

## **Proposal for amendments to UN Regulation No. 46 (Devices for indirect vision)**

### **Uniform provisions concerning the approval of devices for indirect vision and of motor vehicles with regard to the installation of these devices**

The text reproduced below was prepared by the expert from Italy to allow for the use of free form mirrors as an alternative to spherical mirrors in UN Regulation No. 46.

The modifications to the current text of the UN Regulation are marked in bold for new or strikethrough for deleted characters.

#### **A. Proposal**

Paragraph 2.1.1.7., amend to read:

- 2.1.1.7. "Spherical surface" means a **convex** surface, which has ~~a constant and equal radius in all directions~~, **in both horizontal and vertical direction, measured radii of curvature compliant with the provisions given in paragraphs 6.1.2.2.2 and 6.1.2.2.4.**

Paragraph 2.1.1.8., amend to read:

- 2.1.1.8. "Aspherical surface" means a **convex** surface, which ~~has only in one plane a constant radius~~ **may have variable radii of curvature both in the horizontal and vertical direction.**

Paragraph 2.1.1.9., amend to read:

- 2.1.1.9. "Aspherical mirror" means a mirror composed of a spherical and an aspherical part, **defined in 2.1.1.7 and 2.1.1.8 respectively**, in which the transition of the reflecting surface from the spherical to the aspherical part has to be marked. **As an example**, the curvature of the main axis of the mirrors **is may be** defined in the x/y coordinate system defined by the radius of the spherical primary calotte with:

$$y = R - \sqrt{(R^2 - x^2)} + k(x - a)^3$$

Where:

R: nominal radius in the spherical part

k: constant for the change of curvature

a: constant for the spherical size of the spherical primary calotte

Paragraph 6.1.2.2.1., amend to read:

- 6.1.2.2.1. The reflecting surface of a mirror shall be either flat or ~~spherically~~ convex. Exterior mirrors may be equipped with an additional aspherical part provided that the main mirror fulfils the requirements of the indirect field of vision.

## **B. Justification**

1. The purpose of the proposal is to offer an update of quality in optical vision by adopting innovative surface designs and manufacturing processes. The intention is to let the current spherical product continue to be offered on the market and at the same time to allow the new generation of optical reflecting mirrors being offered to the market in order to improve the quality of the reflected images.

2. The proposed changes to the Regulation will allow vehicle manufacturers to get all of the benefits related to free form surfaces which, according to the way they have been designed, can be one or more of the following:

- Reduction of the optical distortion;
- Blind spot reduction;
- Mirror overall size reduction, while keeping the same field of view, to improve the aerodynamic efficiency of the vehicle and achieve either a reduction of fuel consumption or an increase of the range (in the case of BEVs);
- A clear and more relaxed vision by the driver through the full mirror, thus resulting in a better ergonomics/safety, when an aspherical mirror is replaced with a wide angle free form mirror (the binocular vision through the transition between spherical and aspherical surfaces can be significantly improved by a proper design of the free form surface ensuring a smooth change in curvature between the two parts of the mirror).

---