Chapter 3

Engineering Drawing Practice

SUMMARY

The following are some suggestions for rationalizing and reducing cost in the drawing practice area.

Metric. Prepare drawings with metric dimensions only.

Inch. Do not change existing inch-dimensioned drawings unless necessary. Show linear dimensions in inches and decimals on inch drawings. Do not use feet and fractions.

Use of Symbols. The internationally recognized symbols shown in Fig. 3-1 are recommended used whenever practical. Symbols need no translations and take minimal drawing space.

Computer Drafting. Computer drafting is recommended. A number of excellent CAE/CAD/CAM computer software are available now, which will save time and reduce costly errors.

GENERAL INFORMATION ON ENGINEERING DRAWINGS

INTRODUCTION

The material presented in this chapter is intended to serve as a general guide in finding national and international standards on the subject of Engineering Drawing. It is of great importance for multinational companies to use internationally recognized drawing practices. Where a machine is initially designed and manufactured in one country, and at a future date must be produced in another nation, the company will avoid substantial extra expense by producing the machine from the initial drawings.

ISO PAPER SIZES (ISO 216)

The familiar letter-paper size, 8.5 x 11 in., used in the USA, still captures a large percentage of the world market. The ISO paper size, A4, is principally used in Europe and in most of the emerging nations, and is estimated to represent an increasing portion of the world usage of letter-size paper. Some of the considerations made before including the ISO paper sizes in ISO 216 were as follows.

In many countries, far more sizes of paper are used than are really necessary. Many of them came into existence under conditions different from those prevailing today, while the origin of others was due to chance. Consequently, they do not fulfill the present need for consistency between the sizes of paper and printed matter for various purposes, nor do they meet the many requirements for a coherent relationship between the sizes of paper, printed or not, papermaking, printing and converting machinery and equipment, and storage and filing equipment.

The purpose of the ISO standard is to improve the present position by providing a rationally designed ISO system of trimmed sizes which can bring about a reduction in the number of sizes and create more rational, clear, and consistent ranges. This will simplify and cheapen ordering, production, use, dispatch, and storage, and will also provide a sound basis for standardization in related fields.

SYMBOL FOR:	ASME Y14.5M	ISO
STRAIGHTNESS	—	—
FLATNESS	▱	▱
CIRCULARITY	○	○
CYLINDRICITY	⌭	⌭
PROFILE OF A LINE	⌒	⌒
PROFILE OF A SURFACE	⌓	⌓
ALL AROUND	⌒○	⌒○ (proposed)
ANGULARITY	∠	∠
PERPENDICULARITY	⊥	⊥
PARALLELISM	//	//
POSITION	⌖	⌖
CONCENTRICITY (concentricity and coaxiality in ISO)	◎	◎
SYMMETRY	⌯	⌯
CIRCULAR RUNOUT	↗	↗
TOTAL RUNOUT	⌰	⌰
AT MAXIMUM MATERIAL CONDITION	Ⓜ	Ⓜ
AT LEAST MATERIAL CONDITION	Ⓛ	Ⓛ
REGARDLESS OF FEATURE SIZE	NONE	NONE
PROJECTED TOLERANCE ZONE	Ⓟ	Ⓟ
TANGENT PLANE	Ⓣ	Ⓣ (proposed)
FREE STATE	Ⓕ	Ⓕ
DIAMETER	Ø	Ø
BASIC DIMENSION (theoretically exact dimension in ISO)	50	50
REFERENCE DIMENSION (auxiliary dimension in ISO)	(50)	(50)
DATUM FEATURE	A	or A
DIMENSION ORIGIN	⌖→	⌖→
FEATURE CONTROL FRAME	⌖ Ø0.5 Ⓜ A B C	⌖ Ø0.5 Ⓜ A B C
CONICAL TAPER	▷	▷
SLOPE	◺	◺
COUNTERBORE/SPOTFACE	⌴	⌴ (proposed)
COUNTERSINK	⌵	⌵ (proposed)
DEPTH/DEEP	↧	↧ (proposed)
SQUARE	□	□
DIMENSION NOT TO SCALE	15	15
NUMBER OF PLACES	8X	8X
ARC LENGTH	105	105
RADIUS	R	R
SPHERICAL RADIUS	SR	SR
SPHERICAL DIAMETER	SØ	SØ
CONTROLLED RADIUS	CR	NONE
BETWEEN	•◄►	NONE
STATISTICAL TOLERANCE	⟨ST⟩	NONE
DATUM TARGET	Ø6 A1 or A1 Ø6	Ø6 A1 or A1 Ø6
TARGET POINT	×	×

• MAY BE FILLED OR NOT FILLED

FIG 3-1 COMPARISON OF SYMBOLS (ANSI Y14.5M)

NOTES:

1. International and national dimensioning and tolerancing standards.

GLOBAL ISO 1101,2692,5458,5459,7083

USA	ANSI Y14.5M
JAPAN	JIS B0021
GERMANY	DIN 7184
FRANCE	NF E04-121
UK	BS 308-PART 3
ITALY	UNI 7226
CANADA	CSA B78.2
AUSTRALIA	AS 1100.201

2.The ISO symbols are specified in the above national standards. The Canadian standard CSA B78.2 shows the three machining symbols not yet adopted by ISO.

3. Rule No. 1. Where no geometric tolerance is specified, the size tolerances control the geometric form of a feature, as well as its size.