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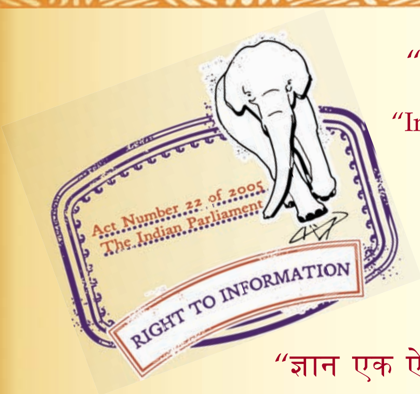

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IS 15021 (Part 3) : 2001
ISO 5456-3 : 1996

भारतीय मानक

तकनीकी ड्राइंग — प्रक्षेपण पद्धतियाँ

भाग 3 घन प्रस्तुतीकरण

Indian Standard

TECHNICAL DRAWINGS — PROJECTION METHODS

PART 3 AXONOMETRIC REPRESENTATIONS

ICS 01.100.01

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

November 2001 **Price Group 4**

NATIONAL FOREWORD

This Indian Standard (Part 3) which is identical with ISO 5456-3 : 1996 'Technical drawings — Projection methods — Part 3: Axonometric representations' issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on the recommendation of Drawings Sectional Committee and approval of the Basic and Production Engineering Division Council.

This standard (Part 3) specifies basic rules for the application of the recommended axonometric representations of all types of technical drawings. Other parts of this series are given as follows:

IS 15021 (Part 1) : 2001	Technical drawings — Projection methods: Part 1 Synopsis
IS 15021 (Part 2) : 2001	Technical drawings — Projection methods: Part 2 Orthographic representations
IS 15021 (Part 4) : 2001	Technical drawings — Projection methods: Part 4 Central projection

The text of ISO Standard has been approved as suitable for publication as Indian Standard without deviations. In the adopted standard certain terminology and conventions are not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.

b) Comma (,) has been used as a decimal marker, while in Indian Standards, the current practice is to use a full point (.) as the decimal marker.

In this adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their place are listed below along with their degree of equivalence for the editions indicated :

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 128 : 1982	IS 10714 : 1983 General principles of presentation on technical drawings	Identical
ISO 129 : 1985	IS 11669 : 1986 General principles of dimensioning on technical drawings	do
ISO 3098-1 : 1974	IS 9609 (Part 1) : 1983 Lettering on technical drawings: Part 1 English characters (*first revision*)	do
ISO 5456-1 : 1996	IS 15021 (Part 1) : 2001 Technical drawings — Projection methods: Part 1 Synopsis	do
ISO 10209-1 : 1992	IS 8930 (Part 1) : 1995 Technical product documentation — Vocabulary: Part 1 Terms relating to technical drawings: General and types of drawings (*first revision*)	do
ISO 10209-2 : 1993	IS 8930 (Part 2) : 2001 Technical product documentation — Vocabulary: Part 2 Terms relating to projection methods	do

(*Continued on third cover*)

Indian Standard

TECHNICAL DRAWINGS — PROJECTION METHODS

PART 3 AXONOMETRIC REPRESENTATIONS

1 Scope

This part of ISO 5456 specifies basic rules for the application of the recommended axonometric representations for all types of technical drawings.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 5456. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 5456 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 128:1982, *Technical drawings — General principles of presentation.*

ISO 129:1985, *Technical drawings — Dimensioning — General principles, definitions, methods of execution and special indications.*

ISO 3098-1:1974, *Technical drawings — Lettering — Part 1: Currently used characters.*

ISO 5456-1:1996, *Technical drawings — Projection methods — Part 1: Synopsis.*

ISO 10209-1:1992, *Technical product documentation — Vocabulary — Part 1: Terms relating to technical drawings: general and types of drawings.*

ISO 10209-2:1993, *Technical product documentation — Vocabulary — Part 2: Terms relating to projection methods.*

3 Definitions

For the purposes of this part of ISO 5456, the definitions given in ISO 5456-1, ISO 10209-1 and ISO 10209-2 apply.

4 General

The general principles of presentation given in ISO 128 shall be followed.

4.1 Position of the coordinate system

The position of the coordinate axes shall be chosen, by convention, so that one of the coordinate axes (the Z-axis) is vertical.

4.2 Position of the object

The object to be represented is located with its principal faces, axes and edges parallel to the coordinate planes. The object shall be orientated to show the principal view and the other views that would preferably be chosen when representing the same object in orthogonal projections.

4.3 Axes of symmetry

Axes and traces of planes of symmetry of the object shall not be drawn unless necessary.

4.4 Hidden contours and edges

Hidden contours and edges should preferably be omitted.

4.5 Hatching

Hatching to indicate a cut or section shall be drawn preferably at an angle of 45° with respect to axes and contours of the cut or section (see figure 1).

Hatching to indicate planes parallel to the coordinate planes shall be drawn parallel to the projected coordinate axis, as shown in figure 2.

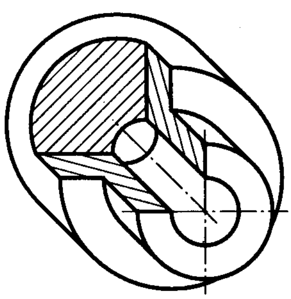


Figure 1

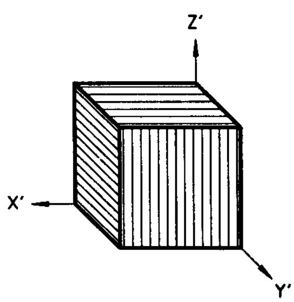


Figure 2

4.6 Dimensioning

Dimensioning of axonometric representations is normally avoided. If, for special reasons, dimensioning is considered necessary, the same rules given for orthogonal projections (ISO 129 and ISO 3098-1) shall be used (see figures 6 and 12).

5 Recommended axonometries

Recommended axonometries for technical drawings are:

— isometric axonometry (see 5.1);

— dimetric axonometry (see 5.2);

— oblique axonometry (see 5.3).

Coordinate axes X, Y, Z are to be indicated by upper case letters. If other items (e.g. dimensions) have to be indicated in a table or drawing, lower-case letters x, y, z shall be used for better differentiation (for examples see ISO 6412-2).

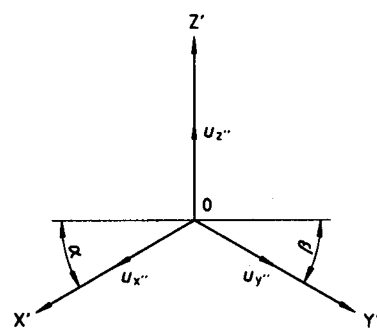
5.1 Isometric axonometry

The isometric axonometry is the orthogonal axonometry in which the projection plane forms three equal angles with the three coordinate axes X, Y and Z[1].

Three unit length segments u_X, u_Y and u_Z on the three coordinate axes X, Y and Z, are respectively projected orthogonally on the projection plane in three equal segments $u_{X'}$, $u_{Y'}$ and $u_{Z'}$ on the projected X', Y' and Z' axes whose lengths are:

$$u_{X'} = u_{Y'} = u_{Z'} = (2/3)^{1/2} = 0{,}816$$

The projection X', Y' and Z' of the three coordinate axes X, Y and Z on the projection plane (drawing surface) is shown in figure 3.



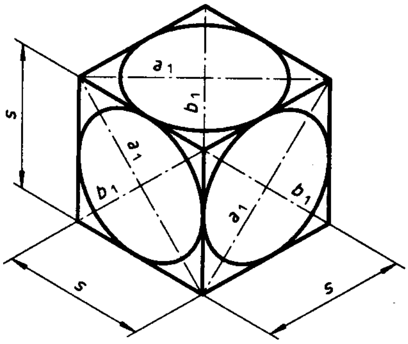
$\alpha = \beta = 30°$

Figure 3

In drawing practice, the projected unit length segments on the X', Y' and Z' axes are taken as $u_{X''} = u_{Y''} = u_{Z''} = 1$, which corresponds to a graphic representation of the object enlarged by a factor $(3/2)^{1/2} = 1{,}225$.

1) This gives a representation identical to that obtained by orthogonal projection of the principal view of a right hexahedron with all its faces equally inclined to the projection plane.

The isometric axonometry of a right hexahedron with circles inscribed on its faces is represented in figure 4.



Length of the ellipse axes:

$$a_1 = \sqrt{\frac{3}{2}}\, s \approx 1{,}22s$$

$$b_1 = \sqrt{\frac{1}{2}}\, s \approx 0{,}71s$$

Figure 4

The isometric axonometry gives the same visual importance to all three faces of the right hexahedron, and is therefore convenient to draw on an equilateral-triangle grid (see figure 5).

An example of dimensioning for isometric axonometry is given in figure 6.

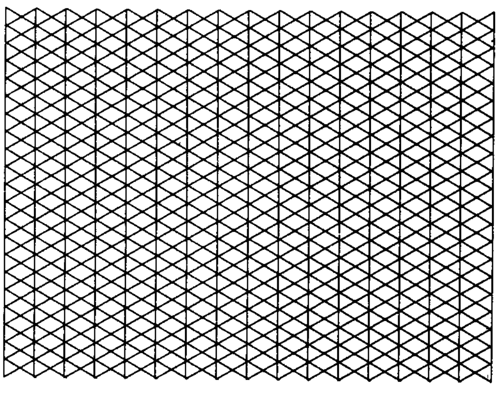


Figure 5

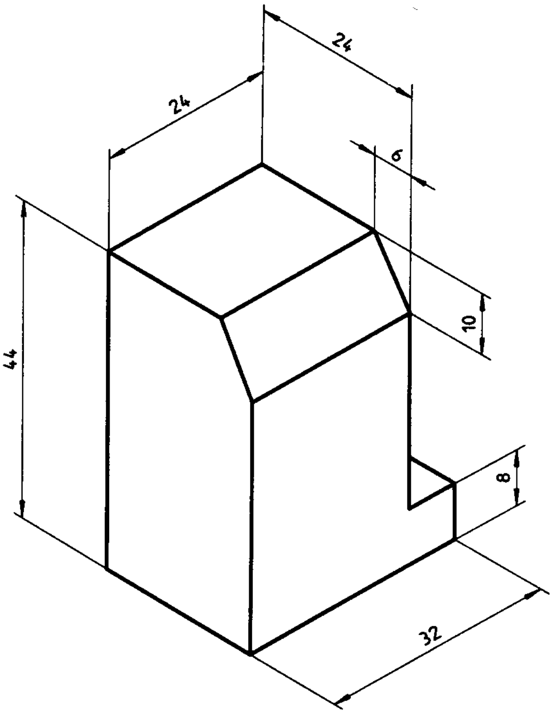


Figure 6

5.2 Dimetric axonometry

Dimetric axonometry is used when a view of the object to be represented is of main importance. The projection of the three coordinate axes is given in figure 7. The ratio of the three scales is $u_{x'}:u_{y'}:u_{z'}$ = 1/2:1:1.

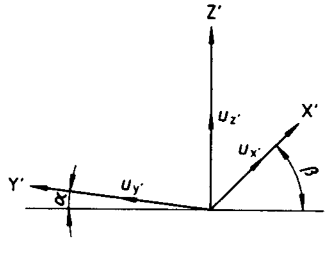
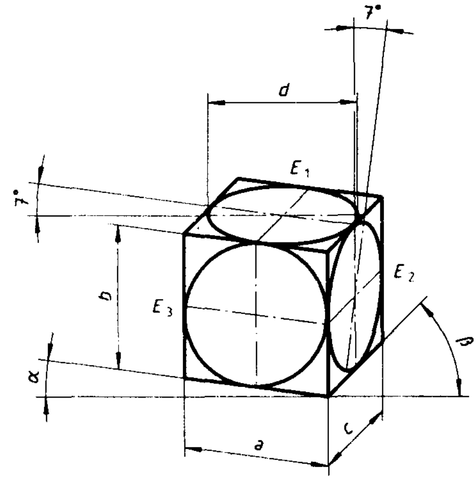


Figure 7

The dimetric axonometry of a right hexahedron with circles inscribed in its faces is given in figure 8.



$a:b:c = 1:1:1/2$
$\alpha = 7°$
$\beta = 42°$

Figure 8

5.3 Oblique axonometry

In oblique axonometry, the projection plane is parallel to one coordinate plane and to the main face of the object to be represented, whose projection remains in the same scale. Two of the projected coordinate axes are orthogonal. The direction of the third projected coordinate axis and its scale are arbitrary. Several types of oblique axonometry are used, because of their ease of drawing.

5.3.1 Cavalier axonometry

In this type of oblique axonometry, the projection plane is normally vertical and the projection of the third coordinate axis is chosen by convention at 45° to the remaining projected orthogonal axes; the scales on the three projected axes are identical: $u_{X'} = u_{Y'} = u_{Z'} = 1$ (see figure 9).

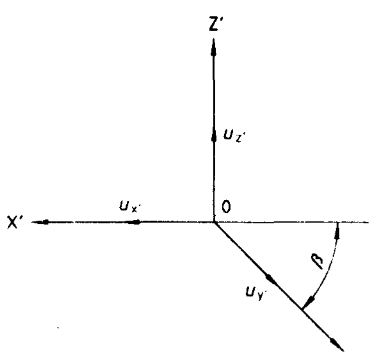


Figure 9

The four possible cavalier axonometries of a right hexahedron are shown in figure 10.

Cavalier axonometry is very simple to draw and makes it possible to dimension the drawing, but heavily distorts the proportions along the third coordinate axis.

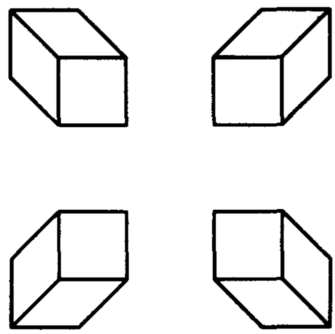
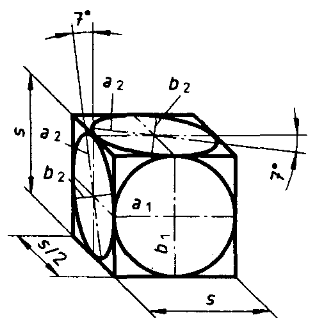


Figure 10

5.3.2 Cabinet axonometry

Cabinet axonometry is similar to cavalier axonometry, except that on the third projected axis the scale is reduced by a factor of two. This provides a better proportion to the drawing.

A cabinet axonometric representation of a right hexahedron with circles inscribed in its faces is shown in figure 11.



$a_1 = b_1 = s$

Length of the ellipse axes:

$a_2 = 1{,}06s$
$b_2 = 0{,}33s$

Figure 11

An example of dimensioning is given in figure 12.

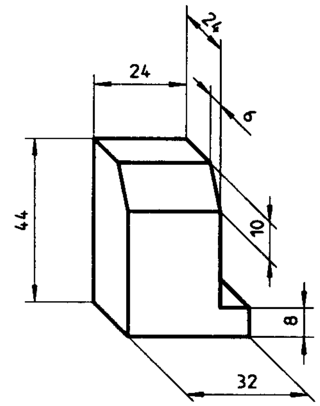


Figure 12

5.3.3 Planometric axonometry

In planometric axonometry, the projection plane is parallel to the horizontal coordinate plane. Projections using angles α = 0°, 90° or 180° should be avoided so that all necessary information can be presented (see figure 13).

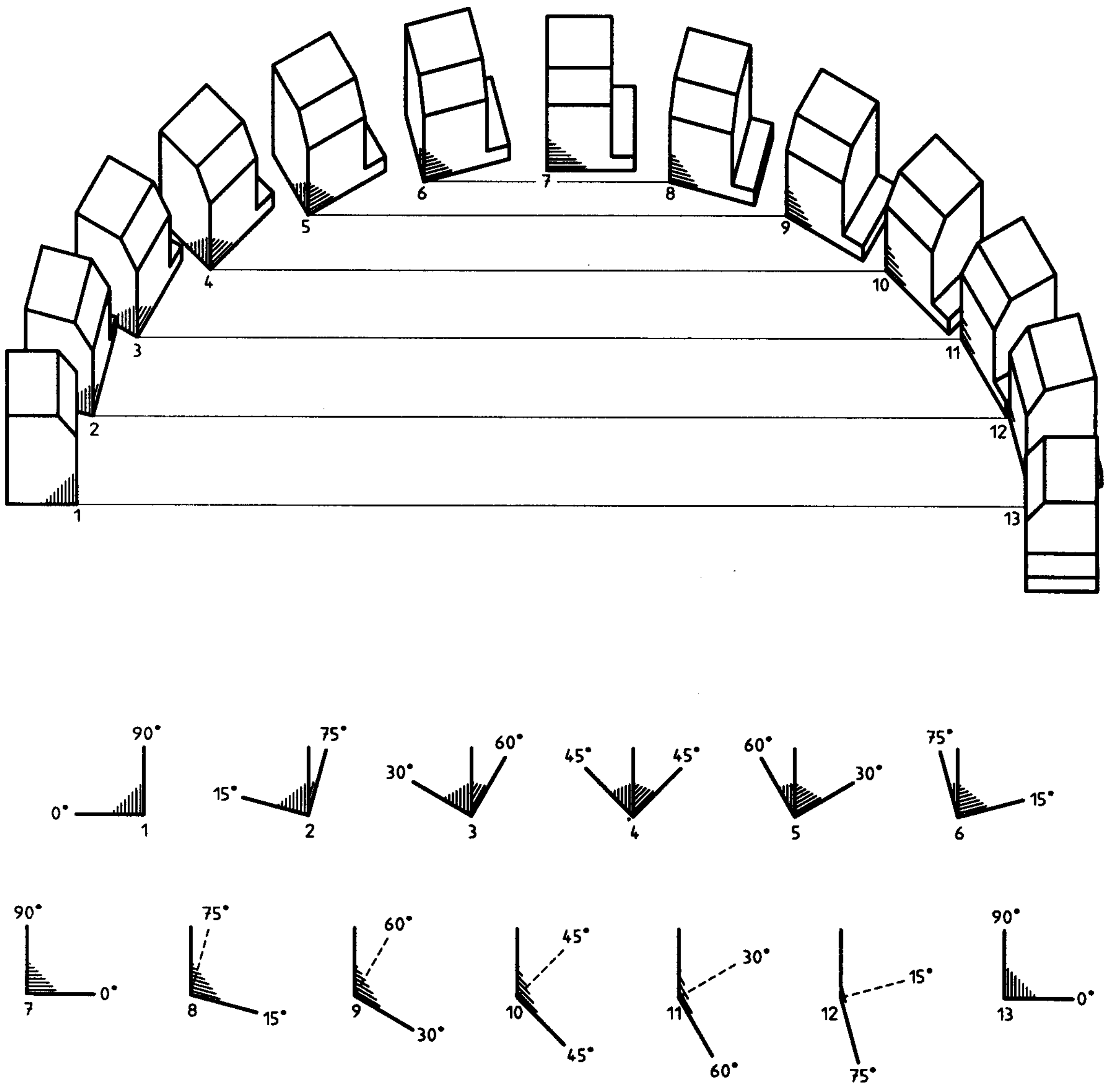


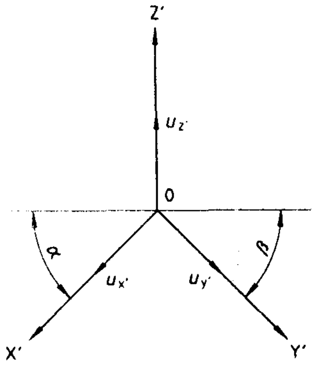
Figure 13

5.3.3.1 Normal planometric projection

Possible projections of coordinate axes whose scales can be chosen in the ratio 1:1:1 are shown in figure 14.

A right hexahedron with its dimensioning is given in figure 15.

This type of oblique axonometry is particularly suited for town planning drawings.



α = 0° to 180°
β = 90° − α

Figure 14

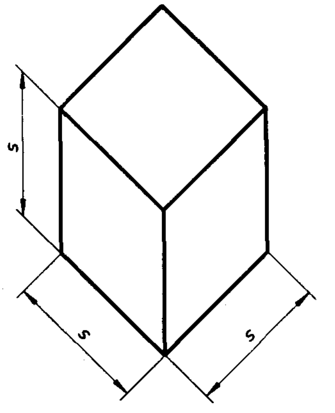


Figure 15

5.3.3.2 Shortened planometric projection

Possible projections of the coordinate axes whose scales can be chosen in the ratio 1:1:2/3 are shown in figure 14.

A right hexahedron with its dimensioning is given in figure 16.

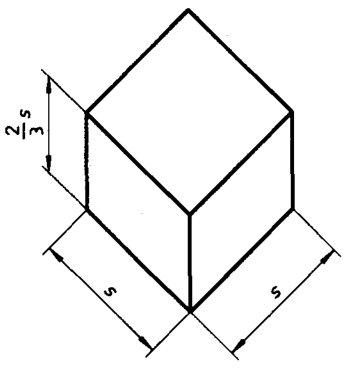


Figure 16

Annex A
(informative)

Bibliography

[1] ISO 6412-2:1989, *Technical drawings — Simplified representation of pipelines — Part 2: Isometric projection.*

(*Continued from second cover*)

This adopted standard also gives Bibliography in Annex A which is informative. The corresponding Indian Standard against the ISO Standard is given below along with its degree of equivalence for the editions indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 6412-2 : 1989	IS 10990 (Part 2) : 1992 Technical drawings — Simplified representation of pipelines: Part 2 Isometric projections (*first revision*)	Identical

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Amendments Issued Since Publication

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Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110 002
Telephones : 323 01 31, 323 33 75, 323 94 02

Telegrams : Manaksanstha
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