volumes are 50-100 units per day.	3 = it is likely that a given crash type will occur.	3 = should a crash occur, it is likely that it will result in a fatality or serious injury to any road user involved. Kinetic energies are moderate, but are not effectively dissipated and therefore may or may not result in an FSI.
4 = volumes of vehicles that may be involved in a particular crash type are very high, or the road is very long, and therefore exposure is very high. For run-of-road, head-on, intersection and other crash types, AADT is > 10 000 per day. For cyclist, pedestrian and motorcycle crash types, volumes are > 100 units per day.	4 = the likelihood of individual road user errors leading to a crash is high given the infrastructure in place (e.g. high approach speed to a sharp curve, priority movement control, flaring right turn across several opposing lanes, high speed).	4 = should a crash occur, it is highly likely that it will result in a fatality or serious injury to any road user involved. Kinetic energies are high enough to cause an FSI crash, and it is unlikely that the forces will be dissipated before reaching the road user.

Crash Likelihood

Auditors then need to apply their road safety engineering experience to determine the overall crash likelihood using the level of exposure identified in the previous step as a starting point.

Remember, the overall crash likelihood can be either the same, lower or higher than the level of crash exposure identified in the previous step.

Examples of reasons an auditor may elect to increase the “**MODERATE**” exposure level to “**HIGH**” or even “**VERY HIGH**” overall Crash Likelihood in this example could include:

- a high traffic volume entering from the side road;
- a right angle crash history; or
- the intersection may be located on a crest or curve with severely restricting sight lines.

If none of these conditions exist, the auditor may decide to leave the overall crash likelihood as “**MODERATE**”.

Alternatively, an example where an auditor may elect to reduce the level from “**MODERATE**” exposure level to “**LOW**” overall Crash Likelihood in this example could include:

- a very low traffic volume entering from the side road with no crash history.

All Other Findings

All other findings shall have the annotation “**CRASH RISK**” displayed using black text and should be risk assessed to determine each findings overall crash likelihood using the same process as applied to Safe System findings by considering the crash exposure as the starting point to determine the overall crash likelihood.

The exposure and likelihood of crash occurrence should be considered for all other findings and be evaluated based on an auditors professional judgement. Auditors should consider factors such as, traffic volumes and movements, speed environment, crash history and the road environment, and apply road safety engineering and crash investigation experience to determine the likelihood of crash occurrence. The likelihood of crash occurrence shall be considered either “**VERY HIGH**”, “**HIGH**”, “**MODERATE**” or “**LOW**” and this annotation shall be displayed using black text following the “**CRASH RISK**” annotation on applicable findings.

This can either be the same, higher or lower than the level of crash exposure. With the overall crash likelihood defined as either “**LOW**” “**MODERATE**” “**HIGH**” or “**VERY HIGH**”

This annotation is then displayed next to the additional annotation “**CRASH RISK**” on applicable road safety audit findings.

E.g. [**CRASH RISK | MODERATE**]