PAO POLICY STATEMENT
Vision Requirements for Driving

Policy

The Philippine Academy of Ophthalmology (PAO) recognizes its role in promoting road safety. Vision is regarded important in the safe operation of motor vehicles but while the evidence relating vision problems to road injuries is weak, visual assessment for driving is considered a major health issue.[1]

Although the responsibility for the issuance of driver's license belongs to the Land Transportation Office of the Philippines (LTO), the Academy acknowledges the need to set visual standards and develop recommendations for use in the refinement of current statutory requirements for driving licensure in order that only persons who are physically qualified operate commercial motor vehicles.

Objective

The purpose of this project is to promote road safety:

1. through the endorsement of a minimum visual standard for driving, based on current research evidence or on consensus where evidence is lacking;
2. by proposing vision screening tests that
   - shall identify applicants who are visually fit from those visually impaired or at risk for driving
   - are inexpensive and simple enough to be administered by the common personnel of the licensing agency, and
3. by developing a standard protocol by which the ophthalmologist may further evaluate and provide guidance for driving applicants who fail the screening tests

Background

Driving is a highly visual task. About 90 percent of information used while driving is derived from vision.[2] Despite the apparent link between driving and vision, there is a dearth of data that can establish the relationship between the methods used in evaluating driver's vision and collision risks.

In 2002, the International Council of Ophthalmology (ICO) pointed out the difference between Visual Functions, which describe how the eye functions and Functional Vision, which describes how the person functions in vision-related activities. Accordingly, the

[1] International Council of Ophthalmology (ICO). Visual Standards Vision Requirements for Driving Safety with Emphasis on Individual Assessment at the 30th World Ophthalmology Congress Sao Paulo, Brazil, February 2006.

[2] Hills RL, Burg A (1980). A re-analysis of Californian driver vision data: general findings.Research Report LR 768, Transport and Road Research Laboratory, Crowthorne.

relationship between visual functions and functional vision is complex and cannot be inferred from the evaluation of one component alone.

Current clinical tests merely measure a performance threshold. Real-life activities demand sustainable, supra-threshold performance. Thus, establishing the visual criteria for driving will require finding a safe margin between performance on clinical tests and performance in actual traffic, rather than a cut-off value between competence and incompetence. Simply put, safe driving does not depend only on what is seen, but rather on how efficiently drivers respond to what is seen.[3]

Visual functions which include acuity, field, contrast, color and night vision are much easier to measure in office examinations than functional vision, which refer to the performance of daily living skills such as mobility and driving. For this reason, measurement of visual functions is often used as a substitute to estimate functional vision. This estimate, although poor in predicting at-fault crash involvement,[4] is used to further estimate driving safety.

Despite the lack of empirical evidence upon which recommendations may be based, there seems to be worldwide consensus that tests for visual functions provide an adequate margin between office measurements and road safety.

Visual Functions Crucial to Driving

1. Visual Acuity

The most widely measured parameter and in fact, the only criterion applied in most countries is the visual acuity. The **minimum criterion for distant visual acuity is 20/40** (0.5, 6/12), measured in each eye and in both eyes, with or without corrective lenses. This standard implies that drivers who can read 20/40 on a well-lighted, stationary chart are assumed to have time to detect and react to obstacles, pedestrians, other vehicles and signs while moving at the maximum speed under day or night conditions.[5]

2. Peripheral Visual Field

There is evidence to support that the peripheral visual field, rather than central acuity, has the greater predictive relevance to safe driving.[6] In fact, peripheral vision was deemed as the most important parameter for both static (i.e. avoidance of curbs, barricades or height clearance) and dynamic situations (i.e., avoidance of collision or approaching pedestrians).[7]

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[3] International Council of Ophthalmology (ICO). Visual Standards Vision Requirements for Driving Safety with Emphasis on Individual Assessment at the 30th World Ophthalmology Congress Sao Paulo, Brazil, February 2006.

[4] Gronda S., Samson S., Withrow J., Getting in Gear. St. Petersburg, FL: Area on Aging of Pasco-Pinellas, Inc., 2000.

[5] International Council of Ophthalmology (ICO). Visual Standards Vision Requirements for Driving Safety with Emphasis on Individual Assessment at the 30th World Ophthalmology Congress Sao Paulo, Brazil, February 2006.

[6] Coekelbergh T.R.M., Brouwer W.H., Cornelissen F.W., van Wolffelaar P., Kooijman A.C. The Effect of Visual Field Defects on Driving Performance: A Driving Simulator Study. Arch Ophth 2002; 120:1509-1516.

[7] Szlyk, JP, Severing, K, Fishman, G. Peripheral Visual Field Loss and Driving Performance. AAA Foundation for Traffic Safety, August, 1991.

The consensus reached by the 2005 International Council of Ophthalmology (ICO) on the minimum field required is a binocular (both eyes open) **visual field of 120° in the horizontal meridian** with no obvious interruptions or defects and approximately evenly divided to the left and right of fixation. Additionally, the vertical criterion should bear no significant defect encroaching within **20° above and below fixation**. This minimum criterion means that defects which come close to fixation whether homonymous or bitemporal or hemianopic or quadrantanopic are incompatible with safe driving.

Arguably, drivers with restricted fields but with good scanning ability may be able to negotiate their way through traffic better than those with full fields but limited neck rotation. However, there is little data on the effectiveness of compensatory scanning techniques or neck rotation in drivers with field defects.

No consensus exists about the method or instrument to be employed for testing the visual field. But the general assumption is that instruments such as the Goldmann III4e or Humphrey 10 dB perimetry using fairly large / strong stimulus may be used.

Requiring perimetry for all applicants may however be impractical and costly. Confrontation visual field exam has been proposed as a quick screening test that can give fairly accurate limits of the visual field and detect large field defects. It may not be as sensitive as the other tests but for the purpose of expediency, a modified confrontational field test may be considered (refer to Appendix 1), where the examiner displays the test stimuli (i.e. a moving finger) at selected points 20 degrees above and below the horizontal meridian. Each eye is assessed individually.

Further evaluation by an ophthalmologist is required when a visual field problem is suspected, as a result of a screening test failure, an accident report or the presence of any disease/exposure associated with visual field defects.

Screening for the peripheral visual field, while deemed necessary is not widespread because of the prohibitive cost involved. Nonetheless, the number of accidents that could have been prevented should provide the impetus to consider the cost of screening all applicants.

3. Glare and Contrast Sensitivity

Glare and Contrast sensitivity is currently not used as a licensing parameter albeit studies showing an association between reduced contrast sensitivity and increased crash risk.[8] The index of suspicion must be raised among drivers who had undergone cataract or refractive procedures. Post cataract or refractive patients may experience glare and loss of contrast when the edges of the IOL or ablation zone become exposed during night driving. Patients with cataracts may likewise be severely handicapped by the glare caused by oncoming headlights.[9]

[8] Owsley C. et al. Visual Risk Factors For Crash Involvement In Older Drivers With Cataract. Archives of Ophthalmology 2001; 119:881-887.

[9] Mainster MA, Timberlake GT. Why HID headlights bother older drivers. Br J Ophthalmol., 2003, 87, 113-7.

As a result, there is a move to incorporate the use of simple tests for contrast and glare sensitivity as a prerequisite for driving licensure particularly among the elderly.[10] Yellow filters and polarized lenses may be used for the benefit this group of drivers.

4. Diplopia

Some jurisdictions include the absence of diplopia within the central 40° (ie: 20° left, right, above and below fixation) of the primary gaze as criterion for road safety. But others contend that some are able to tolerate, if not suppress the unattended image by closing or patching one eye. The ICO recommends leaving this issue under individual consideration.

5. Color Vision

Investigators have found no connection between color deficiency and reduced driving performance.[11] It has been observed that drivers with color deficiencies rely on visual clues other than color and are thus able to cope well in identifying traffic signals.

6. Depth perception

Road safety requires that drivers accurately and instantly judge distances. People with good vision in both eyes are able to judge distance accurately using their stereoscopic binocular vision. However, studies show that people who have lost one eye (monocular vision) can regain their skill for judging distance using monocular clues. In a series of patients enucleated for a malignant melanoma, a majority was able to adapt and drive safely after 6 months.[12]

Recommended Screening Criteria for Driving

Parameter	Minimum Visual Standard
Visual Acuity	▪ Distant binocular visual acuity of not less than 20/40 by Snellen (or 0.5, 6/12) in both eyes, with or without corrective lenses.
Visual Field	▪ Uninterrupted visual field of 120° or better along the horizontal meridian and 20° or better, above and below fixation, with both eyes open and examined together

[10] Mäntyjärvi M, Tuppurainen K. Cataract in traffic. Graefe's Arch Clin Exp Ophthalmol., 1999, 237, 278-82.
[11] Gronda S., Samson S., Withrow J., Getting in Gear. St. Petersburg, FL: Area on Aging of Pasco-Pinellas, Inc., 2000.
[12] Edwards MG, Schachat AP. Impact of enucleation for choroidal melanoma on the performance of vision-dependent activities. Arch Ophthalmol., 109, 519-21 (1991).

Suggested Evaluation Protocol

1. A person applying for a driver's license shall be required to take a screening vision test administered by the licensing authority, in this case, the LTO.

2. Any person whose binocular (with both eyes opened) visual acuity is worse than 20/40 Snellen, either corrected or uncorrected, should be referred to an accredited ophthalmologist.

3. Further evaluation by an ophthalmologist is likewise required when a visual field problem is suspected, as a result of a screening test failure, an accident report or the presence of any disease/exposure associated with visual field defects.

4. The ophthalmologist shall determine the best correction for vision to improve to 20/40 Snellen or better.

5. An applicant whose binocular vision cannot be corrected to at least 20/70 Snellen shall need to undergo further testing to include but not limited to the visual fields, contrast sensitivity, glare sensitivity, depth perception and diplopia, using current practice standards.

6. Adequate evaluation of all the aforesaid visual functions can assist the ophthalmologist in forming his recommendation to the LTO, on the possible license restrictions and re-assessment interval deemed fit and fair for the applicant.

7. These recommendations which are based on visual performance alone, should be correlated by the LTO to the other medical problems, past driving performance and if necessary, on-the-road performance. The final responsibility for the issuance of driver’s license lies with the LTO and not with the ophthalmologist.

APPENDIX 1

Protocol for Screening Procedures

1. Visual Acuity

The examiner should assess the distance visual acuity with both eyes open using a Snellen chart or its equivalent at the distance appropriate for the chart under bright photopic lighting conditions of 275 to 375 lux. The applicants should be tested using the refractive correction (spectacles or contact lenses) that they will use for driving.

2. Visual Field

By the **Confrontation Method** *as proposed by the Beth Israel Deaconess Medical Center Harvard Medical School, Boston, Massachusetts*

a. The examiner is standing or seated 2 feet in front of the examinee at about the same eye level as the examinee.
b. The examinee covers the left eye with the palm of the left hand for testing of the right eye.
c. The examiner asks the examinee to fixate on the left eye of the examiner.
d. The examiner extends his/her arms forward, positioning the hands halfway between the examinee and the examiner. The right hand is held one foot to the right of the straight-ahead axis and six inches above the horizontal plane. The left hand is held one-and-a-half feet to the left of the straight-ahead axis and six inches above the horizontal plane.
e. The examinee is asked to confirm when a moving finger is detected. The procedure is repeated with the examiner testing six inches below the horizontal meridian.
f. The entire procedure (2. through 5.) is then repeated for the examinee's left eye which should fixate on the examiner's right eye. The hand placement is appropriately reversed.

Testing is recommended in an area of at least 180° horizontal and 40° vertical, centered on a fixation. If a defect is detected, the individual should be referred to an ophthalmologist for a full assessment.

Additional Tests proposed by the International Council of Ophthalmology, 2005

1. Contrast Sensitivity

A simple screening test for contrast sensitivity could be based on the Mixed Contrast reading card (Colenbrander, Fletcher, 2005). This card is a regular reading card with alternating black and gray lines in each paragraph. It was found that the difference between the number of lines read with high-contrast and with low-contrast provides a simple measure of contrast sensitivity that is independent of visual acuity. The card is meant for use in general practice where the high-contrast section would replace regular reading cards. With 10% contrast for the low-contrast lines a difference of 1 or 2 lines is normal.

The card uses a reading task rather than letter recognition, since reading involves a larger retinal area and contrast losses do not necessarily start at the fovea. Patients with contrast sensitivity deficits often feel that “something is wrong”, but cannot pinpoint the cause; they appreciate the card as a vivid demonstration of the consequences of contrast sensitivity loss.

A modification of this card could be made with a smaller contrast difference, calibrated so that the black and gray lines would be equally difficult for persons with normal contrast sensitivity. Any person who experiences a greater difficulty reading the gray lines than the black lines should be referred to an ophthalmologist for further testing.

2. Combined Test for Visual Field, Scanning Strategy and Reaction Time

Existing diagnostic visual field tests are monocular and exclude eye movements. A test of the functional field of view must be binocular, must allow scanning eye movements and must include reaction speed. Clinical field testing equipment cannot accomplish this.

A proposed test would present stimuli in different parts of the (binocularly viewed) visual field; the subject would push a button a soon as the stimulus is seen. Another stimulus would then be presented after a variable interval. The score is the sum of the reaction times for all stimuli. If a stimulus is presented in a scotoma, the reaction time will be prolonged. An inefficient scanning strategy will further prolong the reaction time. Subjects with a generally delayed reaction time will fail also.

A similar test for the central field, presented on a computer screen, has shown good correlations with reading performance. For a wider field the stimulus could be presented with a digital projector or in virtual reality glasses. Failure on the screening test would require referral to an ophthalmologist.

APPENDIX 2

Sample Form of Ophthalmologist's Statement of Examination

(Adapted from Driver Assessment and Appeal Division, Lansing Michigan)

INSTRUCTIONS FOR DRIVER/APPLICANT:

You must complete the Driver/Applicant Section of this form completely prior to forwarding this statement to your ophthalmologist. A full name both printed and signed along with your driver license number is required for processing. This request is based on results of vision screening at a local branch office, or other information received by this Department which indicates you may have a visual condition which may affect your ability to safely operate a motor vehicle. **Information provided by your ophthalmologist must report vision condition from an eye examination performed within the past six months.** The completed statement may be mailed to the address printed above.

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RELEASE OF INFORMATION

I, (Please print or type) _____ hereby authorize and request that information regarding my visual condition be released to the _____

Driver License Number:	Date of Birth:	Telephone Number:
Address:		Postal Code:
Applicant's Signature		Date:

INSTRUCTIONS FOR THE OPHTHALMOLOGIST

The LTO asks your assistance in determining the visual condition of your patient. Your professional opinion, the answers to these questions and any other pertinent information will help the LTO assess this individual's ability to safely operate a motor vehicle. Confidential information may be mailed directly at the address shown above. Please type or print your answers.

Certification by ophthalmologist's signature required on page 3.

FOR DRIVER ASSESSMENT USE ONLY

Favorable Set up _____ Refer for reexamination
Restriction _____ Refer to Health Consultant
Must Pass _____ Need additional information
Unfavorable Medical Vision

REVIEWED BY:	DATED:

1. How long has this patient been under your care? _____ Years _____ Months

2. Date of most recent visual exam: _____

3. Visual acuity:

	Without Lens	With Present Lens	With New Lens
Right Eye	20/	20/	20/
Left Eye	20/	20/	20/
Both Eyes	20/	20/	20/

4. Does the driver have any progressive diseases of the eye? _____Yes _____No

   Cataracts
   Diabetic Retinopathy
   Glaucoma
   Macular Degeneration
   Retinitis Pigmentosa
   Other
   If other, please describe:
   _____

5. Specify other reasons for visual impairment:
   _____

6. Doctor, please complete all peripheral fields.
   Peripheral Vision – Horizontal fields in degrees. (See page 4 peripheral vision standards.)

	Right Eye (OD)	Left Eye (OS)	Both Eyes (OU)
Less than 70 Degrees			
Greater than 110 Degrees			

Do you suspect a visual field defect? Yes No If yes, how does it affect their ability to drive safely?
_____

Method used and test object size: _____

Tangent screen: _____ Perimeter: _____

7. Should the LTO require a periodic vision evaluation to monitor changes that may affect driving? _____ No _____ Yes

   If yes, how often? _____

8. If you wish to make additional comments, please use the space provided below or additional sheets if necessary.
   _____
   _____

OPHTHALMOLOGIST'S CERTIFICATION

I certify that the statements contained in this form are true to the best of my knowledge.

DOCTOR'S SIGNATURE:		DATE:
NAME OF OPHTHALMOLOGIST (Print or Type):		
STREET ADDRESS:	CITY:	ZIP:
PROFESSIONAL LICENSE NUMBER	TELEPHONE NUMBER:	

The Following Standards Do Not Take Into Consideration
Other Conditions Which May Require Further Restrictions or Denial of License:

If applicant has more than one condition present, read down the chart until all conditions are covered, e.g., a driver with a progressive disease such as cataracts, **and** 20/100 or less in one eye will be evaluated under #3 below, not eligible for a license.

SUMMARY OF VISION SCREENING STANDARDS FOR DRIVER LICENSING
Generally, drivers who meet screening requirements of 20/40 or better are granted full driving privileges unless an ophthalmologist recommends otherwise, or, other physical conditions require restrictions or denial of a license. Drivers who are screened at less than 20/40 fall into categories 1 through 4 below.

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1. VISION **WITH NO PROGRESSIVE** ABNORMALITIES OR DISEASES OF THE EYE:
    a. Less than 20/40 to and including 20/50 – **full driving privileges**
    b. Less than 20/50 to and including 20/70 – **daylight driving only**
    c. Less than 20/70 – **not eligible for licensing**

2. VISION **WITH PROGRESSIVE** ABNORMALITIES OR DISEASES OF THE EYE:
    a. Less than 20/40 to and including 20/50 – **full driving privileges**
    b. Less than 20/50 to and including 20/60 – **daylight driving only**
    c. Less than 20/60 – **not eligible for licensing**

3. DRIVERS WITH VISION OF **20/100 OR LESS IN ONE EYE** AND THE OTHER EYE AS FOLLOWS:
    a. Up to and including 20/50 – **full driving privileges**
    b. Less than 20/50 – **not eligible for licensing**

4. PERIPHERAL VISION:
    a. 140 Degrees to and including 110 Degrees – **full driving privileges**
    b. Less than 110 Degrees to and including 90 Degrees – **subject to additional conditions and requirements**
    c. Less than 90 Degrees – **not eligible for licensing**

References

1. International Council of Ophthalmology (ICO). Visual Standards Vision Requirements for Driving Safety with Emphasis on Individual Assessment at the 30th World Ophthalmology Congress Sao Paulo, Brazil, February 2006.
2. Hills RL, Burg A (1980). A re-analysis of Californian driver vision data: general findings.Research Report LR 768, Transport and Road Research Laboratory, Crowthorne.
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