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JIS Z 8315-4 : 1999

(ISO 5456-4 : 1996)

**Technical drawings—  
Projection method—  
Part 4 : Central projection**

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ICS 01.100.01

**Descriptors** : engineering drawings, projection (drawing)

**Reference number** : JIS Z 8315-4 : 1999 (E)

Z 8315-4 : 1999 (ISO 5456-4 : 1996)

## Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International Trade and Industry through deliberations at Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law. Consequently **JIS Z 8315 : 1984** is withdrawn and replaced with **JIS Z 8315** group. By this establishment, **JIS Z 8315** group becomes identical with the corresponding part of **ISO 5456**, *Technical drawings—Projection method*. **JIS Z 8315** group, inclusive of forward and title, is named *Technical drawing—Projection methods*, and consists of the following parts.

Part 1 : *Synopsis*

Part 2 : *Orthographic*

Part 3 : *Axonometric representations*

Part 4 : *Central projection*

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## Technical drawings—Projection methods— Part 4 : Central projection

**Introduction** This Japanese Industrial Standard has been prepared based on **ISO 5456-4**, *Technical drawings—Projection methods—Part 4: Central projection* issued as the first edition in 1996 without changing the technical contents.

Central projection (perspective) is a realistic pictorial representation obtained by projecting the object to be represented from a point at finite distance (projection centre) on a single projection plane (normally the drawing surface). Central projection provides excellent visual appearance of the object (monocular vision) and is often used in architectural drawings.

**1 Scope** This part of **JIS Z 8315** specifies basic rules for the application of central projection for all types of technical drawings in all technical fields in accordance with the synopsis given in **JIS Z 8315-1**.

**2 Normative reference** The following standard contains provisions which, through reference in this text, constitute provisions of this part of **JIS Z 8315**.

For these normative references, the most recent editions (including Amendment) shall apply.

JIS Z 8114 *Technical product documentation—Terms relating to technical drawings*

Note: The provisions cited from ISO 10209-2 : 1993, *Technical product documentation—Vocabulary—Part 2: Terms relating to projection methods* are equivalent to the relevant provisions in this Standard.

**3 Definitions** For the purposes of this part of **JIS 8315**, the definitions given in **JIS Z 8114** and the following definitions apply.

**3.1 alignment line** Line parallel to a given line passing through the projection centre. Its intersection with the projection plane gives the vanishing point of all lines parallel to the given line.

**3.2 height of projection** Vertical distance of the projection centre from the basic plane.

**3.3 horizontal distance** Distance between the projection centre and the projection plane.

**3.4 projection angle** Angle formed by the projection plane and the horizon plane.

**3.5 scale point** Vanishing point of the horizontal direction orthogonal to that bisecting the angle formed by the horizon line and the alignment line of the given horizontal line, and allowing the true length of the projection of the given line to be determined.

**3.6 station of observation** Orthogonal projection of the projection centre onto the basic plane.

Informative reference: It is also called the station.

**4 Symbols** Letter symbols for terms used in central projection are given in Table 1 and illustrated in Figs. 1 and 2, as well as in the figures mentioned in Table 1.

**Table 1 Terms and letter symbols**

| No.                                     | Term                   | Letter symbol | Figure |
|-----------------------------------------|------------------------|---------------|--------|
| 1)                                      | Projection plane       | T             | 1      |
| 1)                                      | Basic plane            | G             | 1      |
| 1)                                      | Basic line             | X             | 1      |
| 3.4                                     | Projection angle       | $\beta$       | 5      |
| 1)                                      | Horizon plane          | HT            | 1      |
| 1)                                      | Horizon line           | h             | 1      |
| 3.1                                     | Alignment line         | VI            | 4      |
| 1)                                      | Main point             | C             | 1      |
| 1)                                      | Vanishing point        | V             | 4      |
| 1)                                      | Main projector         | pL            | 1      |
| 1)                                      | Projection centre      | O             | 1      |
| 3.2                                     | Height of projection   | H             | 1      |
| 3.3                                     | Horizontal distance    | d             | 1      |
| 1)                                      | Vision cone            | K             | 2      |
| 1)                                      | Circle of vision       | Ks            | 3      |
| 1)                                      | Vision angle           | $\alpha$      | 2      |
| 1)                                      | Projector              | PI            | 3      |
| 1)                                      | Distance point         | DP            | 13     |
| 3.5                                     | Scale point            | MP            | 14     |
| 3.6                                     | Station of observation | Sp            | 1      |
| 1) Terms already defined in JIS Z 8114. |                        |               |        |

**5 Central projection methods** The mode of the central projection depends on the position of the object to be represented with respect to the projection plane.

**5.1 One-point method** A one-point projection method is a central projection of an object having its principal face parallel to the projection plane (special position). All parallel outlines and edges of the object which are parallel to the projection plane retain their direction in this representation (horizontal lines remain horizontal and vertical lines remain vertical). All lines perpendicular to the projection plane converge at the vanishing point, V, coinciding with the main point, C, (see Fig. 3 and 7.2.1 and 7.3).

**5.2 Two-point method** A two-point projection method is a central projection of an object having its vertical outlines and edges parallel to the projection plane (particular position). All horizontal lines of a representation converge at multiple vanishing points  $V_1, V_2, V_3, \dots$ , on the horizon line (see Fig. 4 and 7.2.2 and 7.4).

**5.3 Three-point method** A three-point projection method is a central projection of an object having no outlines or edges parallel to the projection plane (any position). If the projection plane is inclined towards the projection centre, i.e.  $\beta > 90^\circ$ , the vanishing point for vertical lines is situated below the horizon line (see Fig. 5 and 7.5.1 and 7.5.2)

**5.4 Coordinate method** Representation by the coordinate method is based on simple proportions.

The coordinates, related to the main projector of all relevant points of the object to be represented, are taken by the graphic method from the basic plane and elevation. From these point coordinates, the image coordinates are obtained by a calculation method and entered to scale. The image points are connected to each other to provide a clear representation of the object (see Fig. 6).

## 6 Principle

**6.1 Location and position of the projection plane** The image size of an object can be varied by parallel shifting of the projection plane. If the object is placed in front of the projection plane, the representation will be enlarged. The object behind the projection plane will result in a smaller image. Fig. 7 shows the change in image size depending on the position of the object with respect to the projection plane.

Fig. 8 shows the change in image size depending on the method of representation with vertical or inclined projection planes.  $\beta$  is the included angle between the projection plane and the basic plane near the projection centre.

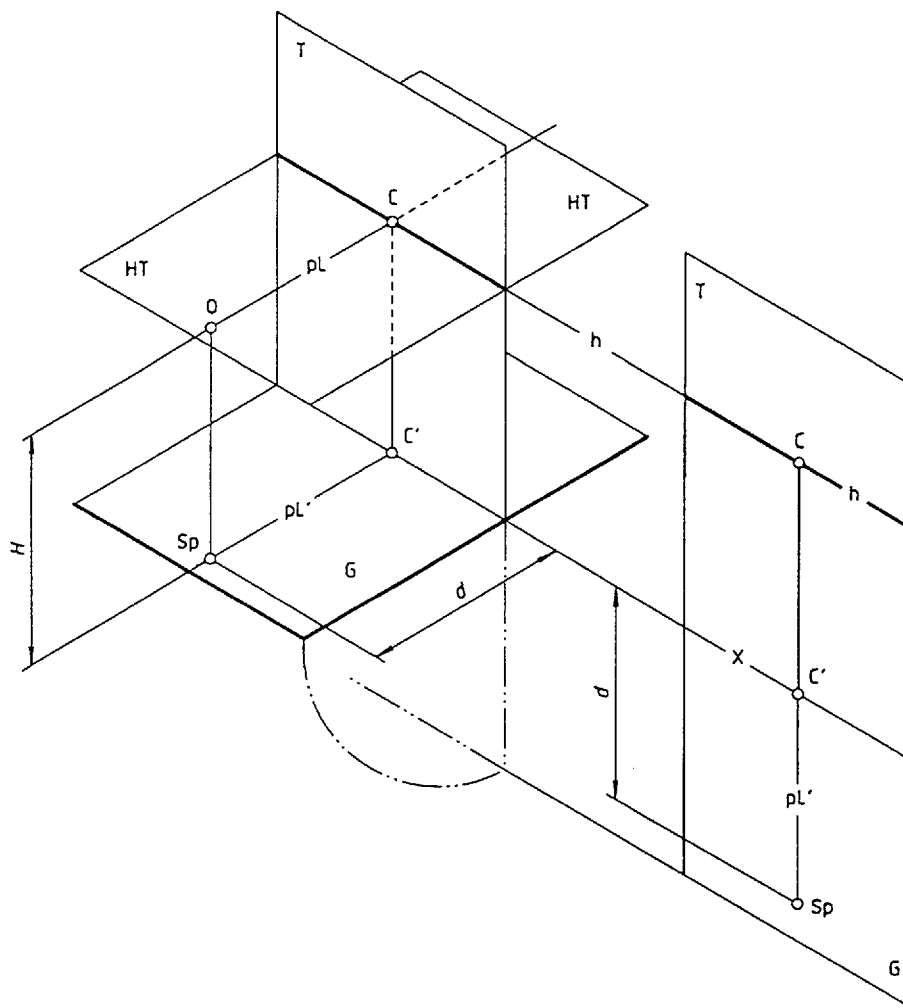


**Fig. 1 Projection model of the central projection**

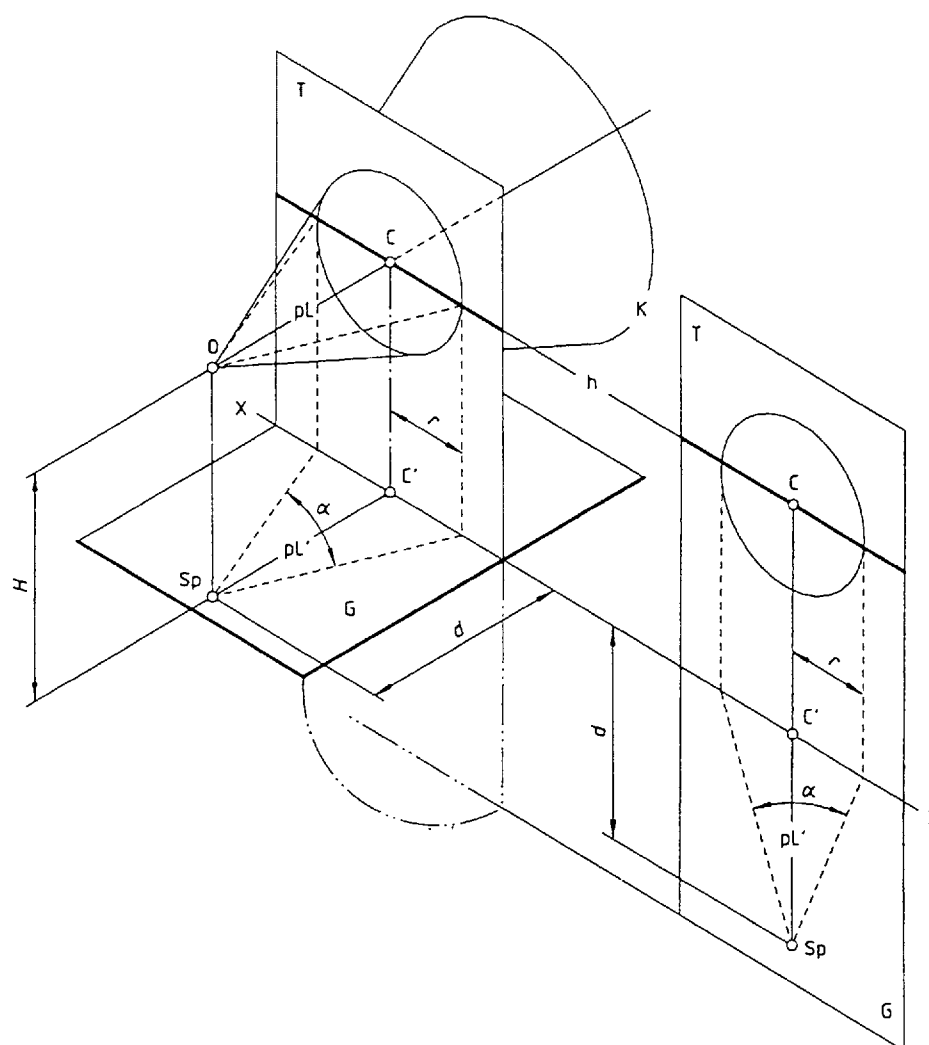


**Fig. 2 Vision cone and vision angle in the projection model of the central projection**

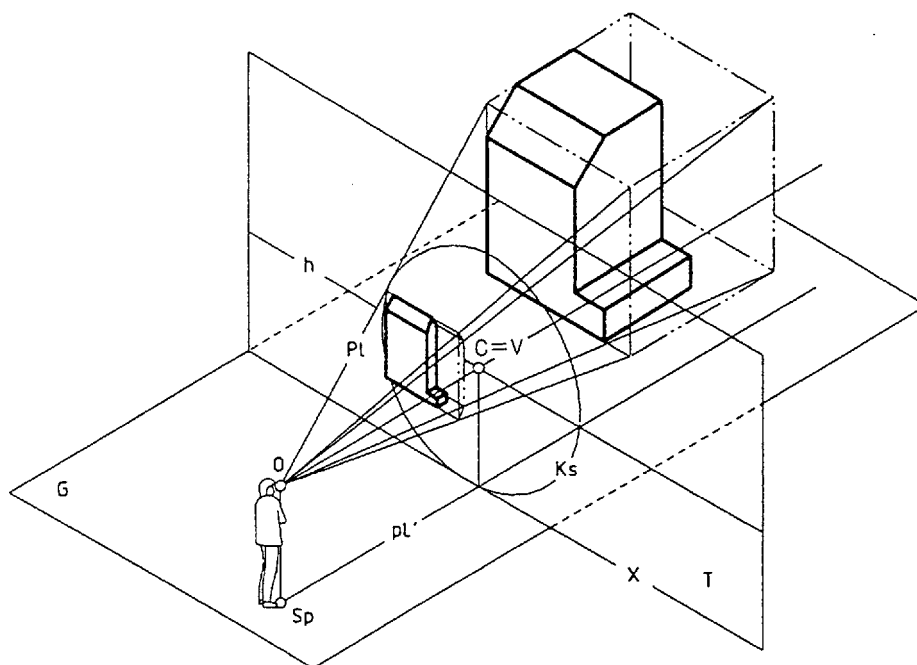


**Fig. 3** Projection model with vertical projection plane and an object in a special position with respect to the projection plane

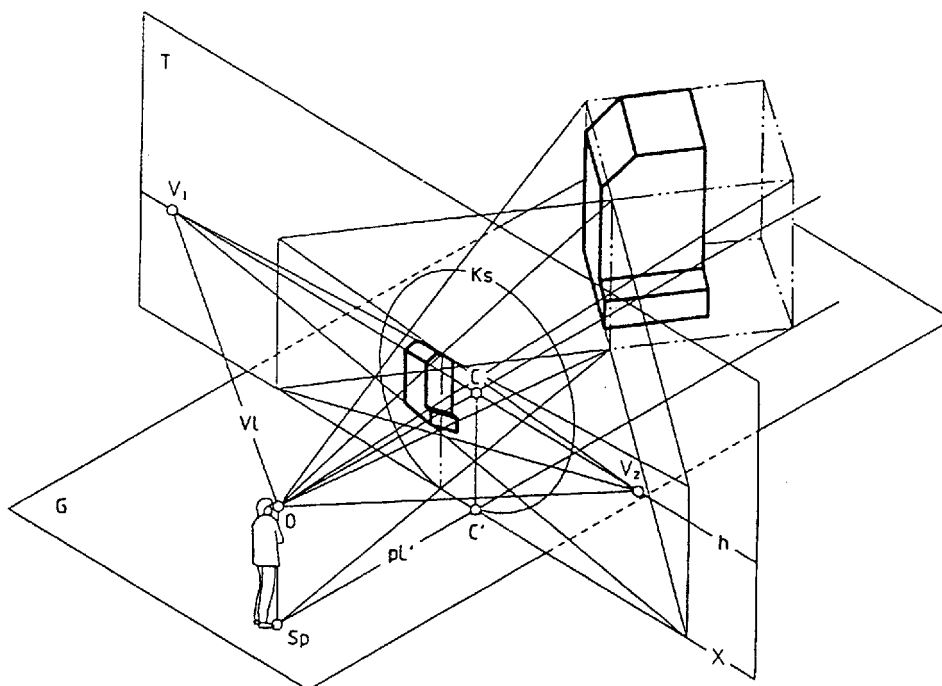


**Fig. 4** Projection model with vertical projection plane and an object in a particular position with respect to the projection plane

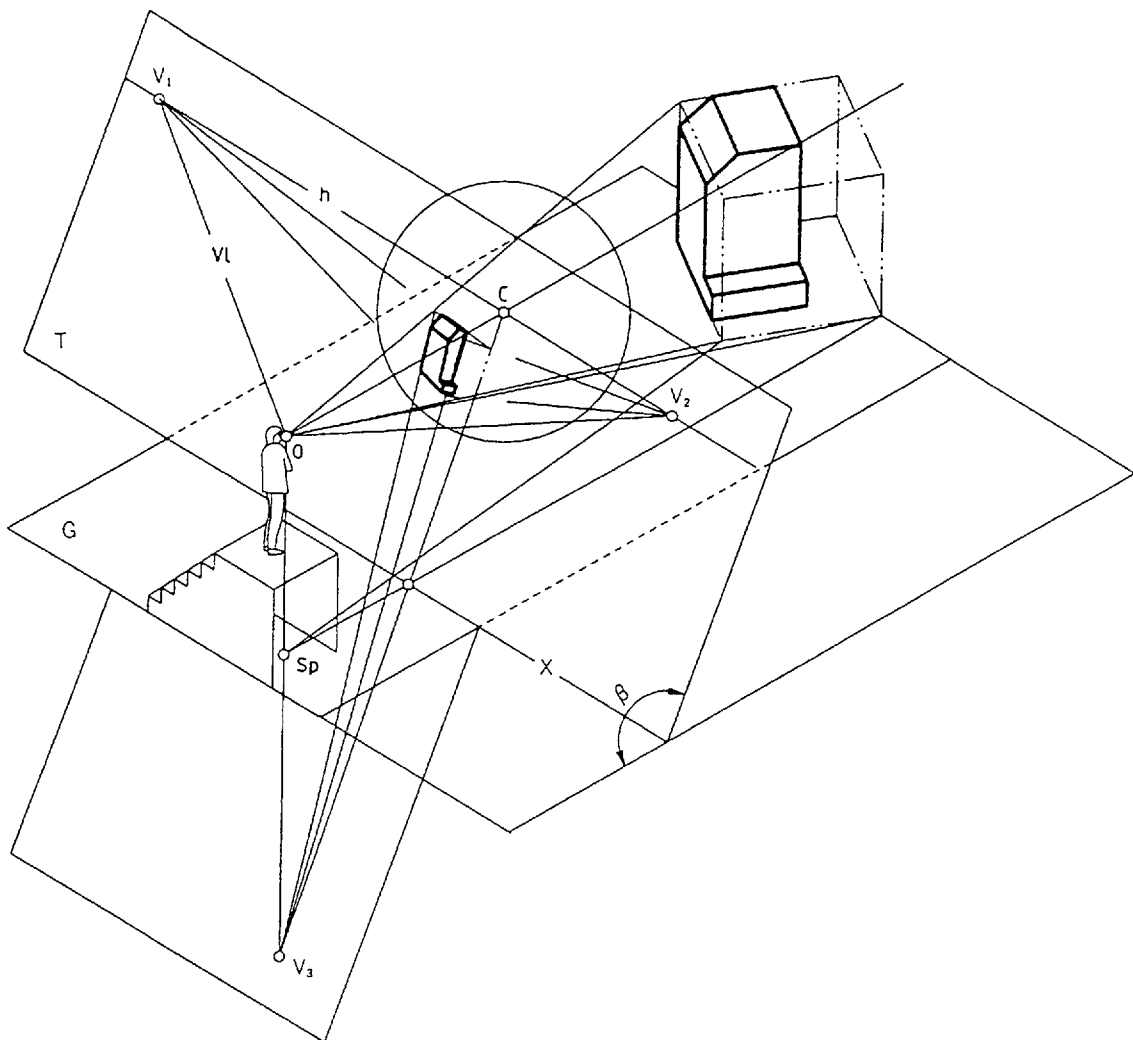


**Fig. 5** Projection model with inclined projection plane and an object in any position with respect to the projection plane ( $\beta > 90^\circ$ )

Informative reference:  $\beta$  is an angle formed by the projection plane and the basic plane towards the projection centre .

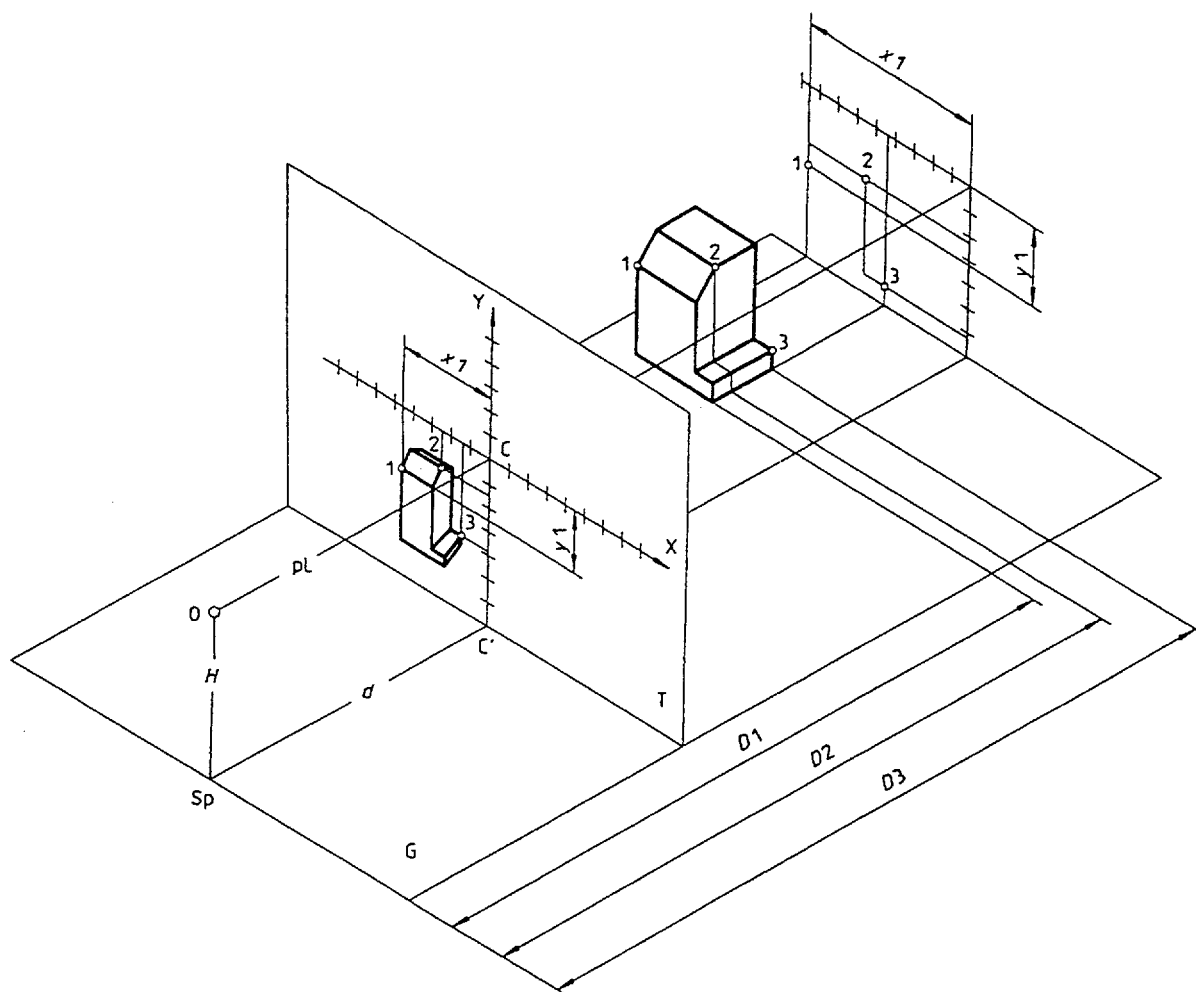


**Fig. 6** Projection model with vertical projection plane and an object in special position, showing the lengths used in the mathematical formula for calculation of the perspective image

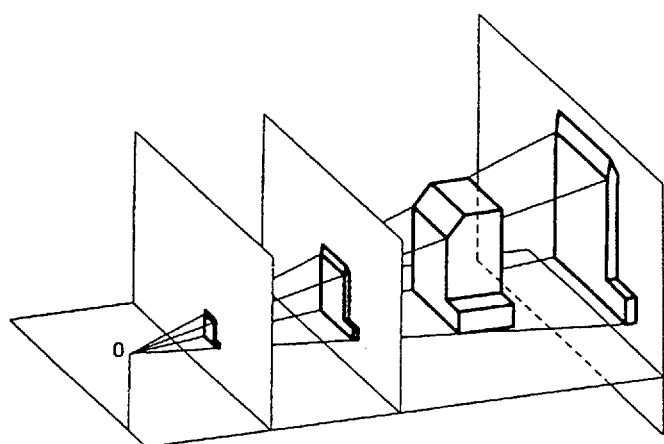
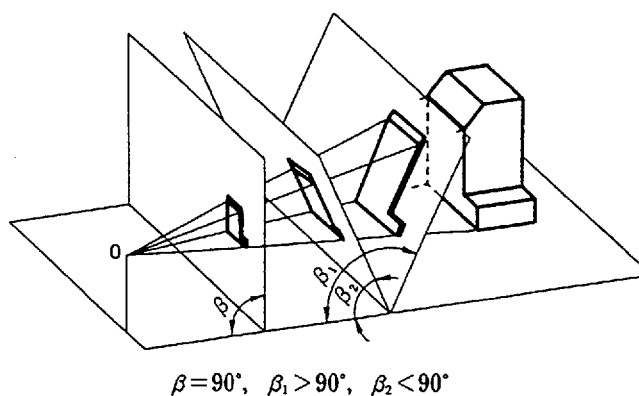


**Fig. 7** Location of projection planes



$$\beta = 90^\circ, \beta_1 > 90^\circ, \beta_2 < 90^\circ$$

**Fig. 8** Position of projection planes

**6.2 Circle of vision and vision cone** To obtain a fully instructive image of an object without peripheral distortions on the projection plane, the object must be positioned within a vision cone having an aperture angle not greater than  $60^\circ$ .

Heavy peripheral distortions occur on images outside the circle of vision; the image does not appear fully instructive since length, width and height do not match the object's inherent proportions (see Fig. 9)

An object can be depicted nearly undistorted if the projectors result in a bundle of rays inclined not more than  $30^\circ$  with respect to the main projector.

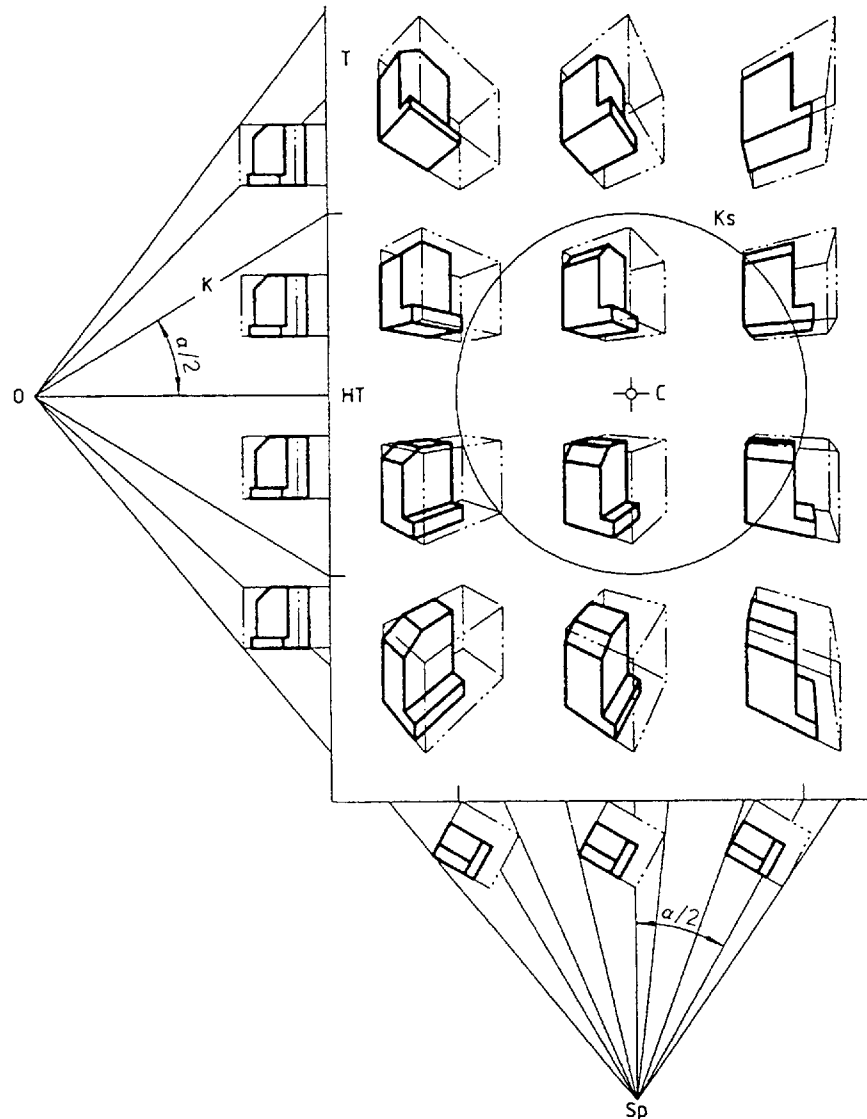


**Fig. 9 Object, framed in a cube, within and outside the circle of vision**

The main projector should hit the object to be depicted in a part which is visually important, so that the object is contained within the minimum vision cone.

**6.3 Distance** Different relative distance influence the image size and its appearance. When the distance between the object and the projection plane is fixed and the projection centre and the object lie on opposite sides of the projection plane, increasing the distance ( $d$ )