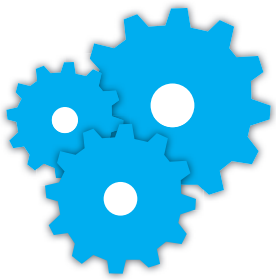
Contents

Unit 1

Engineering Drawing



Part I Reading and Translating

Section A: Types of Views

Engineering drawing is a graphic language shared by people in different nations. It deals with the means of representation of a designer's idea by line styles or specific symbols on the plane. In engineering environment, drawings or views are chosen to describe physical objects like machine parts. Therefore, only the minimum number of views or drawings is used to portray the size and shape of an object completely.

1.1 Basic Views

The First-angle Projection

The first-angle projection is widely used and makes a standard in China. In the **first-angle projection**, an object is supposed to be positioned in a square box, and the image of the object from **six viewing** directions creates six projected orthographic views on the principle planes, that is, each view of the

object is drawn on the opposite side of the box (Fig. 1-1). Frequently, in industry, three views are chosen to represent the shape of an object. They are top, front and left side views. Imaginatively, the top view is seen directly from above, the front view is drawn by looking straight at the front; and the sight of left view is on the right side of the object (Fig. 1-2).

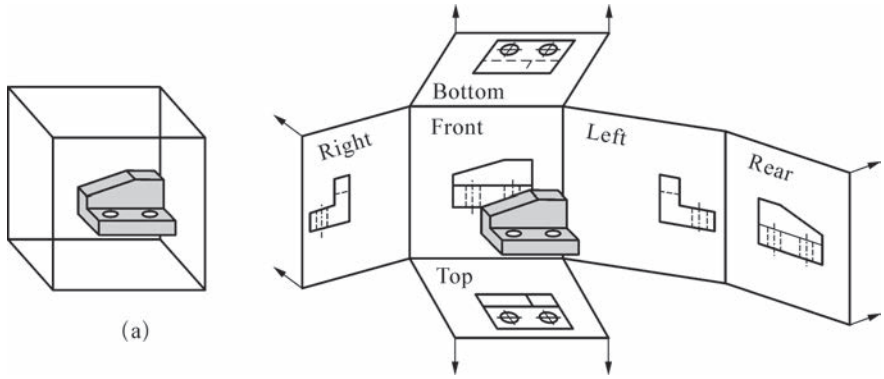


Fig. 1-1 Six Principle Views

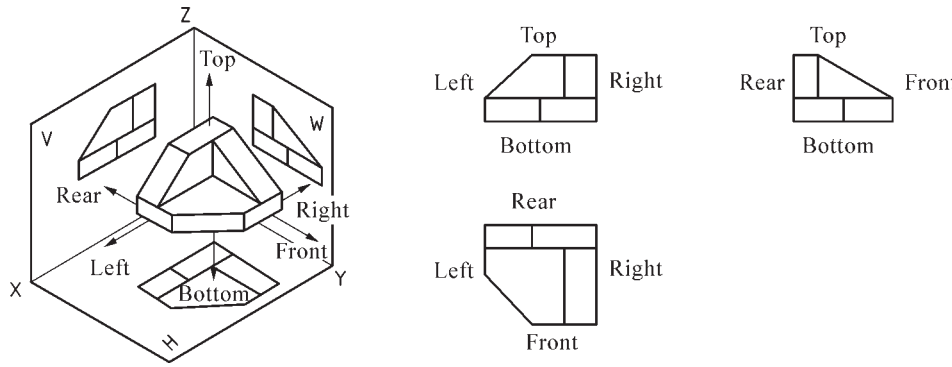


Fig. 1-2 Three Views

Auxiliary Views

An auxiliary view is another orthographic projection on a plane (not one of the six primary planes). It is used to show a slanted surface in true size and shape of an object. When necessary, the auxiliary view will be combined with a partial view. One of its features is that the projection on a plane is perpendicular to one of the principle planes (Fig. 1-3).

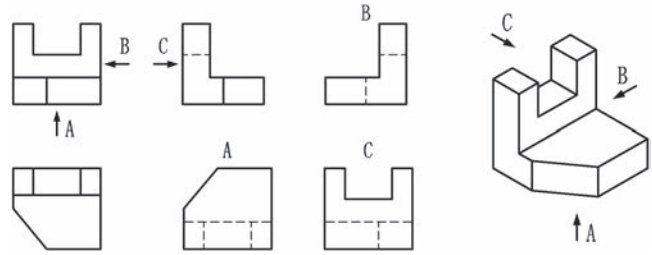


Fig. 1-3 Auxiliary Views of an Object

Partial Views

Principle views are generally used to represent an object. If some part of an object isn't shown clearly and it is not necessary to draw the whole principle view, but to project the local part of the object to the principle plane, we can get a projection view of this part, called partial view as shown in Fig.1-4.

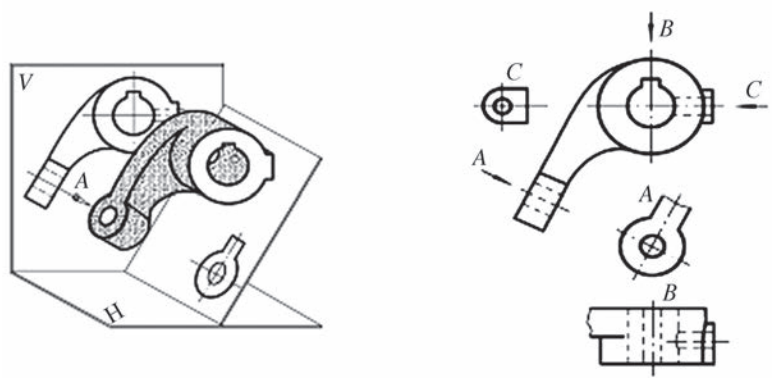


Fig. 1-4 Partial View

1.2 Sectional Views

A simple object may have an invisible and complicated internal design, while a view "in section" can clearly display the detailed structure. A sectional view is supposed to have a cutting plane. Its front part is removed to make the internal features visible. Representations of this kind are specified mainly by full and half views.

Full View

A full view is derived from a cutting plane passing entirely through an object. The resulting section will show the whole model on the datum plane (Fig. 1-5).

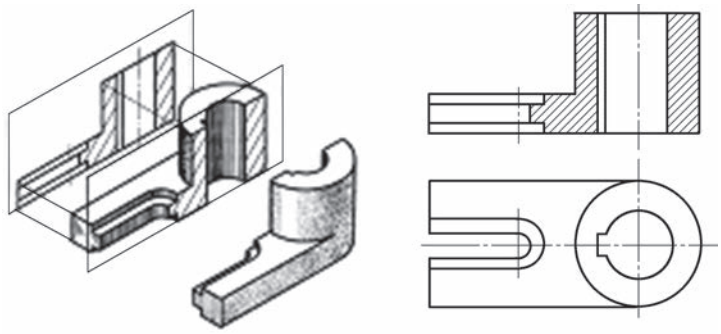


Fig. 1-5 Full-sectional Views of an Object

Half View

If the cutting plane cuts only half-way across an object, usually symmetrical, a half view of the section

appears. A sectional view of this type deals with the representation of both the interior and exterior construction of a symmetrical object, as shown in (Fig. 1-6).

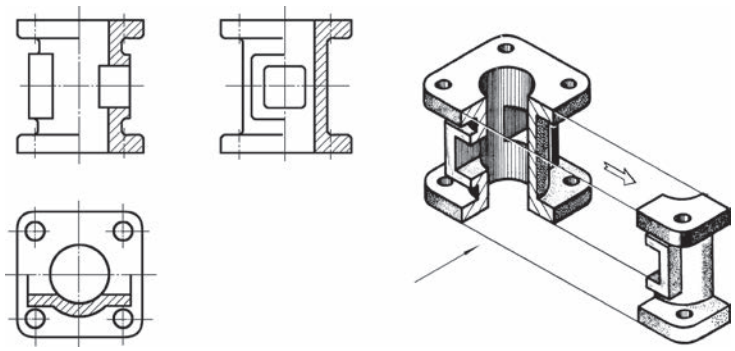


Fig. 1-6　Half-section View of an Object

1.3 Broken View

From a geometric point of view, a broken view is an orthographic projection of an object from the position of a plane. View of this type is used to display only a cross-section of a body for a particular view (Fig. 1-7). More plainly, it is supposed to cut through an object along a cutting plane, where the parallel cross section can be drawn.

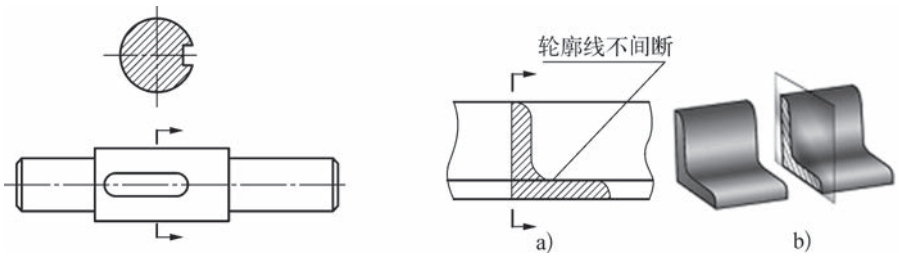


Fig. 1-7　A Broken View

New Words

1. **graphic** /'græfɪk/ *a.* 图形的，图表的
2. **minimum** /'mɪnɪməm/ *a.* 最小的；*n.* 最小值
3. **portray** /pɔ:'treɪ/ *v.* 描绘，描画
4. **plane** /pleɪn/ *n.* 平面；*v.* 刨，刨平
5. **project** /prə'dʒekt/ *v.* 投影
   /'prɔdʒekt/ *n.* 方案
6. **partial** /'pɑ:ʃəl/ *a.* 部分的，局部的
7. **auxiliary** /ɔ:g'zɪlɪərɪ/ *a.* 辅助的，补助的
8. **combination** /ˌkɒmbɪ'neɪʃən/ *n.* 结合，联合
9. **orthographic** /ˌɔ:θə'græfɪk/ *a.* 正交的；直线的
10. **perpendicular** /ˌpɜ:pən'dɪkjʊlə/ *a.* 垂直的；正交的；*n.* 垂线
11. **complicated** /'kɒmplɪkeɪtɪd/ *a.* 复杂的；难解的
12. **internal** /ɪn'tɜ:nl/ *a.* 内在的；国内的
13. **detail** /'di:teɪl/ *v.* 详述，细说；*n.* 细节，详情
14. **section** /'sekʃən/ *n.* 截面；断面
15. **feature** /'fi:tʃə/ *n.* 特征；特色；*v.* 是……的特色

16. **represent** /ˌreprɪ'zent/ *v.* 表现；描绘
representation /ˌreprɪzen'teɪʃən/ *n.* 表现，表述
17. **specify** /'spesɪfaɪ/ *v.* 指定；详细说明
specification /ˌspesɪfɪ'keɪʃən/ *n.* 规格；说明书
18. **datum** /'deɪtəm/ *n.* 数据，资料；基准面
19. **symmetrical** /sɪ'metrɪkəl/ *a.* 对称的；均匀的
20. **interior** /ɪn'tɪərɪə/ *a.*内部的； *n.* 内部
21. **exterior** /eks'tɪərɪə/ *a.* 外部的，表面的； *n.* 外部，表面
22. **geometric** /ˌdʒɪə'metrɪk/ *a.* 几何（学）的

Technical Expressions

1. **engineering drawing** 工程制图
2. **the first-angle projection** 第一视角投影
3. **projection view** 投影图
4. **projection-plane** 投影面
5. **partial view** 局部视图
6. **auxiliary view** 辅助视图
7. **sectional view** 剖视图
8. **full view** 全剖视图
9. **half view** 半剖视图
10. **broken view** 断面图
11. **section view/drawing** 剖面图
12. **section-lining** 剖面线
13. **cross-section** 剖切面；横截面

Notes

1. Engineering drawing is a graphic language shared by people in different nations.
工程制图是世界各国人们都使用的一种绘图语言。
句中“shared by people in different nations.”为过去分词短语作定语，修饰前面的先行词a graphic language， 相当于定语从句。

2. ... and the image of the object from six viewing directions produces six projected orthographic views on the principle planes ...
……箱内6个方向的投影产生该物体6幅正投影图，……

3. A sectional view is supposed to have a cutting plane.
剖视图有一个假想的剖切面。
to have a cutting plane 为不定式短语作主语补足语。

4. A full view is derived from a cutting plane passing entirely through an object. The resulting section will show the whole model on the datum plane.
当剖面全部通过物体，所得到的是一幅全剖视图，所得到的剖面在该基准面上展示出整个物体的（内部）模型。
passing entirely through an object为现在分词短语作介词from的宾语补足语。

5. One of its features is a projection on a plane perpendicular to one of the principle planes.
它的一个主要特征就是其在一个平面上所产生的投影与其它基本投影之一相垂直。

6. It is not necessary to draw the whole principle view, but to project the local part of the object to the

principle plane.
绘出完整的基本视图没有必要，则只需将这一局部形状向基本投影面投射。
not ... but 为一固定结构。

7. In mechanical drawing, a broken view is also an orthographic projection of an object from the position of a plane.
机械绘图中，断面图也是物体“面”的正投影。

8. More plainly, it is supposed to cut an object perfectly along a cutting plane, where the parallel cross section can be drawn.
更明确地讲，假想的剖切平面将物体的某一处截断，仅就截断面的形状绘成图形。
where引导了一个非限制性定语从句修饰a cutting plane。

Exercises

I. Tell whether each of the following statements is true or false.

1. Engineering drawing is a graphical language that communicates ideas and information from one mind to another.
2. In engineering environment, three views are enough to show fully the size and shape of an object completely; these drawings are the top, front and left side views.
3. The first-angle orthographic projection is an illustration technique in which up to six pictures of an object are produced.
4. A view “in section” is one obtained by imaging the object cut by a cutting plane, the front portion being removed in order to show clearly the interior features.
5. An auxiliary view is derived from projecting to an inclined surface at an angle larger than 90, or more inclined plane.
6. A broken section needs to remove a section between two points in order to make the two remaining sections close together.
7. Not all views are necessarily used, and the determination of what surface constitutes the front, back, top and bottom depends on the projection used.
8. In the first-angle projection, the “top” view is pushed down to the floor, and the “front” view is pushed back to the rear wall.

II. Match the items listed in the following columns.

1. minimum	a. inside of something
2. feature	b. supplementary
3. complicated	c. characteristic
4. internal	d. not easy to understand or analyze
5. partial	e. a flat or level surface

6. plane	f. only a part; not total
7. expose	g. to make visible
8. auxiliary	h. the least possible quantity or degree
9. incline	i. outside part of anything
10. exterior	j. to cause to lean; slant

III. Fill in each blank with a proper word beginning with the letter given.

Section Drawings

Many objects have c_____ interior structure, which can't be clearly shown by m_____ of front, top, side or pictorial views. Section views enable the engineers to show the i_____ in such a way. Features of section drawings are cutting-plane symbols, which show where i_____ cutting planes are passed to produce the sections, a_____ section-lining which appears in the section view on all p_____ that have been in contact with the cutting plane. When only a part of the o_____ is to be shown in section, conventional r_____ such as a revolved, rotated or broken-out section is used. Thus, c_____ engineering drawings will be combination of top and front views, and p_____ or pictorial views.

IV. Translation (Chinese to English).

1. 工程制图是一种在平面上用线条及符号来表达设计者思想的一种手段。**(deal with)**
2. 在制造业中，通常只用限定的几类视图来展示某一物体形状。**(portray)**
3. 迫于就业的压力，学生必须从金工实训中学到实用知识。**(derive ... from)**
4. 剖视图可让设计人员更好地表现某一物体的内部细节。**(enable)**

Section B: Mechanical Drawings and Dimensioning

Mechanical drawings can be classified in two ways. They are recognized as detail drawings and assembly drawings. However, before they are recommended for manufacturing, dimensioning and identifying are required.

1.4 Detail Drawings

A detail drawing is obtained by taking a portion of an existing view and gives complete information for the production of a part. So it is necessary to be indicated with clear specifications, such as, relevant codes, size tolerances, heat treating requirements, finished surfaces, and manufacturing materials (Fig. 1-8).

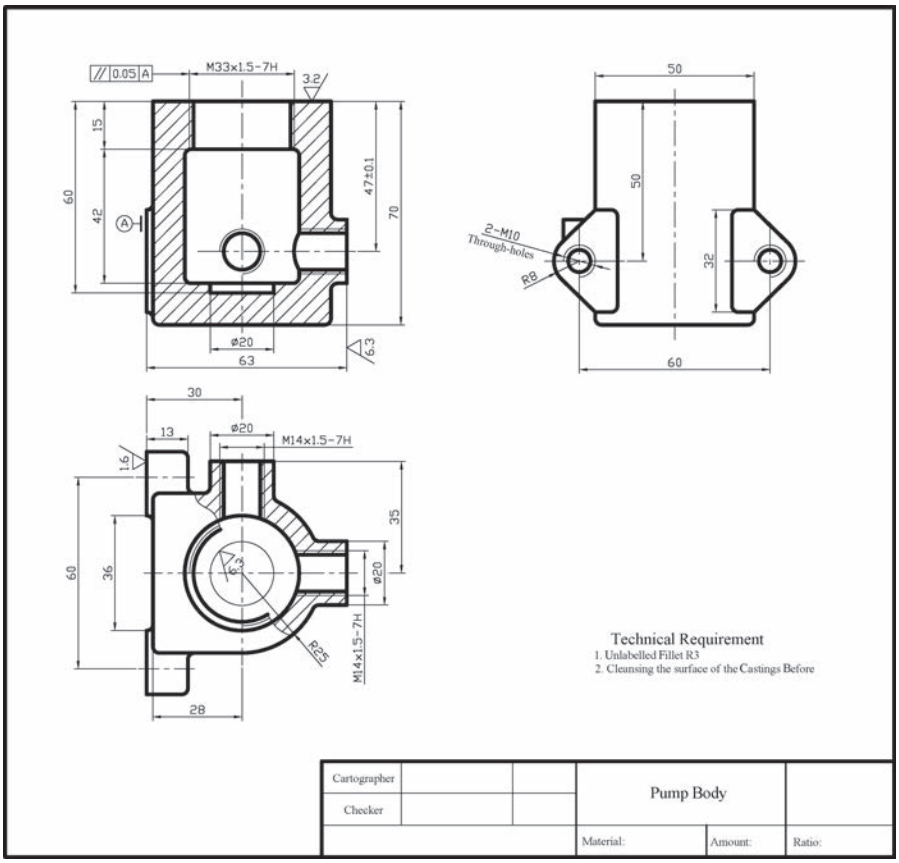


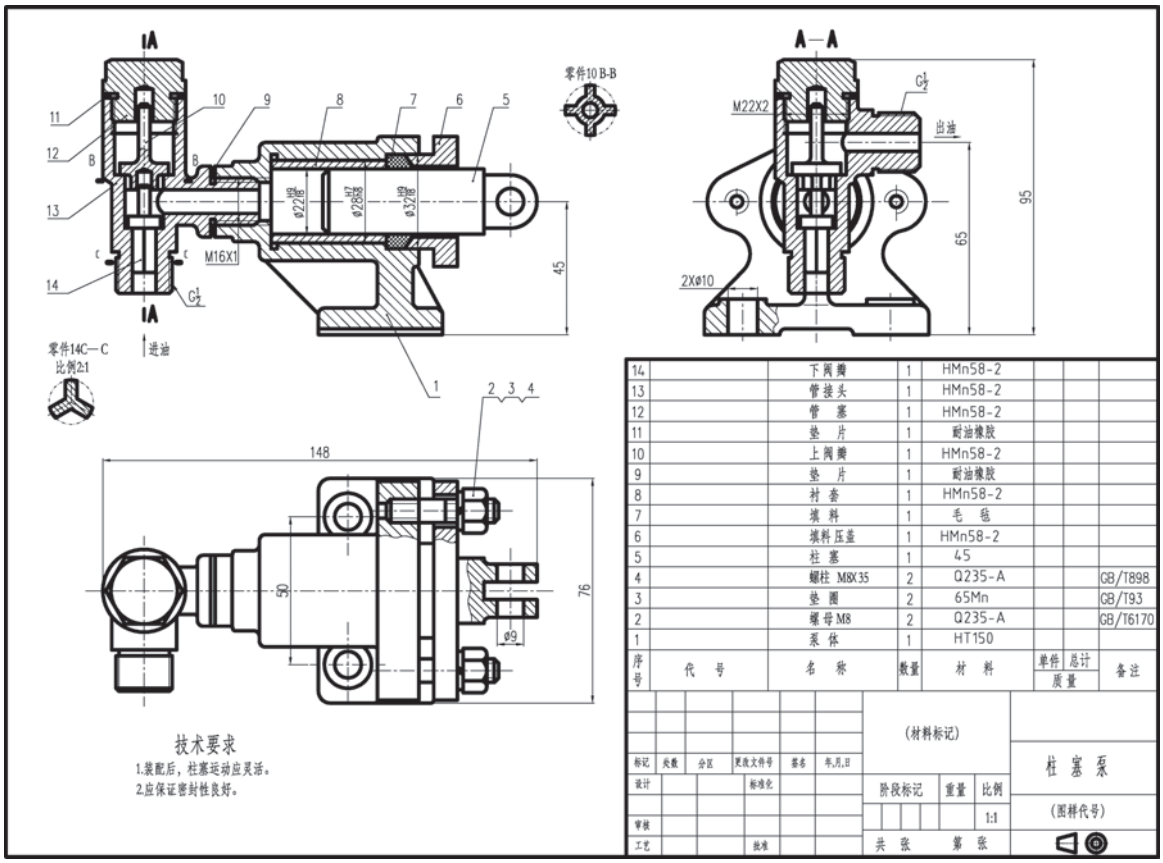
Fig. 1-8 A Detail Drawing

1.5 Assembly Drawings

Assembly drawings show how different parts go together according to a parts list. There are several types of such drawings: design assembly drawings, working assembly drawings, unit assembly drawings, installation diagrams, and so on. A general assembly drawing deals with the parts of a machine or machine unit assembled in their relative working positions (Fig. 1-9). A set of working drawings should include detail drawings of all parts and all relative information.

1.6 Dimensioning

As the purpose of an engineering drawing is to convey the ideas of the designer to workshop, any drawing must be given adequate information, so a part can be made. Before they are introduced to the workshop, careful identifications and labels should be given for the final product or process. Thus, the complete, detailed specification of the elements is required for the completion of this stage of design. In the detailed stage, the task will involve describing the size, shape, orientation, color, material and so on.



序号	代号	名称	数量	材料	单件质量	总计质量	备注
14		下阀瓣	1	HMn58-2			
13		管接头	1	HMn58-2			
12		管 塞	1	HMn58-2			
11		垫 片	1	耐油橡胶			
10		上阀瓣	1	HMn58-2			
9		垫 片	1	耐油橡胶			
8		衬 套	1	HMn58-2			
7		填 料	1	毛 毡			
6		填料压盖	1	HMn58-2			
5		柱 塞	1	45			
4		螺柱 M8X35	2	Q235-A			GB/T898
3		垫 圈	2	65Mn			GB/T93
2		螺 母M8	2	Q235-A			GB/T6170
1		泵 体	1	HT150			

Fig. 1-9 An Assembly Drawing

New Words

1. **classify** /'klæsɪfaɪ/ *v.* 分类；分等
   classification/ˌklæsɪfɪ'keɪʃən/ *n.*分类；分级
2. **identify** /aɪ'dentɪfaɪ/ *v.* 识别；确定
   identification/aɪˌdentɪfɪ'keɪʃən/ *n.* 鉴定；认同
3. **standard** /'stændəd/ *n.* 标准；水准
4. **indicate** /'ɪndɪkeɪt/ *v.* 指出；预示
5. **finished** /'fɪnɪʃt/ *a.* 精加工过的；完工的
6. **relative** /'relətɪv/ *a.* 有关系的；相对的
7. **label** /'leɪbl/ *v.* 为……标注； *n.* 标签
8. **process** /prə'ses/ *n.* 过程；程序； *v.* 加工；处理
9. **orientation** /ˌɒ(:)rɪen'teɪʃən/ *n.* 方位；定向
11. **assemble** /ə'sembl/ *v.* 装配；集合
    assembly/ə'semblɪ/ *n.* 装配；集结
12. **dimension** /dɪ'menʃən/ *n.* 尺寸，尺度；*v.* 标注

Technical Expressions

1. **detail drawing** 零件图
2. **assembly drawing** 装配图
3. **design assembly drawing** 设计装配图
4. **working assembly drawing** 施工装配图
5. **general assembly drawing** 总装配图
6. **installation diagram** 安装图

Notes

1. They are recognized as detail drawings and assembly drawings.
   它们被公认为零件图和装配图。

2. A detail drawing is obtained by taking a portion of an existing view and gives complete information for the production of a part.
   零件图是用现有视图上的一部分为零件生产商提供完整信息的图样。
   existing是现在分词作定语。

3. A general assembly drawing deals with the parts of a machine or machine unit assembled in their relative working positions.
   总装图是一种展示机器部件或装配在相对工作位置的图样。
   assembled in their relative working positions 是过去分词短语，在句中作定语，相当于定语从句 which are assembled in their relative working positions。

4. In this detailed stage, the task will involve describing the size, shape, orientation, color, material, etc.,
   标注阶段的工作是将零件的尺寸、形状、方位、颜色、材料等进行详细描述。
   involve “包括”等意思，后接动名词。

Exercises

I. Choose the best answer for each of the following statements or questions according to the text.

1. Among the variety of engineering drawings, only _____ is recognized as an acceptable standard in today's modern manufacturing industry.
   A. the detail drawing　　B. the assembly drawing
   C. the sectional drawing　　D. the multi-view drawing
2. What differentiates a detail drawing from an assembly drawing is that _____.
   A. it should be given complete information for the manufacturer, describing the work with the adequate dimensions to the part's size
   B. it should be given more views to portray the size and shape of an object
   C. it is unnecessary to show shop operations
   D. it should be given an additional assembly drawing for manufacturing the part
3. Which of the following statements does the classification of the assembly drawings not include?
   A. Multi-view drawings.　　B. Design assembly drawings.
   C. Working assembly drawings.　　D. Installation diagrams.
4. _____ is called detailing stage.
   A. Selecting the kinds of components that will be used to make the process or product
   B. Revision and further improvement of the product

C. Finding and using information in machine design
D. Showing dimensions and describing the shape of objects

5. Engineering drawing is referred to "universal language". It can be understood and used by _____.
   A. people interested in art and languages
   B. engineers and other technical personnel associated with the engineering profession
   C. groups and nations in farming and fishing industry
   D. those who live outside the space of the earth

II. Complete each of the following sentences with one suitable word or phrase in the proper form.

specified	indicate	identify	finished	assemble
deals	construction	involve	recognized	classify

1. There are two _____ classes of drawings. They are detail drawings and assembly drawings.
2. The parts must be manufactured within the _____ limits.
3. Raw materials make up only a small proportion of the cost of the _____ product.
4. Fundamentally, engineering design _____ with the process of problem solving.
5. The cracking of the ice _____ a change of temperature.
6. They needed to _____ the object and make sure it would actually be a UFO because UFO is an unidentified flying object.
7. When you buy furniture from IKEA, you must _____ it yourself.
8. The matter is serious because it _____ your reputation.
9. Elements are usually _____ as metals or non-metals.
10. In a developed city, such as Beijing, wherever you go, you see building under _____.

III. Translation (English to Chinese).

1. Layout drawings of different types are used in different manufacturing fields for various purposes.
2. As the purpose of engineering drawing is to express graphically the ideas and information necessary to others, many drawings must show dimensions so that workers can manufacture parts that will fit together.
3. Usually, a set of working drawings includes a detail drawing of all parts and an assembly drawing of the complete unit.
4. A typical general assembly drawing should include specific use of sectioning and identification of each part with a numbered balloon.

Part II Listening and Speaking

I. Fill in the blanks with what you hear on the CD only once.

1. Engineering drawing _____ a graphic language shared by people in different nations.
2. It deals with the means of representation of a designer's idea by lines or marks _____ the surface.
3. Only the minimum number of views or drawings is _____ to portray completely the size and shape of a part.
4. Generally, there are _____ principle views to represent a machine part.
5. In industry, three views are usually _____ to show fully the shape of an object.
6. Even a simple object may _____ an invisible, complicated internal design.
7. A front part is removed, and _____ the remainder exposing the interior features.
8. A full view is derived _____ the cutting plane passing entirely through an object.
9. If the section of an object is symmetrical, typically, a partial view will be used, _____, two views are sufficient to detail the internal design.
10. A broken section needs to remove a section between two points _____ make the two remaining sections close together.

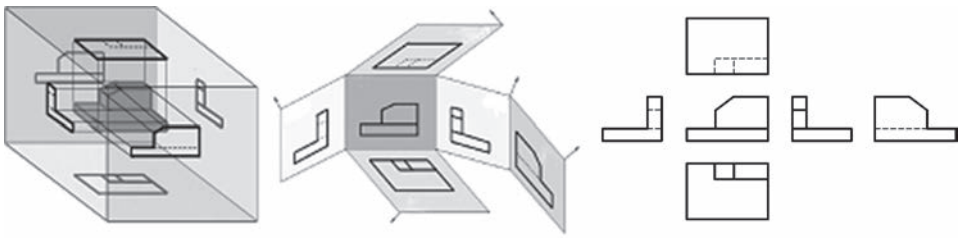
II. Listen to the following paragraph three times and try to fill in the blanks with the words you hear on the disc.

An engineering drawing is a type of _____1_____, used to represent a designer's idea by lines or marks _____2_____. Its purpose is to accurately and clearly seize all the geometric features of a product or a component. The end goal of an engineering drawing is to convey _____3_____ that will allow a manufacturer to produce that component. The process of producing engineering drawings, and the skill of producing them, is often _____4_____ as technical drawing, although technical drawings are also required for disciplines that would not ordinarily _____5_____ as parts of engineering.

III. Read aloud the following paragraph so that your classmates can understand what you are reading.

Engineering drawing is a graphic language shared by people in different nations. It deals with the means of representation of a designer's idea by lines or marks on the surface. In engineering environment, drawings or views are chosen to describe material objects like machine parts. Therefore, only the minimum number of views or drawings is used to portray the size and shape of a part completely.

IV. Describe the following pictures of the first-angle projection in your own words.



Part III Practical Writing

This part is to test your ability to do practical writing. You are required to write a short passage to describe the first-angle projection according to the above pictures in the exercise.