Engineering Graphics

Conversion of Pictorial Views into Orthographic Views

4.1 Conversion of Pictorial Views into Orthographic Views

A pictorial view, such as an isometric or oblique view, represents a three-dimensional object in a single drawing, showing several of its faces simultaneously in a realistic, easy-to-visualise manner. While pictorial views are extremely useful for quickly understanding the overall shape of an object, they suffer from an important limitation: since faces are shown at an angle (foreshortened), a pictorial view does not generally show the true shape and true size of most of the object's individual surfaces, making it unsuitable, on its own, for precise manufacturing or construction purposes.

For this reason, engineering drawings intended for actual manufacture are almost always prepared as a set of orthographic views (typically the front view, top view, and one side view), each showing the true shape and true size of the object as seen from a particular direction, at right angles to the corresponding plane of projection. The process of converting a given pictorial view of an object into its equivalent set of orthographic views is therefore an essential and frequently practised skill in engineering graphics.

This section deals with this conversion process for simple objects, using the first angle projection method exclusively (as introduced in Section 3.1).

General Procedure for Conversion

Although the specific details vary depending on the shape of the object concerned, the general procedure for converting a pictorial view into a set of orthographic views (in first angle projection) follows the sequence of steps outlined below:

Step	What to Do
1. Study the Pictorial View	Carefully examine the pictorial (isometric or oblique) view of the object to understand its overall shape, and identify all its individual surfaces, edges, and features (steps, notches, holes, slots, etc.).
2. Choose the Direction of Viewing	Decide which direction will be taken as the front (usually the direction that shows the maximum detail and the most natural, characteristic shape of the object), since the front view (FV) is the starting point for all other views.
3. Visualise and Draw the Front View	Imagine looking directly at the object along the chosen front direction, and draw the outline seen, representing every visible edge as a continuous line and every hidden edge as a dashed line.

4. Draw the Top View, Projected from the Front View	Imagine looking straight down at the object from above, and draw the top view directly below the front view (in first angle projection), keeping every corresponding point vertically aligned with the front view by projection lines.
5. Draw the Side View, Projected from the Front View	Imagine looking at the object from the side (usually the left, for a left-hand side view in first angle projection), and draw the side view to the right of the front view, keeping every corresponding point horizontally aligned with the front view by projection lines, and vertically aligned with the top view (through a 45° mitre line, or by transferring depth measurements).
6. Add Correct Line Conventions and Dimensions	Ensure all views use correct line types (visible outlines, hidden lines, centre lines, as covered in Section 1.2), and add appropriate dimensions to fully describe the size of the object.

Worked Example: A Simple Stepped Block

The following worked example illustrates the conversion process for a simple stepped block, a common introductory shape used to practise orthographic view construction. The object consists of two rectangular portions of unequal height joined together, forming a step (or L-shaped profile) along its length, as shown in the pictorial view below.

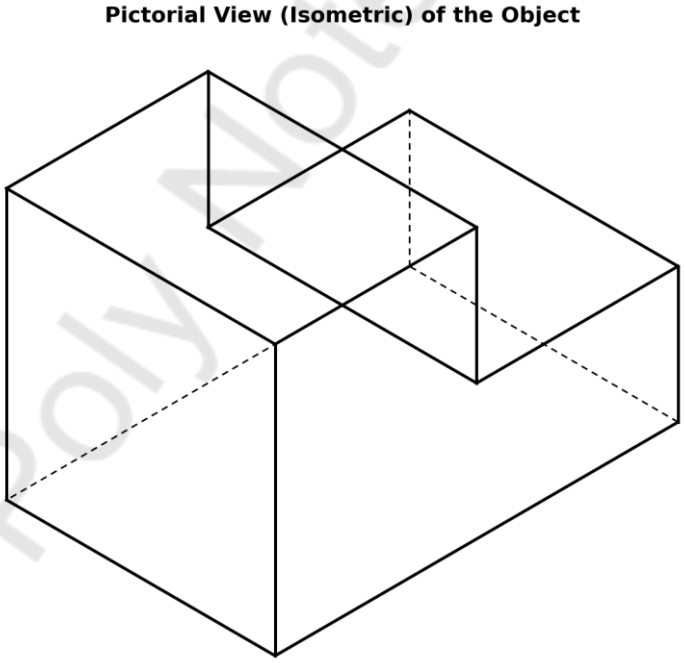

Figure 1: Pictorial (isometric) view of a simple stepped block (hidden edges shown dashed)

Applying the general procedure described above, the front view is first drawn by visualising the object as seen directly from the front, showing the characteristic L-shaped step profile. The top view is then drawn directly below the front view (in first angle projection), and appears as a plain rectangle (since the object's footprint does not change with height), with a single visible line marking the position of the step, where the surface height changes.

Finally, the side view is drawn to the right of the front view, appearing as a plain rectangle corresponding to the maximum height and full depth of the object, with a hidden (dashed) line marking the height at which the shorter portion's top surface lies, since this edge is not visible when viewed directly from the side.

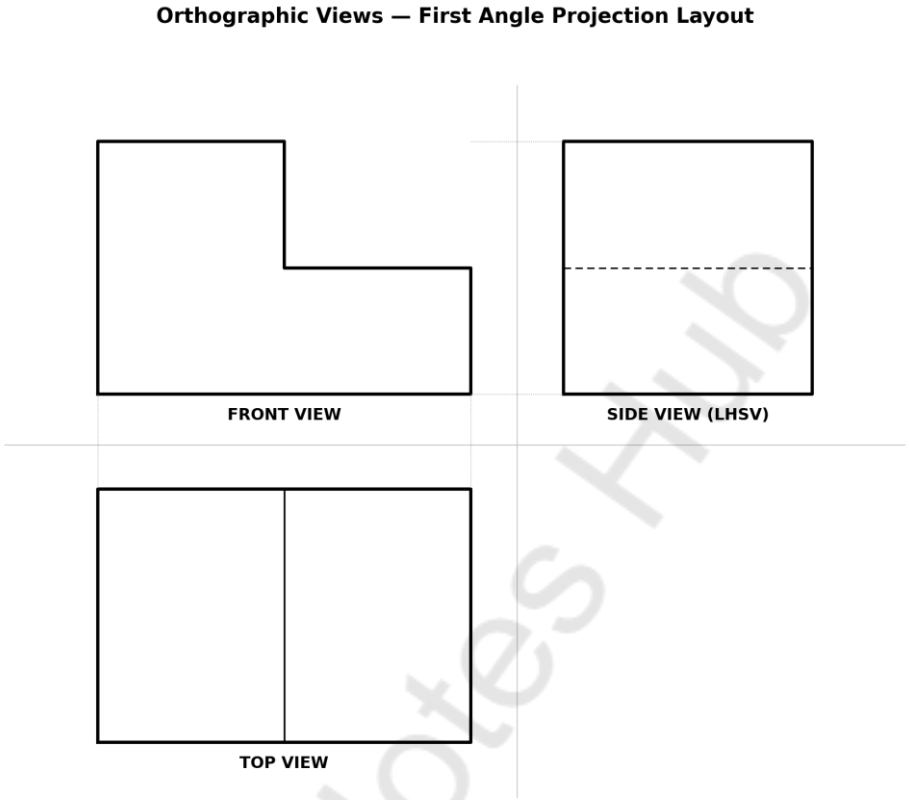

Figure 2: The resulting front view, top view, and side view, arranged in standard First Angle projection layout

This worked example illustrates several important general principles that apply when converting any pictorial view into orthographic views:

- Every visible edge of the object, in a given viewing direction, is drawn as a continuous (visible) line in the corresponding orthographic view.
- Every edge that is hidden from view in a given viewing direction (blocked by other parts of the object) is drawn as a dashed (hidden) line in the corresponding view, at its correctly projected position.
- Corresponding points and features must remain correctly aligned between views, using vertical projectors between the front view and top view, and horizontal projectors (together with depth transfer, often via a 45° mitre line) between the front view and side view.

- Features that are visible as an edge in one view (such as the top surface boundary of the step, visible in the top view) may appear as a hidden line, or not require a separate line at all, in a different view, depending on the viewing direction.

2. Multiple Choice Questions (MCQs)

Answer the following questions by selecting the most appropriate option.

1. A pictorial view (such as an isometric view) of an object shows:

A) Only the front face of the object

B) A three-dimensional, single-view representation of the object, showing several faces at once

C) Only measurements, without any shape

D) Only the top surface of the object

2. Converting a pictorial view into orthographic views is necessary mainly because:

A) Pictorial views are always more accurate for manufacturing

B) Orthographic views show the true shape and size of each face without distortion, which is essential for accurate manufacture

C) Pictorial views cannot be drawn by hand

D) Orthographic views require no measurements at all

3. When converting a pictorial view to orthographic views, the first view that is generally drawn is the:

A) Side view

B) Front view

C) Top view

D) Auxiliary view

4. In first angle projection, once the front view is drawn, the top view is drawn:

A) Above the front view

B) Below the front view, in direct vertical projection from it

C) To the extreme left, unrelated to the front view

D) On a completely separate sheet

5. In first angle projection, the side view is typically placed:

A) To the right of the front view (for a view from the left)

B) Above the top view only

C) Never drawn at all

D) Overlapping the front view

6. An edge of the object that is not visible in a particular orthographic view is represented using a:

A) Continuous thick line

B) Dashed (hidden) line

C) Long dash dot line

D) No line at all, simply omitted

7. When converting a stepped or notched pictorial object into its front view, a change in the height of the object along its width is typically represented in the front view as:

A) A smooth curve

B) A step (change of level) in the outline

C) A dashed line only

D) No change at all in the outline

8. Projectors used to transfer points from the front view to the top view (in first angle projection) are drawn:

A) Horizontally

B) Vertically, connecting corresponding points directly below the front view

C) At a random angle

D) Diagonally only

9. A visible edge on the top surface of an object, marking a change in height (such as a step), is represented in the top view as a:

A) Hidden (dashed) line

B) Continuous (visible) line

C) No line at all

D) Centre line

10. Depth measurements are typically transferred between the top view and the side view using:

A) A 45° mitre line, or by direct transfer of measurements

B) Random guesswork

C) Only verbal description

D) They cannot be transferred at all

Answer Key

1. B) A three-dimensional, single-view representation of the object, showing several faces at once | 2. B) Orthographic views show the true shape and size of each face without distortion, which is essential for accurate manufacture | 3. B) Front view | 4. B) Below the front view, in direct vertical projection from it | 5. A) To the right of the front view (for a view from the left) | 6. B) Dashed (hidden) line | 7. B) A step (change of level) in the outline | 8. B) Vertically, connecting corresponding points directly below the front view | 9. B) Continuous (visible) line | 10. A) A 45° mitre line, or by direct transfer of measurements

3. Broad / Long Answer and Practical Questions

1. Explain why orthographic views are generally required for manufacturing purposes, even when a pictorial view of the object is already available.

2. List, in the correct sequence, the general steps followed when converting a pictorial view of an object into its corresponding orthographic views.

3. Explain how visible and hidden edges of an object are represented differently when converting a pictorial view into orthographic views, referring to the appropriate line conventions.

4. Referring to the worked example in this chapter, explain why the top view of the stepped block appears as a plain rectangle, while the front view shows a distinct L-shaped step.

5. Explain why the side view of the stepped block, in the worked example, shows a hidden (dashed) line rather than a visible line at the height of the shorter portion.

6. Explain the role of projectors (both vertical, between the front view and top view, and horizontal, between the front view and side view) in ensuring that all three orthographic views remain correctly aligned and consistent with one another.

7. Sketch a simple L-shaped or notched block of your own design (with approximate dimensions), and draw its pictorial (isometric) view.

8. For the object you designed in Question 7, draw its three orthographic views (front view, top view, and side view) in first angle projection, correctly applying visible and hidden line conventions.

9. Explain, with reference to a simple example, how a rectangular notch or hole in an object would be represented differently in the front view, top view, and side view.

10. Discuss why practising the conversion of pictorial views into orthographic views (and vice versa) is considered an important skill for developing spatial visualisation ability in engineering students.