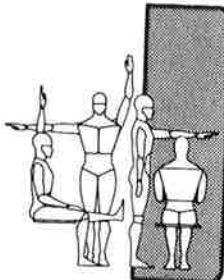


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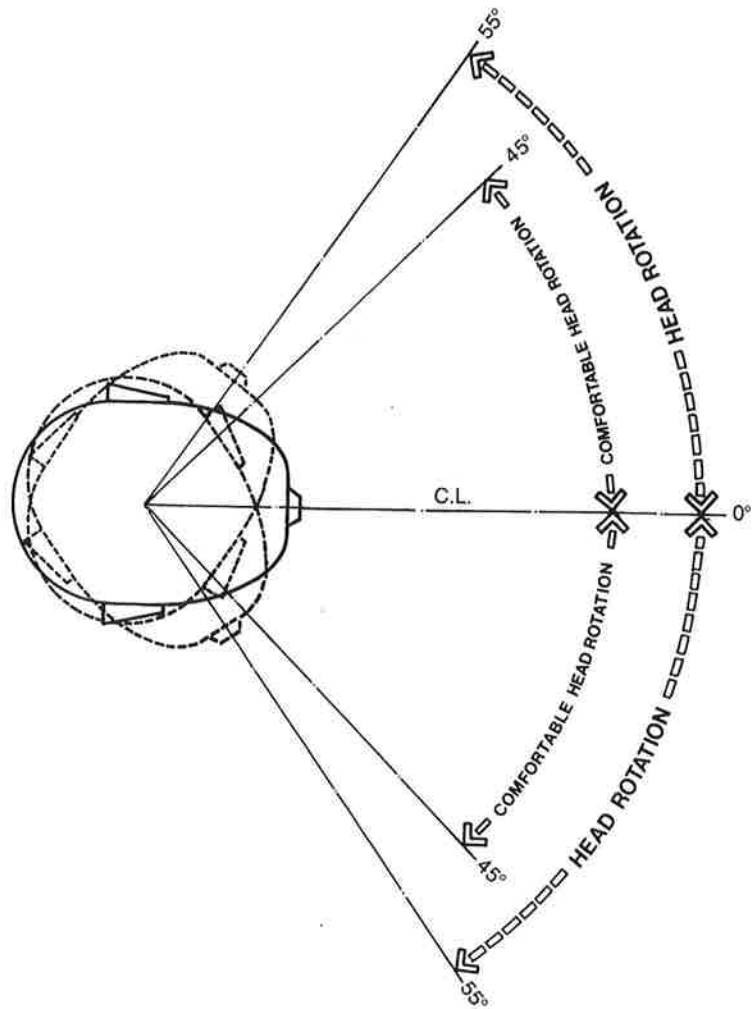
		9.1 BASICS	
			
		BASICS	ACTIVITIES
TABLE		ANTHROPOMETRIC DATA	
9	●	25	ROTATION
9	●	26	FLEXION
9	●	27	HYPEREXTENSION

The quality of the interface between any visual communication system and the viewer is, to a very large degree, a function of the extent to which the design of that system and the interior space in which it is housed responds to certain fundamental human capabilities and constraints. The more important factors for the architect or interior designer to consider involve the biomechanics of the human body and the geometry of the visual field. A third factor, the eye heights of seated and standing viewers, will also be discussed in the following section. In regard to biomechanics, the area of particular concern centers on the limits of the range of head movement. The degree to which the viewer may rotate the head in the vertical and horizontal planes will quite obviously widen or restrict his or her field of vision. The geometry of the visual field is equally significant since this aspect of the eye establishes the viewer's cones of vision and related viewing angles. It should be noted that in addition to head movement, the eyes themselves are capable of rotation. The range of eye movement up or down or from side to side adds to the viewer's ability to scan visual displays. The drawings on the following pages deal with the basics: the range of head movement in the horizontal and vertical planes and the visual field in the horizontal and vertical planes.

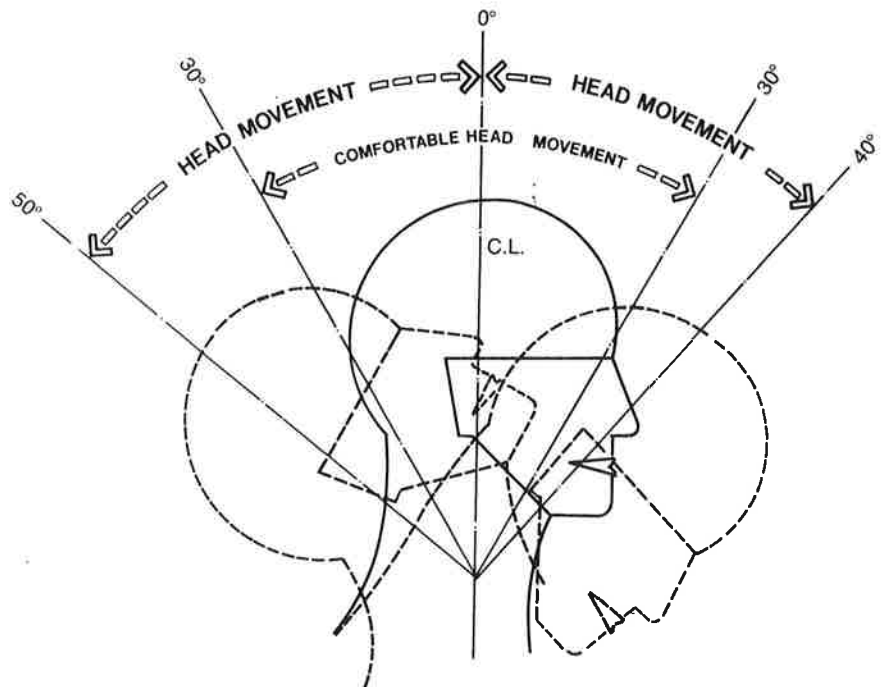
9.1 BASICS

Joint motions and positions are usually recorded in three basic planes—sagittal, frontal or coronal, and transverse—or in planes parallel to them. The sagittal plane is a vertical plane taken through the center of the body and perpendicular to body breadth. The frontal or coronal plane is also a vertical plane and is assumed to be taken through the body and perpendicular to the sagittal plane. The transverse plane is a horizontal plane perpendicular to the other two planes. For purposes of biokinematic research, these three planes are viewed as an orthogonal axis system centered on the pelvis.

The top drawing illustrates the range of head movement in the transverse or horizontal plane. Anthropometrically, the motion is referred to as “neck rotation” and a range of 45° to the left or right can be achieved without strain or discomfort by most people. A simple trial rotation by the reader will demonstrate the tremendous increase in the area that can be scanned from a single fixed location. The lower drawing illustrates the range of head movement in the vertical or sagittal plane. A range from 0° to 30° in either direction is possible without discomfort. Anthropometrically, the movement is termed “neck flexion.” If measured downward, it is described as “ventral,” and if measured toward the back or upward, it is described as “dorsal.” International Standard Orthopaedic Measurements (ISOM), however, refer to the downward motion as “flexion” and the upward motion as “extension.” Again, a simple experiment by the reader illustrates the tremendous increase in the field that can be scanned as a result of head movement, even if that movement is only a few degrees in magnitude.



HEAD MOVEMENT IN HORIZONTAL PLANE

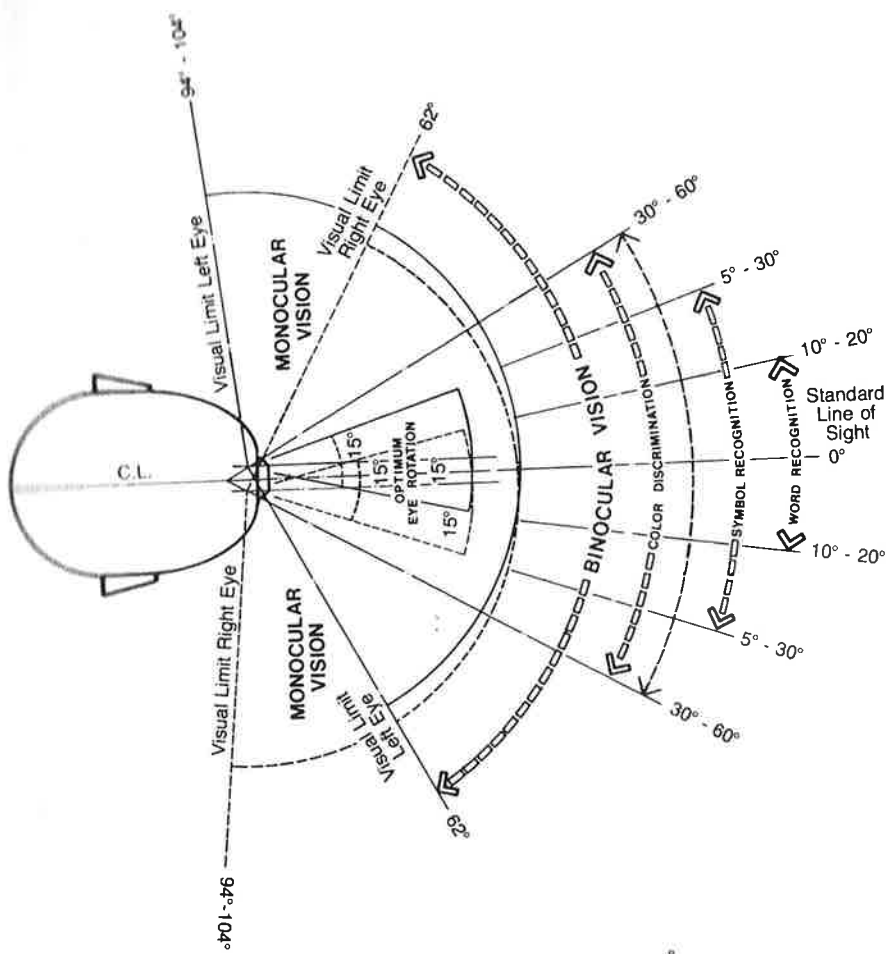


HEAD MOVEMENT IN VERTICAL PLANE

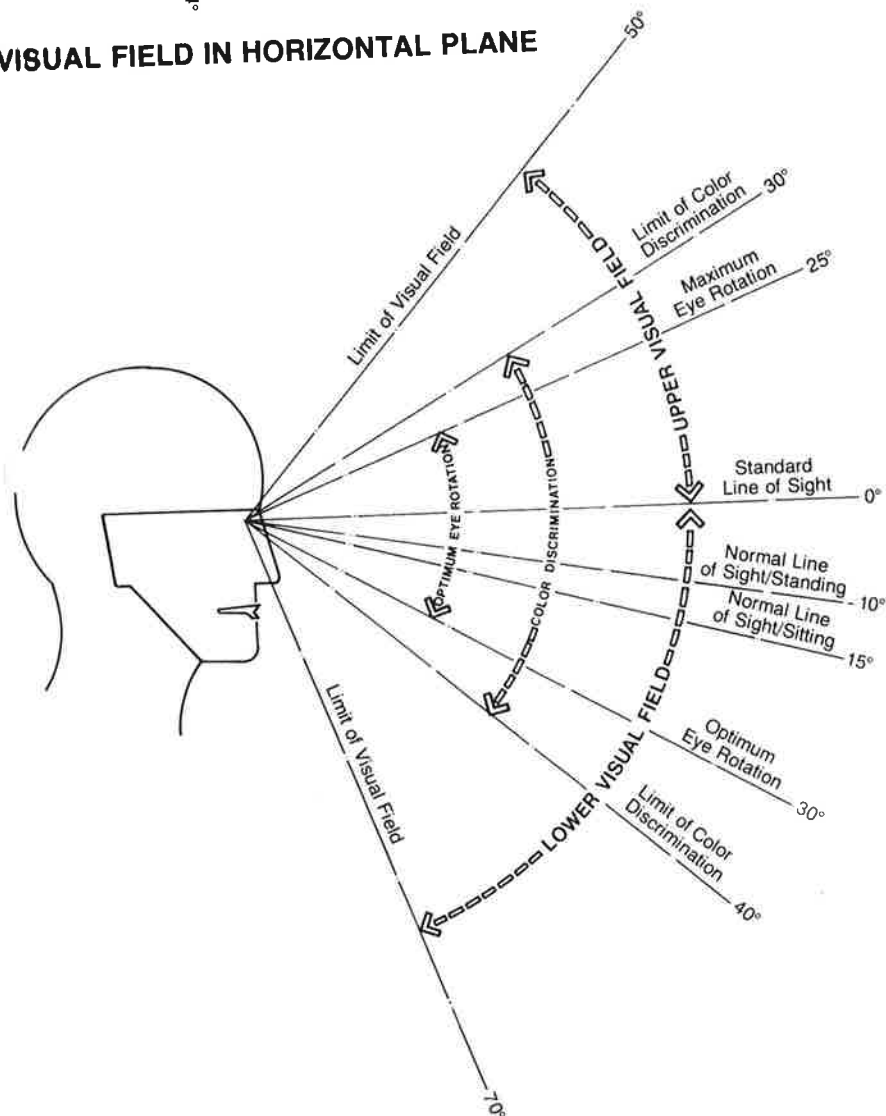
9.1 BASICS

The visual field is that part of space, measured in angular magnitude, that can be seen when the head and the eye are absolutely still. The visual field of the individual eye is termed "monocular vision." Within this field sharp images are not transmitted to the brain, causing objects to appear unclear and diffused. When an object, however, is observed by both eyes simultaneously, the visual field of each individual eye overlaps, creating a central field of greater magnitude than that possible by each eye separately. This central field of vision is termed "binocular field" and, as indicated in the top drawing, is about 60° in each direction. Within this field very sharp images are transmitted to the brain, depth perception occurs, and color discrimination is possible. Within this central field, recognition of words and symbols also occurs: 10° to 20° of the line of sight for the former and 5° to 30° of the line of sight for the latter. Beyond these respective limits, both words and symbols tend to disappear. The area of the sharpest focus is actually about 1° either side of the sight line. Depending on the particular color, color begins to disappear between 30° and 60° of the line of sight.

As shown in the drawing at the bottom of the page, the standard line of sight is assumed to be horizontal and at 0°. A person's natural or normal line of sight, however, is actually below the horizontal and varies slightly depending upon each individual and whether he is standing or sitting. If standing, the normal line of sight is about 10° below the horizontal and if sitting about 15°. In a very relaxed position, both standing and sitting sight lines may drift to an even greater angle below the horizontal: about 30° and 38° respectively. The magnitude of the optimum viewing zone for display materials is about 30° below the standard line of sight.



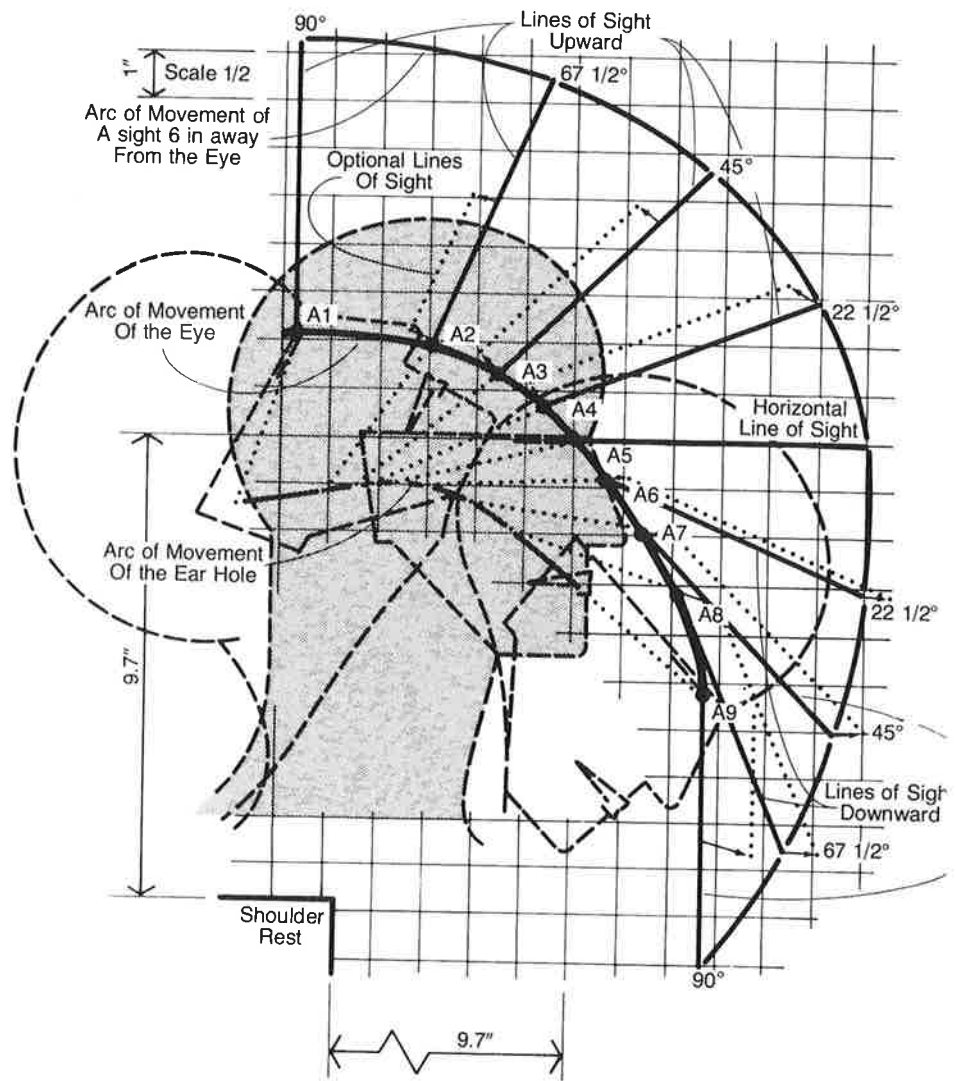
VISUAL FIELD IN HORIZONTAL PLANE



VISUAL FIELD IN VERTICAL PLANE

9.1 BASICS

The preceding drawings serve to individually illustrate the range of head movement in the horizontal and vertical planes and the field of vision in the horizontal and vertical planes. The drawing here combines both the head and eye movements in the vertical plane involved in sighting at various angles above and below the horizontal plane. Although the diagram itself may be of little, if any, practical use to the interior designer or the architect, it serves to stress the extent to which the area that can be scanned is affected by the range of head and eye movement.



RANGE OF HEAD AND EYE MOVEMENT IN THE VERTICAL PLANE

Adapted from *Human Factors Engineering*,
U.S. Air Force Systems Command Handbook, DH1-3, P. DN2B11, 19.