INTERNATIONAL STANDARD

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Cinematography — Work stations used for film and video production — Requirements for visual and audio conditions

Cinématographie — Stations de travail utilisées en production de film et vidéo — Prescriptions pour les conditions visuelles et audio

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Contents

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 17121 was prepared by Technical Committee ISO/TC 36, *Cinematography.*

Cinematography — Work stations used for film and video production — Requirements for visual and audio conditions

1 Scope

This International Standard specifies the requirements for work stations used for electronic image and sound production in film and video facilities and broadcasting organizations. It provides assistance in achieving a consistent and critical evaluation of television and video programme material with a view to facilitating programme exchange in commonly used review conditions.

This International Standard is not applicable to work stations based on general purpose office computers or film production by traditional methods.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

CIE 15.2:1986, *Colorimetry.*

CIE S005:1998, *CIE standard illuminant for colorimetry.*

EBU Specifications Techn. 3213:1975, *EBU standard of chromaticity tolerances of studio monitors.*

EBU Specifications Techn. 3263:1991, *Specification of grade-1 colour picture monitors.*

EBU-Recommendation R 23:1987, *Procedure for the operational alignment of grade-1 colour picture monitors.*

ITU-Report 624-4/90:1990, *Recommendations and Reports of the CCIR — Characteristics of television systems.*

ITU-Recommendation 500, volume XI:1974, *Recommendations and Reports of CCIR — Method for the subjective assessment of quality of television pictures.*

3 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply.

3.1
eye point term
point in space where the eyes of the user of a particular item of technical equipment are positioned

NOTE 1 It is dependent on the body dimensions of the user and the posture he or she adopts.

NOTE 2 The technical equipment referred to in this case is a picture monitor or a data monitor.

3.2
viewing angle
angle between the line of sight and the surface normal of the object of vision

3.3
image resolution
capacity of the screen to display dots or lines separately

3.4
height of picture
electronic image measured vertically

3.5
picture monitor
device for the reproduction and visual assessment of electronic images

3.6
binocular vision
sight with both eyes

3.7
field of fixation
sum total of the object points which can be fixed with the head at rest, moving only the eyes

3.8
data monitor
device for displaying alphanumeric characters and graphic representations

3.9
electronic image
television picture produced by the technical processing of film, video, text and graphics in accordance with ITU-Report 624-4/90

3.10
detect
notice that one or more optical stimuli exist

3.11
recognize
determine what is seen through congruence being established between the object of vision and its remembered meaning

3.12
space of recognition
space delimited by all the eye points from which all the characters displayed on a surface can be recognized with certainty

NOTE 1 The extent of the space of recognition is dependent on the viewing distance, the viewing angle and the size of the characters being looked at.

NOTE 2 A data monitor is an example of the type of surface referred to in this definition.

3.13
fixation
look
directing the eyes at a point

NOTE 1 A normal-sighted eye assumed, the adjustment takes place in such a way that an image of the fixed point is formed in the middle of the fovea.

NOTE 2 Fixation is the prerequisite for the recognition of objects of vision.

3.14
surface normal
perpendicular onto the surface of the display (here, the screen)

3.15
control desk
operating console or work table with work equipment, for example keys, controls or measuring equipment, for controlling and processing of picture and/or sound

3.16
monitor wall
several picture monitors arranged next to each other vertically and/or horizontally

3.17
monocular vision
sight with one eye

3.18
near point
point to which the eye is adjusted at the highest dioptric power of its optical system

3.19
viewing distance
distance between the eye and the object of vision

NOTE Unless indicated otherwise, the viewing distance is based on the centre of the screen.

3.20
line of sight
straight line between the centrally-imaged object point and its image point

NOTE This line goes approximately through the two nodal points of the eye.

3.21
field of vision
field of fixation and visual field

3.22
object of vision
object in external space, the image of which on the retina leads to a perception

NOTE Objects of vision are electronic images on picture monitors and characters on data monitors.

3.23
visual angle
angle whose vertex is at the eye and whose angle sides encompass the object of vision

See Figure 2.

NOTE Unless indicated otherwise, the visual angle is based on the height of the object of vision.

3.24
peak luminance
luminance adjusted on a monitor that corresponds to the white level of the picture signal

3.25
sound monitors
device (loudspeaker) for reproducing sound signals

3.26
extended field of fixation
space delimited by sum total of all object points that can be fixed with the body at rest, only moving the head and eyes

4 Requirements

4.1 Arrangements of picture monitors and data monitors at work stations

4.1.1 Viewing distances

4.1.1.1 General

When specifying viewing distances, determine the nature of the task in hand; for example, distinguish between assessing television images on picture monitors and reading text on data monitors.

The specifications assume viewers to have normal sight, in particular for colour television. Defective vision shall be corrected by aids to vision such as spectacles.

4.1.1.2 Viewing distances for picture monitors

This International Standard is based on television images in accordance with ITU[1)] (previously CCIR)-Report 624-4/90.

The viewing distance for picture monitors is specified as a multiple of the visible height of the picture h_B (millimetres) (see ITU Recommendation 500, volume XI, 1974).

The viewing distance as shown in Table 1 may vary depending on the nature of the task.

Table 1 — Viewing distances

Viewing distance[a]	Task requirements
from 4 h_B to 6·h_B	suitable for quality assessment and for reliably correcting details of pictures
from 6 h_B to 9·h_B	suitable for assessing and checking whole pictures
from 9 h_B to 14·h_B	suitable for rough assessments
from 14 h_B to 20·h_B	unsuitable for assessment; however, the picture content is still clearly recognizable for checking purposes
a For observing HDTV (high definition television) images, the distances given may be halved.	

1) International Telecommunication Union.

4.1.1.3 Viewing distances for data monitors

The viewing distance for data monitors shall be selected so that individual characters and symbols on the screen are recognized from the position of the eye point. This is assured when the height of the character without ascenders or descenders, for example capital letters, appears at a viewing distance of 500 mm from a visual angle of at least 20 angular minutes (see Figures 1 and 2).

Viewing distances of less than 200 mm shall be avoided because this is less than the position of the near point.

For a viewing distance of 500 mm, the character height shall be at least 2,9 mm.

For viewing distances of more than 500 mm, a visual angle of 20 angular minutes is indicated if the height of the character corresponds to the actual viewing distance, divided by 170.

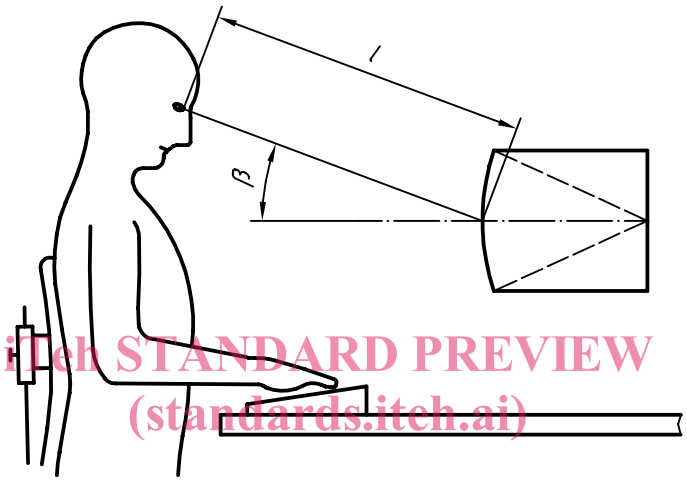


Figure 1 — Viewing distance l, and viewing angle β, displayed in the centre of the screen

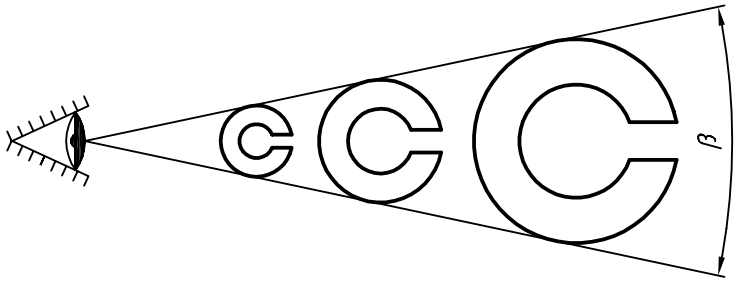


Figure 2 — Viewing angle β

4.1.2 Range of vision

4.1.2.1 General

The characteristics of the range of vision (lines of sight, fields of vision) and the sitting posture, based largely on the work station, are the key factors for the arrangement of picture monitors and data monitors.

The figures indicated (dimensions and angles) represent general ergonomic basic principles for the anthropometric design of work stations.

4.1.2.2 Lines of sight

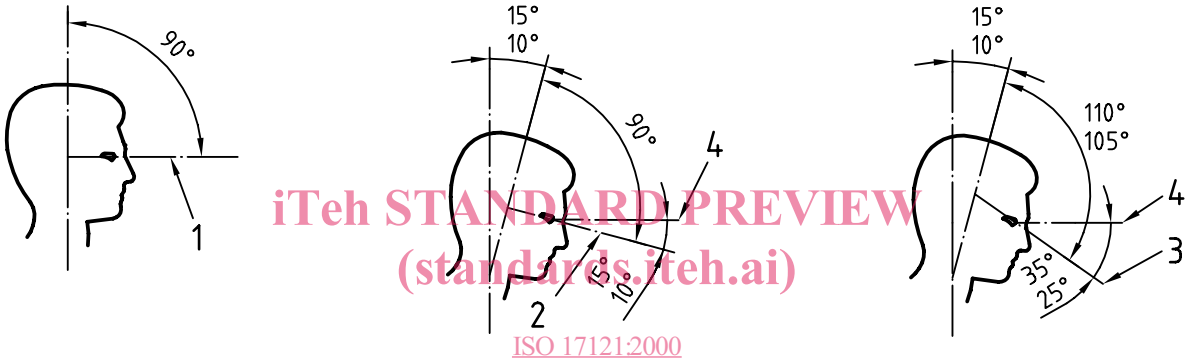
The course of the lines of sight forms the reference for the object of vision (for example television images, characters on data monitors, keys on the control desk) and, in conjunction with the fields of vision, is important for the arrangement of the work equipment.

In order to achieve optimum, that is large, visual angles, the lines of sight of the eye should correspond to the surface normal.

When the **lines of sight** are **horizontal**, the head is held up and the eyes are looking straight ahead; the line of sight is thus identical to the horizontal [see Figure 3a)].

With a **head-related line of sight**, the head is held in a relaxed position (the head axis inclined forward with respect to the trunk axis by 10° to 15°) and the eyes are looking straight ahead; the lines of sight are inclined by 10° to 15° with respect to the horizontal [see Figure 3b)].

With a **normal line of sight,** the eyes and head are in a relaxed position; the line of sight is inclined downwards by 25° to 35° with respect to the horizontal [see Figure 3c)].



a) Horizontal line of sight **b) Head-related line of sight** **c) Normal line of sight**

Key

1 Horizontal line of sight

2 Head-related line of sight

3 Normal line of sight

4 Horizontal (0°)

Figure 3 — Angle of inclination of the lines of sight

4.1.2.3 Fields of vision

A distinction is made between monocular and binocular fields.

In the following cases, binocular fields are assumed:

— the fields of vision are distinguished according to optimum extent and maximum extent, whereby it is preferable to have the display in the optimum field;

— the fields have different vertical and horizontal extents.

All the visual stimuli that can be simultaneously detected, with the eyes and the head at rest, lie in the **visual field**.

In the visual field outside a field less than 1° around the fixation point, none of the objects looked at are recognized; all that is perceived are differences in luminance and colour.

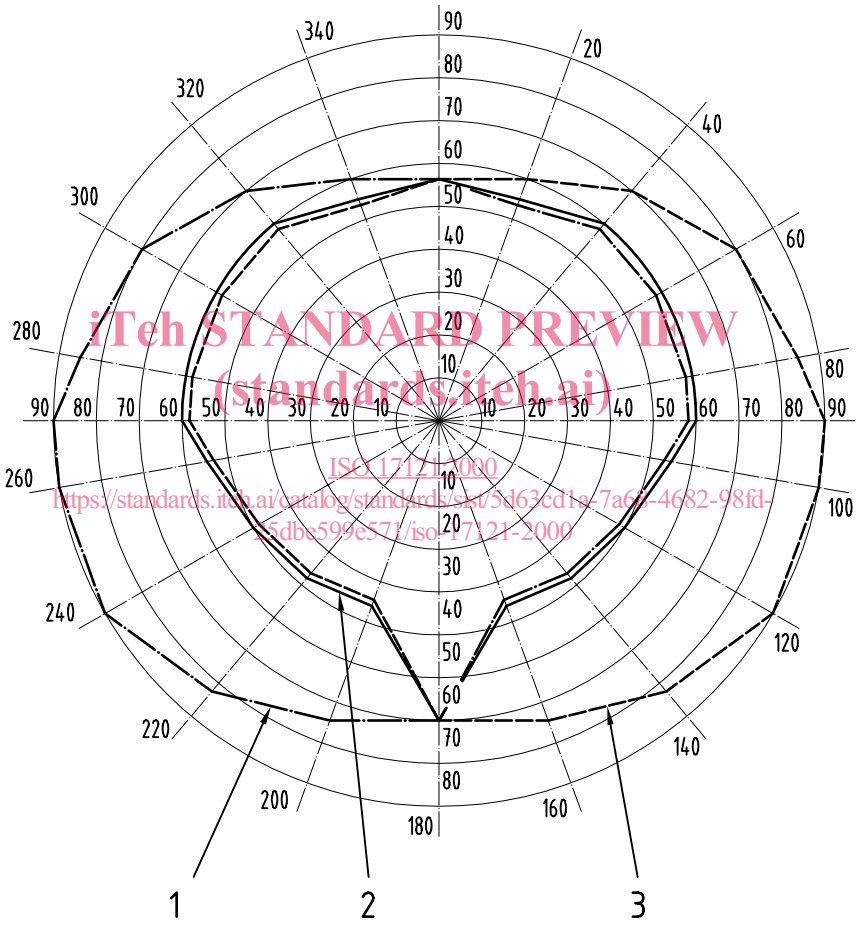
The dimensions of the useful visual field depend on the characteristics of the visual stimulus (size, luminance, colour and temporal characteristics, for example blinking) and on the average luminance in the visual field.

Fatigue, psychic distraction and stress can reduce the visual field (see Figure 4).

The **visual field of fixation** is attained by enveloping all fixable points within the field of fixation by the visual field. It is thus the sum of all visual fields with the head at rest and moving (fixing) eyes (see Figure 5).

The **extended visual field** encompasses the area of all visual fields that come into being through movement of the head and eyes.

NOTE For definition of field of vision, see 3.21.



Key

1 Left eye

2 Binocular

3 Right eye

Figure 4 — Visual field for light stimuli