

# Section 11

## Vision

### Alert box

Immediate contraindications to driving\*:

- Visual acuity: For private drivers, corrected vision less than 20/50 (6/15) with both eyes open and examined together; for commercial drivers, refer to visual acuity standards.
- Visual field: For private drivers, field less than 120° along the horizontal meridian and 15° continuous above and below fixation, with both eyes open and examined together; for commercial drivers, refer to visual field standards.
- Diplopia within the central 40° of the visual field (i.e., 20° to the left, right, above and below fixation).
- Recent functional change from binocular to monocular vision, including temporary patching of an eye.

\*A patient with any of these problems should be advised not to drive until the medical condition is evaluated and treated.

### 11.1 Overview

The following recommendations are based in large part on the work of the Canadian Ophthalmological Society's expert working group on driving and vision standards.

When a patient is visually impaired, the physician should inform the patient of the nature and extent of the visual defect and, if required, report the problem to the appropriate authorities.

When minor visual defects are not accompanied by cognitive defects or neglect, most drivers are capable of compensating for partial defects. For example, most people adapt to the loss of an eye in a period of several months. Recent studies indicate that experienced drivers can compensate for a loss of visual acuity if they are in familiar surroundings and they limit their speed. In these circumstances, functional assessments are indicated.

This section presents information about the recommended visual acuity and visual field needed for safe driving (section 11.2). Actual standards for these functions are set by provincial or territorial licensing authorities and may vary among jurisdictions as well as varying

from the recommendations in this section, which are based on expert opinion. The section also presents information about other important visual functions that should be taken into consideration in determining fitness to drive (section 11.3) and recommendations for exceptional cases that require individual assessment (section 11.4). It also provides further detail on recommended testing procedures (addendum 1), a list of medical conditions with increased risk for vision problems and a discussion of the use of vision aids in driving (addendum 2).

## 11.2 Recommended visual functions

### 11.2.1 Visual acuity (corrected)

A driver's visual acuity must allow him or her time to detect and react to obstacles, pedestrians, other vehicles and signs while moving at the maximum posted speed, both in daylight and in darkness. Greater levels of visual acuity are required for some classes of licence to ensure public safety. Road signs should be designed to be easily legible at a safe distance for all individuals who meet the minimum visual acuity standard. (See addendum 1 for testing procedures.)

Class of licence	Recommended visual acuity
Private (classes 5, 6)	Not less than 20/50 (6/15) with both eyes open and examined together
Commercial (classes 1, 2, 3, 4)	Not less than 20/30 (6/9) with both eyes open and examined together. Worse eye not less than 20/400 (6/120)*

### 11.2.2 Visual field\*

An adequate continuous field of vision is important to safe driving. Any significant scotoma or restriction in the binocular visual field can make driving dangerous. Conditions often associated with visual field loss are described in addendum 2 of this section. If a visual field defect is suspected (based on medical condition, subjective report or confrontation field assessment), the patient should be referred to an ophthalmologist or optometrist for further testing. (See addendum 1 for testing procedures.)

Class of licence	Recommended visual field
Private (classes 5, 6)	120° continuous along the horizontal meridian and 15° continuous above and below fixation with both eyes open and examined together

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\*Several jurisdictions require an acuity higher than 20/400 (6/120) in the worse eye. For example, Quebec has a standard of 20/70 (6/21) and Ontario's is 20/100 (6/30).

Commercial (classes 1, 2, 3, 4)	150° continuous along the horizontal meridian and 20° continuous above and below fixation with both eyes open and examined together
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### **11.2.3 Diplopia**

Diplopia (double vision) within the central 40° (i.e., 20° to the left, right, above and below fixation) of primary gaze is incompatible with safe driving for all classes of licence. Individuals who have uncorrected diplopia within the central 40° of primary gaze should be referred to an ophthalmologist or optometrist for further assessment. If the diplopia can be completely corrected with a patch or prisms to meet the appropriate standards for visual acuity and visual field, the individual may be eligible to drive. Before resuming driving with a patch, there should be an adjustment period of 3 months or a period sufficient to satisfy the treating ophthalmologist or optometrist that adequate adjustment has occurred.

## **11.3 Other important visual functions for driving**

### **11.3.1 Colour vision**

Individuals should be made aware of any abnormality of colour vision to allow them to compensate for this difference in their vision. Although no standards exist for colour vision, all drivers should be able to discriminate among traffic lights. (See addendum 1 for testing procedures.)

### **11.3.2 Contrast sensitivity**

Individuals with reduced contrast sensitivity may experience difficulty with driving, in spite of having adequate visual acuity. However, it is unclear at this time what level of reduction in contrast sensitivity represents an unacceptable risk for driving. Loss of contrast sensitivity can be associated with increased age, cataract, refractive surgery as well as other ocular disorders. Individuals should be made aware of any significant reduction in contrast sensitivity.

### **11.3.3 Depth perception**

Motor vehicle crashes sometimes occur because of the driver's inability to judge distances accurately. However, judging distance is a skill that can be learned, even by persons with monocular vision. Monocular judgements of depth can be made based on such cues as the relative size or interposition of objects, clearness of details and analysis of shadows and contrast effects. A more refined form of distance judgement, called stereopsis, is based on information coming from both eyes.

A driver who has recently lost sight in an eye or lost the use of stereopsis may require a few months to recover the ability to judge distance accurately.

### **11.3.4 Dark adaptation and glare recovery**

The ability to adapt to decreased illumination and to recover rapidly from exposure to glaring headlights is of great importance for night driving. The partial loss of these functions in elderly people, particularly those with cataracts or macular disease, may at times justify limiting driving to daylight hours.

## **11.4 Exceptional cases**

The loss of some visual functions can be compensated for adequately, particularly in cases of long-standing or congenital impairments. When a driver becomes visually impaired, the capacity to drive safely varies with the driver's compensatory abilities. As a result, there may be individuals with visual deficits who do not meet the vision standards for driving but who are able to drive safely. On the other hand, there may be individuals with milder deficits who do meet the vision standards but who cannot drive safely.

In these exceptional situations, it is recommended that the individual undergo a special assessment of fitness to drive. The decision regarding fitness to drive can only be made by the appropriate licensing authorities. However, examining physicians may take the following information into consideration when making recommendations to a patient or to the licensing authorities: favourable reports from the ophthalmologist or optometrist; good driving record; stability of the condition; the absence of other significant medical contraindications; other references (e.g., professional, employment, etc.); assessment by a specialist at a recognized rehabilitation or occupational therapy centre for driver training.

In some cases it may be reasonable to recommend that an individual to be granted a restricted or conditional licence to ensure safe driving. It may also be appropriate to make such permits exclusive to a single class of vehicles.

## **Addendum 1: Testing procedures**

### **A1.1 Visual acuity**

The distance visual acuity of applicants should be tested using the refractive correction (spectacles or contact lenses) that they will use for driving. The examiner should assess visual acuity under binocular (both eyes open) or monocular conditions if required by the standard. It is recommended that visual acuity be assessed using a Snellen chart or equivalent at the distance appropriate for the chart under bright photopic lighting conditions of 275 to 375 lux (or greater than 80 candelas/m<sup>2</sup>). Charts that are designed to be used at 3 meters or greater are recommended.

**Visual field:** When a confrontational field assessment is carried out to screen for visual field defects the following procedure is recommended as a minimum:

1. The examiner is standing or seated approximately 0.6 m (2 feet) in front of the examinee with eyes at about the same level.
2. The examiner asks the examinee to fixate on the nose of the examiner with both eyes open.
3. The examiner extends his or her arms forward, positioning the hands halfway between the examinee and the examiner. With arms fully extended, the examiner asks the examinee to confirm when a moving finger is detected.
4. The examiner should confirm that the ability to detect the moving finger is continuously present throughout the area specified in the applicable visual field standard. Testing is recommended in an area of at least 180° horizontal and 40° vertical, centred around fixation.

If a defect is detected, the individual should be referred to an ophthalmologist or optometrist for a full assessment.

When a full assessment is required, the binocular visual field should be assessed using a III/4e Goldmann type target or the closest equivalent. The Esterman functional vision test on the Humphrey visual field analyzer or kinetic perimetry on the Goldmann perimeter are recommended. When binocular assessments are not possible, monocular assessments will be considered.

Some automated testing devices used in driver testing centres have a procedure for assessing visual field. However, these tests are often insensitive to many types of visual field defect and none tests greater than 140° in the horizontal median. Thus, they may not be adequate for screening purposes.

**Diplopia:** Anyone reporting double vision should be referred to an ophthalmologist or optometrist for further assessment.

**Contrast sensitivity:** Assessment of contrast sensitivity is recommended for those who are referred to an ophthalmologist or optometrist for vision problems related to driving. Contrast sensitivity may be a more valuable indicator of visual performance in driving than Snellen chart visual acuity. Increased use of this test is encouraged as a supplement to visual acuity assessment.

Contrast sensitivity can be measured using a number of procedures that are commercially available. Examples\* include: the Pelli-Robson letter contrast sensitivity chart; either the 25% or the 11% Regan low-contrast acuity chart; the Bailey-Lovie low-contrast acuity chart; and the VisTech contrast sensitivity test. The testing procedures and conditions recommended for the specific test used should be followed.

**Colour vision:** Any test that requires the discrimination of red, green and yellow can be used to assess colour vision for driving.

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\*This list may not be exhaustive and does not constitute an endorsement.

**Depth perception:** There are no clinical tests available for assessing depth perception other than those used for stereopsis. If stereopsis assessment is required, the Titmus test can be used.

**Dark adaptation and glare recovery:** Currently there are no standardized tests or procedures that can be recommended for assessing these functions.

## **Addendum 2: Medical conditions and vision aids for driving**

**Medical conditions that may require further assessment for vision problems:** Some medical conditions have a greater risk of associated vision problems. Examples include\*

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Corneal scarring	Eye movement disorders
Refractive surgery	Strabismus
Cataract	Stroke
Diabetic eye disease	Brain tumour and surgery
Retinal disease	Head trauma
Optic nerve disorders	Neurologic disorders
Glaucoma	Multiple sclerosis

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There are many other conditions that also cause vision problems. If a vision problem is suspected as a result of a medical condition, it is recommended that the individual be referred to an ophthalmologist or optometrist for further assessment of visual function.

**Vision aids and driving:** Telescopic spectacles (bioptic devices), hemianopia aids and other low-vision aids may enhance visual function. The problems associated with their use while driving can include loss of visual field, magnification causing apparent motion and the illusion of nearness. Although expert opinion does not support their use by low-vision drivers, recent Canadian legal decisions oblige licensing authorities to evaluate their use on an individual basis for drivers whose vision does not meet the established standards.

These aids cannot be used to enable the user to meet the visual standards. Consequently, a driver must demonstrate that the use of the low-vision aid permits him to drive safely despite his failure to meet the established visual standard. A road test is the usual means of functional assessment in these cases. It should be noted that drivers using telescopic lenses look through the lenses only 5%–10 % of the time he or she is driving. Consequently, some jurisdictions assess the driver without the lenses to evaluate their driving under the conditions that will prevail for 90% of their time behind the wheel.