

You are viewing sample pages from our textbook:

***“Blueprint Reading for the Construction Trades, Second Edition”***

The first twelve pages of Chapter 4, Orthographic Drawings, have been included in this sample. The information shown is an explanation of how to “see” three-dimensional objects in only a horizontal or vertical direction, and how to arrange the resulting orthographic views.

Emphasis is placed on how the views are generated, why the views must be located as they are, and how to generate hidden information. The intent is the correct visualization of orthographic views from a three-dimensional object.

This theme is developed further as the Chapter continues, and ends with a series of exercises designed to assist the reader in developing orthographic views.

This sequence is typical of the book’s layout; instruction is always followed by exercises, and answers always follow the exercises.

If you require more information about the contents of this book, please contact us directly at [info@micro-press.com](mailto:info@micro-press.com).

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SECTION 2

LEARNING  
TO  
VISUALIZE

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# CHAPTER 4

# ORTHOGRAPHIC DRAWINGS

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## INTRODUCTION

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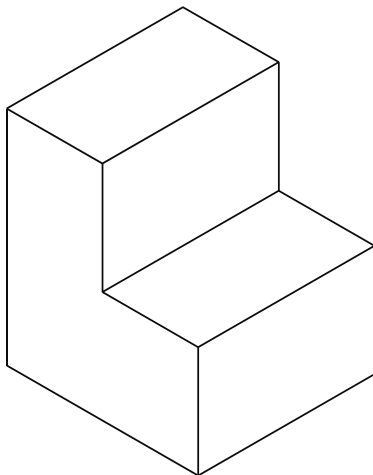
In this Chapter you will learn the method of drawing used by draftspersons to produce virtually all kinds of working drawings, including construction drawings. This system of drawing is so important that you will find it almost impossible to interpret a construction drawing properly without being at least familiar with the techniques involved.

On the other hand, this does not mean you must become an expert draftsperson. At this stage all you need is a good working knowledge of the practical applications of orthographic drawing. The absolute technical and theoretical rules can be studied later in other courses, should you want to specialize in those areas.

As you work through the Chapter, keep in mind that orthographic is only half of the visualization process. The other part comes in the next two Chapters, where you must “reverse” the orthographic drawings to visualize a pictorial or “picture” view of an object. Orthographic is, however, a very logical and rigidly applied method that you will find quite easy to grasp as you work through the exercises. You will first examine a very simple object to see the basic applied techniques and then proceed to harder examples for practice. As you follow the instruction, I want you to copy and hand sketch the examples as they develop. This hand sketching is important - it helps you coordinate and improve your brain-eye-hand faculties. Plus, it helps significantly with your visualization skills.

## THE ORTHOGRAPHIC SYSTEM

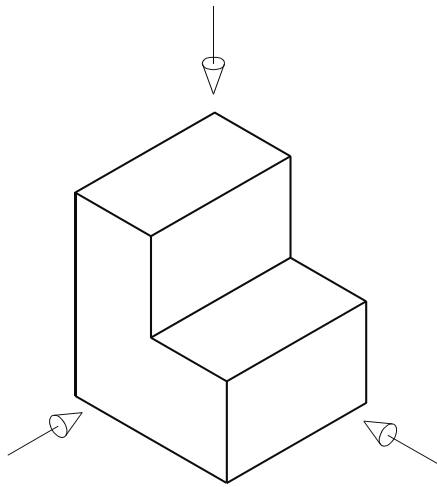
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Pictorial view of a Step-Block.

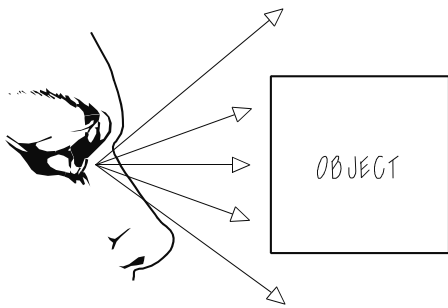
Look at the object on the left, a drawing of a Step-Block. This is the way you tend to see objects in your mind's eye and, while it makes a nice picture, it is not very practical from a technical point of view. For instance, you cannot tell what might be on the unseen sides, you do not know if the corners are all square, nor will you be able to extract dimensions easily.

In order to present all information about the object in a useful form, a draftsperson will convert this pictorial view into a series of *flat, two-dimensional views*, using the orthographic system.



The three standard directions of view.

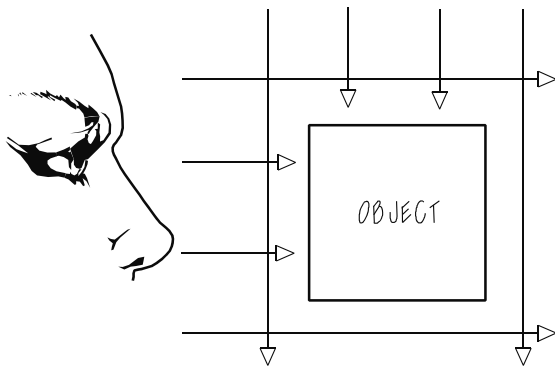
Normally, three views are drawn, looking from the directions shown at the left (although other viewing directions can be used). I will draw these three views for you and show you what they will look like and how they must fit together under the orthographic system.



Pictorial view of a Step-Block.

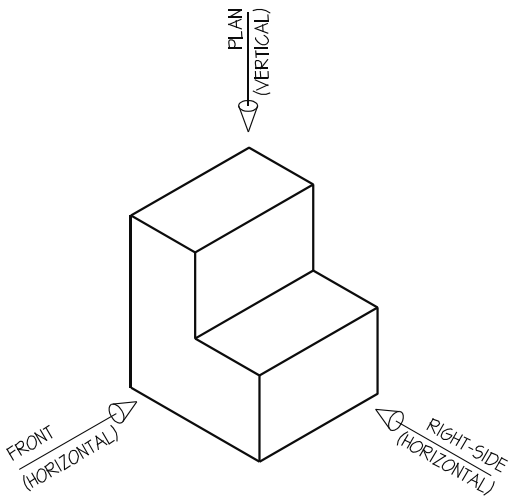
But first, you need to make a slight revision in the way you “see” objects. This change in normal viewing habits is *very important*; you *must* fully understand the effect it will have before proceeding.

Look at the illustration on the left. This is the way you see normally, with your *eyes* moving in a scanning pattern. You do this from side-to-side and up-and-down.



Parallel viewing for orthographic views.

For orthographic visualization, instead of scanning in all directions you must see *only* in *parallel horizontal* or *vertical lines*. This means that your *eyes* remain *fixed* while your *head* moves *up* and *down*. This makes a considerable difference in how you see the faces of the object.

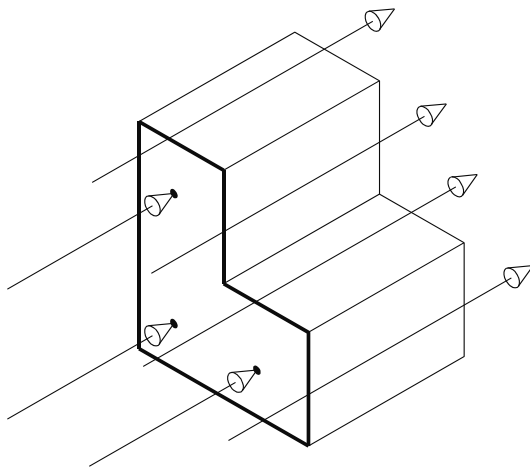


Identifying the horizontal and vertical views.

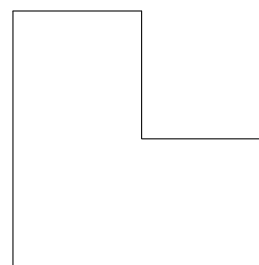
Go back to the Step-Block now and apply this new visual approach. You will notice on the left that I have given names to the three views and have indicated whether they are seen horizontally or vertically. Remember, sketch along with me as you go through the instruction.

### Front View

Concentrate on the *Front View* first. If you look at it correctly the effect will be as seen below on the left, while the below-right illustration shows what you will actually see. Notice in the left-hand drawing that you can *only* see the dark-lined Front “face” of the object. Notice also that you cannot see *any* of the other sides of the object. This is because all of those sides are “going away” from you in your line of sight and are simply not visible from your viewpoint. They are still there, of course, but are hidden behind the outer edges of the Front face.



Correct viewing of the Front face.

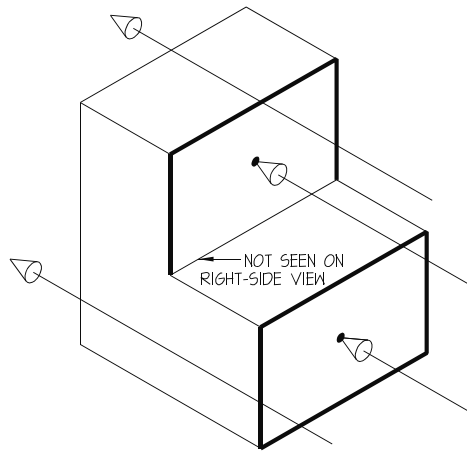


FRONT VIEW

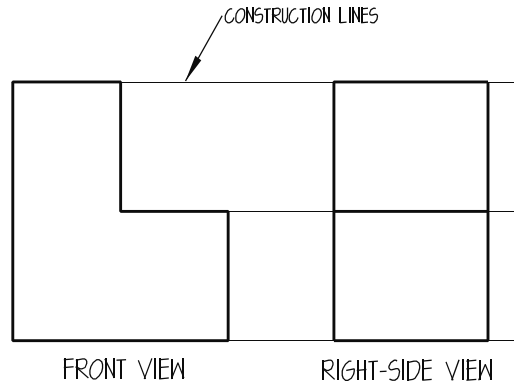
The Front view as seen.

## Right-Side View

The next step is to add the Right-Side view. Imagine moving around the object to look directly at its right side. How you see it is shown below-left and what you see is shown below-right. Again, the faces you actually see are heavily outlined.



Correct viewing of the Right-Side face.



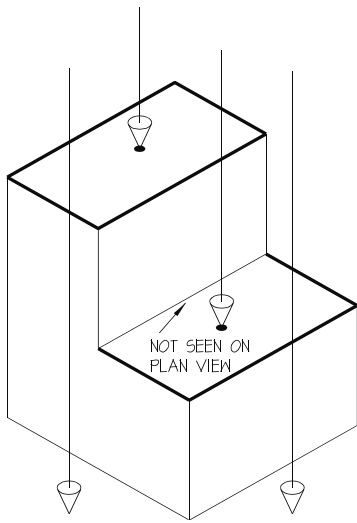
Right-Side view drawn to the right of the Front.

On the Right-Side view, note that there is *no apparent separation* between the upper and lower faces of the Right-Side, other than the nearest middle horizontal *edge* (the back middle edge cannot be seen). The two faces *appear* to be joined together. This is just an illusion caused by the horizontal viewing system. In the next Chapter, Isometric drawing, this illusion becomes very important when you have to reverse the orthographic viewing process.

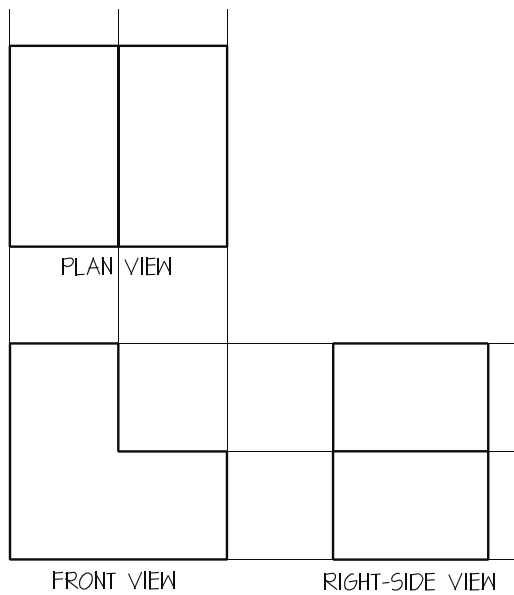
To draw the Right-Side you must first sketch in the horizontal very light-weight construction lines as shown (see Chapter 3). These will help you locate the Right-Side in its proper position relative to the Front. Draw the lines horizontally from each corner of the Front View across to the right, and line-in the Right-Side view of the object. I will explain why the Right-Side is located here later in this Chapter.

## Plan View (or Top View)

Next comes the Plan View. This view can be a little more difficult to visualize because you have to imagine yourself moving over the top of the object and looking vertically downwards. The left-hand and right-hand illustration on the next page show you how the Plan is placed above the Front. Again, first sketch the light vertical construction lines to locate the Plan in its proper position. Draw these *upward* from each corner of the Front View and line-in the Plan of the object.



Correct viewing of the Plan face.



Plan view drawn above the Front.

It is also important to note that the Plan *must* be drawn above the Front as shown. Again, you will see why in a moment.

Note: Technically, this view is called a “Plan” view since it shows *all* of the object, not just the “top” face. However, the term “Top View” is also used on some drawings.

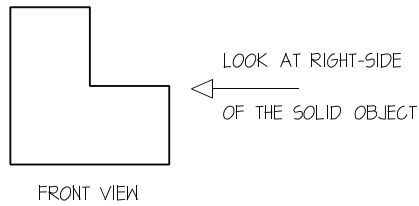
Having sketched the plan in place you have now completed the orthographic drawing and have fully described the Step-Block. Anyone who looks at your three views will be able to interpret your drawing and easily visualize the shape and size of the object.

## VIEW PLACEMENT

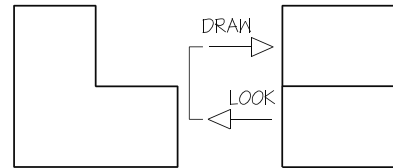
The next principle to understand is why the three views you have drawn must *always* be placed in the positions shown. The answer is very logical and is one of the major parts of the orthographic system that you need to understand completely.

The rule is quite simple: **What you see, you draw on the side you are looking *from*.**

To see how the rule is applied, you need to go back to the Front view. Keep very firmly in mind that although you see only a flat two-dimensional view it is still a solid object. So, when you move around to the right of the Step-Block, you will see the Right-Side view. You apply the rule by locating the Right-Side view on the side you are looking from. The illustrations below show this procedure.

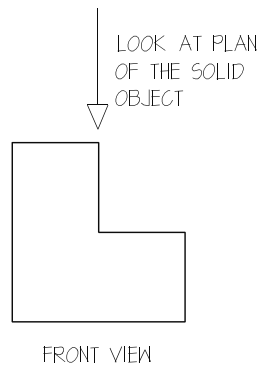


Seeing the Right-Side.

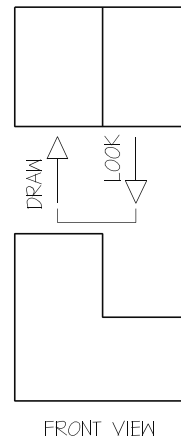


Drawing the Right-Side on the same side.

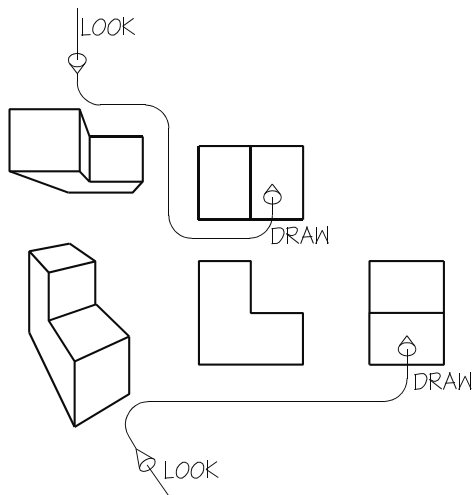
Exactly the same happens with the Plan View (see below).



Seeing the Plan view.

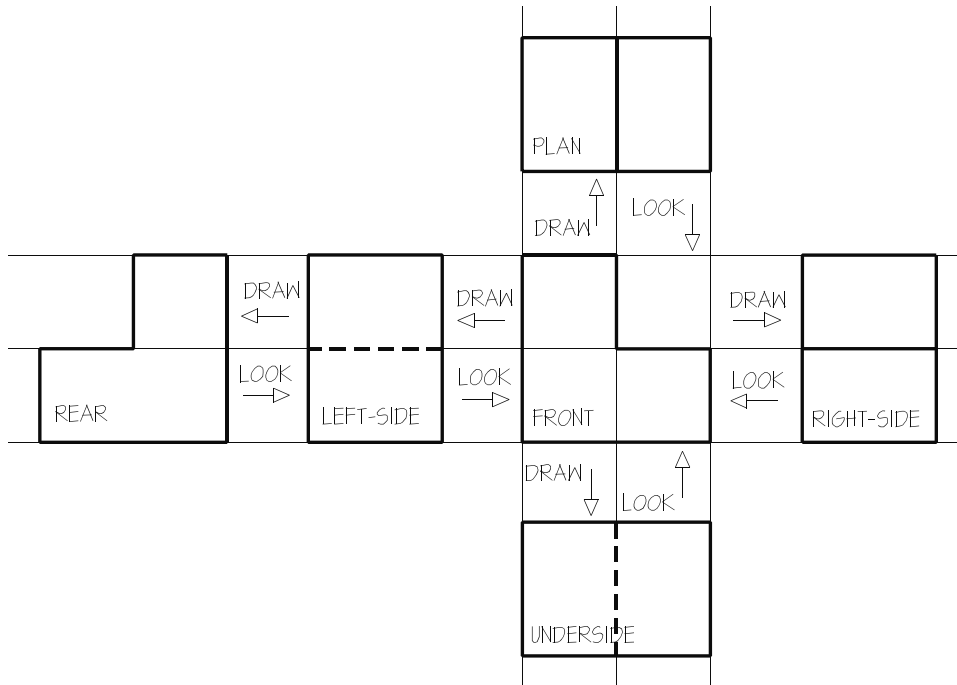


Drawing the Plan view.

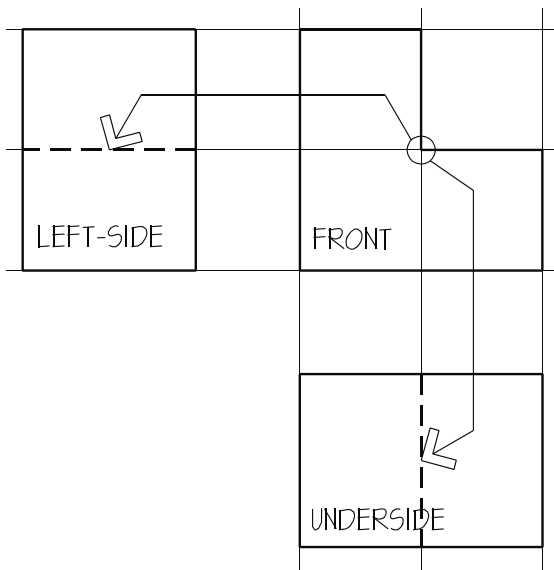


Because of this rule, all the sides are directly related to each other. You *must* maintain that relationship for the complete drawing to make any sense. This is why I want you to draw the light construction lines before you draw the actual view. To help your understanding of this important rule, look at the illustration on the left to see a more pictorial description of the view relationships.

So that you can develop this important sense of relationship it will help if you sketch the three other views of the Step-Block not yet shown. Copy the drawing below, which shows those three extra views, and think carefully about the way the placement rule specifies the exact view relationships. Note though, that only in exceptional circumstances would you need more than three views to fully describe this particular object.



All six views of the Step-Block in their correct locations.



Hidden lines and their relationships between views.

Look closely at the Left-Side and the Under-Side views redrawn and enlarged on the left. Notice the broken lines that have appeared on these two views. These are *hidden lines* (see Chapter 3) and mean that behind the face of the block you are looking at, there is an *edge* of some kind that you cannot normally see.

There are two basic rules to remember when dealing with hidden lines:

1. Hidden edges must always be shown on an orthographic drawing, with one exception:
2. If a hidden edge happens to be exactly behind a solid, visible edge, then it must not be shown.

The edge created by the inside corner of the L-shape is seen as a hidden line on the Left-Side and Under-Side views.