Convex Traffic Mirrors

Operational Instruction
Convex Traffic Mirrors - 2.3

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1. **Scope**

These guidelines have been prepared to provide practitioners with the fundamental considerations necessary to assist in determining whether a convex traffic mirror should be used in the road environment.

2. **Background**

Convex mirrors are commonly used for security and safety reasons to overcome sight restriction problems in visibility deficient areas. Their use for safety is now widely accepted in low speed vehicle and pedestrian conflict areas such as warehouse driveways, truck loading bays and parking areas. They are also increasingly being used in the public road environment by private individuals at sight restricted private property accesses (see Operational Instruction 2.2 - Concealed Property Accesses).

3. **Properties**

To provide an image sufficient to see large areas, it is necessary to use mirrors with a convex surface. However the convex shape of the mirror results in the image, speed and distance of the object being distorted. The degree of distortion depends on the radius of the curvature and the size of the convex safety mirror. The larger the radius of curvature the lesser the distortion and vice versa.

The image appears to be smaller, further away and travelling at a slower speed in a mirror with a smaller radius of curvature. A convex safety mirror with a small radius of curvature will also provide too much detail in a small area, which will hamper road users discriminating ability. It takes some time for road users to understand and interpret the information provided by a convex safety mirror.

In addition to distortion effects, the image of a vehicle in a convex safety mirror appears to be on the wrong side of the road. This is due to the “lateral inversion” of the image created by the mirror. This lateral inversion or mirror image effect can result in road users misinterpreting the images. This misinterpretation is seen as a serious limitation. However, the purpose of a convex safety mirror is simply to indicate to the road user, the presence or absence of a moving or stationary vehicle and/or pedestrian.

Dark blue, black and other dark colours are difficult to detect in these mirrors in the early morning or late afternoon as these colours appear to be absorbed by the road surface colour.

4. **Road Safety Assessment**

The particular circumstances of the proposed installation of a convex safety mirror needs to be assessed from a road safety perspective using documented road safety audit procedures before a decision is made to install a convex safety mirror on a public road. Considering the problems inherent in the design and in the use of convex safety mirrors, the road safety assessment must show that there are safety benefits in installing the mirror over installing other traffic management, engineering or safety measures.
The road safety assessment and consequent decision to install the convex safety mirror must be fully documented.

5. Limitations

Mirrors can be used to overcome sight restrictions in two distinctly different road environments:

1. **Entering** the road network, ie. at accesses to business or residential properties.

2. **Within** the road network, ie. at intersections, junctions, or on single lane roads with opposing traffic flows.

Convex safety mirrors shall not be installed:

- on public roads where alternative traffic management measures or engineering measures such as those mentioned in Operational Instruction 2.2 - Concealed Property Accesses are available
- within the carriageway, including shoulders, islands and medians
- to enhance pedestrian crossing movements. Other solutions should be considered, such as relocation of the crossing point or strategically located pedestrian refuges
- on roads with an 85th percentile greater than 60km/h.

Convex safety mirrors are not considered traffic control devices and so do not require approval under the conditions of the Road Traffic Act. However, the road authority may be legally liable for a negligence claim where a person has been injured through reliance on a convex mirror installed on a road under its care. To minimise the exposure to such a claim, before installing a convex safety mirror, the road authority needs to observe the following three step process:

- use road safety audit procedures to assess the road safety benefits relative to the risk of crashes in installing a convex safety mirror at a particular location,
- make a decision based on the assessment of the road safety benefits and the risk of crashes arising from the installation, and
- take all necessary steps to ensure safe and proper installation, operation and use of the mirror.

6. Mirror Selection

Convex safety mirrors selected must be suitable for outdoor use. They should be durable, vandal resistant, maintenance free or low maintenance and of weather proof material and construction.

Research has shown that acrylic, highly polished stainless steel or polycarbonate convex safety mirrors should be used. The highly polished stainless steel mirrors
appear to offer greater resistance to vandalism and scratching than do glass or acrylic mirrors.

Although convex mirrors are readily available in a range of sizes, very few options of curvature radius appear to be available. Generally, with the mirrors available commercially it appears that the smaller the mirror size the smaller the radius of curvature.

It is important to appreciate that the smaller the radius of curvature (ie. the greater the curvature) the greater the linear distortion. The greater the distortion, the smaller the image of the vehicle and the faster it appears to accelerate as it approaches. Small curvature radius mirrors will also provide too much detail in a small area, which will hamper the driver’s discriminating ability.

Road users more easily see larger diameter mirrors. These mirrors also provide a bigger field of view, enabling the oncoming traffic to be more easily seen than would be the case if smaller mirrors were used.

Having regard to the above, it is considered that mirrors of between 900mm and 1200mm diameter are the most appropriate for use in the road environment. (It has been suggested that large rectangular convex mirrors may offer an added advantage by excluding extraneous sky and ground images).

7. **Installation and Maintenance**

The convex mirror should be installed at a location that provides the best view of the road and the oncoming vehicles concerned. Mirrors should be positioned such that the motorist in the vehicle entering (ie. the one required to give-way) can see the opposing vehicle in approximately the centre of the mirror.

It may be necessary to use two mirrors when one mirror does not give a complete view of the road. Consideration should also be given to potential problems resulting from headlight glare at night and the effect of glare from the sun, particularly at dusk and dawn.

Convex mirrors must be mounted securely to a pole, wall or other high point to deter vandalism and to ensure road user safety. Refer to DPTI Master Specification Part 248 and Part 249, for the minimum height and other requirements.

The DISTORTED IMAGE (G9-SA112) sign, as detailed in section 9, must be attached below the mirror. A red/orange fluorescent coloured protective outer band (target board) will assist in improving the conspicuity of the mirror, particularly for road users who are not regular visitors to the area.

Mirrors shall not be installed within the carriageway, including traffic islands or medians. When installed within the road reserve, care should be taken to ensure that its position does not constitute a road traffic or pedestrian hazard, or create a problem for general road maintenance.

Because the mirrors are likely to be installed between the edge of the carriageway and the road reserve boundary, advice (and approval if necessary) should be sought from the Local Government authority (in incorporated areas) before installation.
Maintenance problems in regard to adjustment are likely to be low. Dust and road grime, however, can significantly reduce a mirror’s effectiveness, particularly if provided on or near unsealed roads. The mirror should be fitted with a visor at its top to prevent the accumulation of dust on the mirror surface.

A number of suppliers can be found in the Yellow Pages under “Mirrors”.

8. **Funding**

DPTI will fund the cost of the convex mirror and installation where it is installed within the road network at intersections, junctions or single laned roads with opposing traffic flows, on roads under the care, control and maintenance of DPTI. DPTI should advise Council of installation.

Local Government is responsible for the cost of mirrors installed on local government roads. Property owners are responsible for the cost of mirrors used for entering the road network from concealed property access.

9. **Signs**

A DISTORTED IMAGE (G9-SA112) sign shall be installed below the mirror to warn road users.

![DISTORTED IMAGE](image)

Figure 1: Distorted Image Sign (G9-SA112)

10. **References**

Moukhwas, D. Applied Ergonomics, 18.2, pp133-136 *Road Junction Convex Mirrors (June 1987).*


Roads and traffic Authority NSW, *Convex Safety Mirrors (1996)*