

ASME Y14.2-2008

[Revision of ASME Y14.2M-1992 (R2003)]

Line Conventions and Lettering

**Engineering Drawing and Related
Documentation Practices**

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FOREWORD

This revision was prepared by Subcommittee 2 of the ASME Y14 Committee, Engineering Drawing and Related Documentation Practices. The successful completion of this revision is attributed to the Subcommittee members, the support of their respective companies/organizations, and the U. S. Department of Defense departments and agencies that participated in the review process.

It consists primarily of minor changes to the text to enhance readability. The more substantial changes are as follows:

- (a) A "no terminator" option for datum targets was added to the terminator options.
- (b) The rules for crossing leader lines were rewritten for consistency.
- (c) Due to changes in drawing preparation since the last revision, the lettering type section has been greatly simplified.
- (d) All the figures have been redrawn.

Suggestions for improvement of this Standard are welcome. They should be sent to The American Society of Mechanical Engineers; Attn: Secretary, Y14 Standards Committee; Three Park Ave., New York, NY 10016-5990.

This revision was approved as an American National Standard on September 19, 2008.

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The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

Proposing a Case. Cases may be issued for the purpose of providing alternative rules when justified, to permit early implementation of an approved revision when the need is urgent, or to provide rules not covered by existing provisions. Cases are effective immediately upon ASME approval and shall be posted on the ASME Committee Web page.

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LINE CONVENTIONS AND LETTERING

1 GENERAL

1.1 Scope

This Standard establishes the line and lettering practices for use in the preparation of drawings, including the recognition of the requirements for computer aided design (CAD) and manually prepared drawings.

1.2 Units of Measurement

All dimensions used in this Standard are in millimeters, except in Mandatory Appendix I.

1.3 Applicable Documents

The following revisions of American National Standards form a part of this Standard to the extent specified herein. A more recent revision may be used, provided there is no conflict with the text of this Standard. In the event of a conflict between the text of this Standard and the references cited herein, the text of this Standard shall take precedence.

ASME Y14.3M-2003, Multiview and Sectional View Drawings

ASME Y14.5M-1994, Dimensioning and Tolerancing

Publisher: The American Society of Mechanical Engineers (ASME), Three Park Avenue, New York, NY 10016-5990; Order Dept: 22 Law Drive, P.O. Box 2900, Fairfield, NJ 07007-2900

2 LINE CONVENTIONS

Line conventions describe the size, construction, and application of the various lines used in making drawings. Paragraphs 2.1 through 2.14 identify the type and style of lines for use on drawings.

2.1 Line Widths

Two widths of line should be used on drawings (see Fig. 1). The thin line width shall be 0.3 mm minimum. The thick line width shall be 0.6 mm minimum. These approximate line widths are intended to differentiate between thick and thin lines and are not values for control of acceptance or rejection of drawings. All lines of the same type shall be uniform throughout the drawing. The ratio of line widths should be approximately two-to-one (2:1).

2.2 Line Spacing

Spacing between parallel lines may be exaggerated to a maximum of 3 mm, so there is no fill-in when the drawing is reproduced.

2.3 Visible Lines

Visible lines are continuous and shall be used for representing visible edges or contours of objects (see Figs. 1 and 2).

2.4 Projection Line

Projection lines are lines used to indicate the line of sight between two successive orthographic views.

2.5 Hidden Lines

Hidden lines are used to represent hidden edges and contours. They consist of short evenly spaced dashes and are used to show the hidden features of an object (see Figs. 1 and 2). The length of the dashes may vary slightly in relation to the scale of the view.

Hidden lines should begin and end with a dash in contact with the visible or hidden line from which they start or end, except when such a dash would form a continuation of a visible line or when a CAD system has limitations that cannot comply with these requirements. Dashes should join at corners, and arcs should start with dashes at tangent points (see Fig. 3).

When features located behind transparent materials are depicted, they shall be treated as concealed features and shown with hidden lines. Hidden lines should be omitted when their use is not required for the clarity of the drawing.

2.6 Section Lines

Section lines are used to show surfaces cut by a cutting plane. They are drawn as a pattern of straight, equally spaced, parallel lines used to indicate the cut surfaces of an object in section views (see Figs. 1 and 2).

2.6.1 General Principles. Cut surfaces of sectional views may be identified by using section lines. Section lines are optional and may be used when necessary to distinguish individual components of an assembly or to distinguish different surface levels of a full or partial section through a part (see ASME Y14.3M).

Lettering should not be placed in section areas. However, when it is unavoidable, the section lines shall be omitted in the area for the lettering (see Fig. 4). When

Fig. 1 Width and Types of Lines

Line Type		Line Style	Paragraph Reference
Visible line	1	Thick	2.3
Hidden line	2	Thin	2.5
Section line	3	Thin	2.4, 2.6
Projection line	4	Thin	2.7
Center line	5	Thin	2.8
Symmetry line	5	Thick	2.8
Dimension line	6	Dimension line	2.9.1
Extension line	7	Extension line	2.9.2
and Leader line	8	Leader	2.9.3
Cutting-plane line	9	Thick	2.10
or	10	Thick	2.10
Viewing-plane line	11	Thick	2.10
Break line	12	Thick	2.11
	13	Thin	2.11
Phantom line	14	Thin	2.12
Reference line	15	Thin	2.13
Stitch line	16	Thin	2.13
Chain line	17	Thick	2.14

GENERAL NOTES:

(a) **Line and Space Lengths.** Because of variances in drawing size and scale used, specifying the length and blank spaces for these line conventions is not practical. It is advisable to select the line and blank space length which depict the appropriate line convention commensurate with the drawing size and scale required.

Fig.2 Applications of Lines

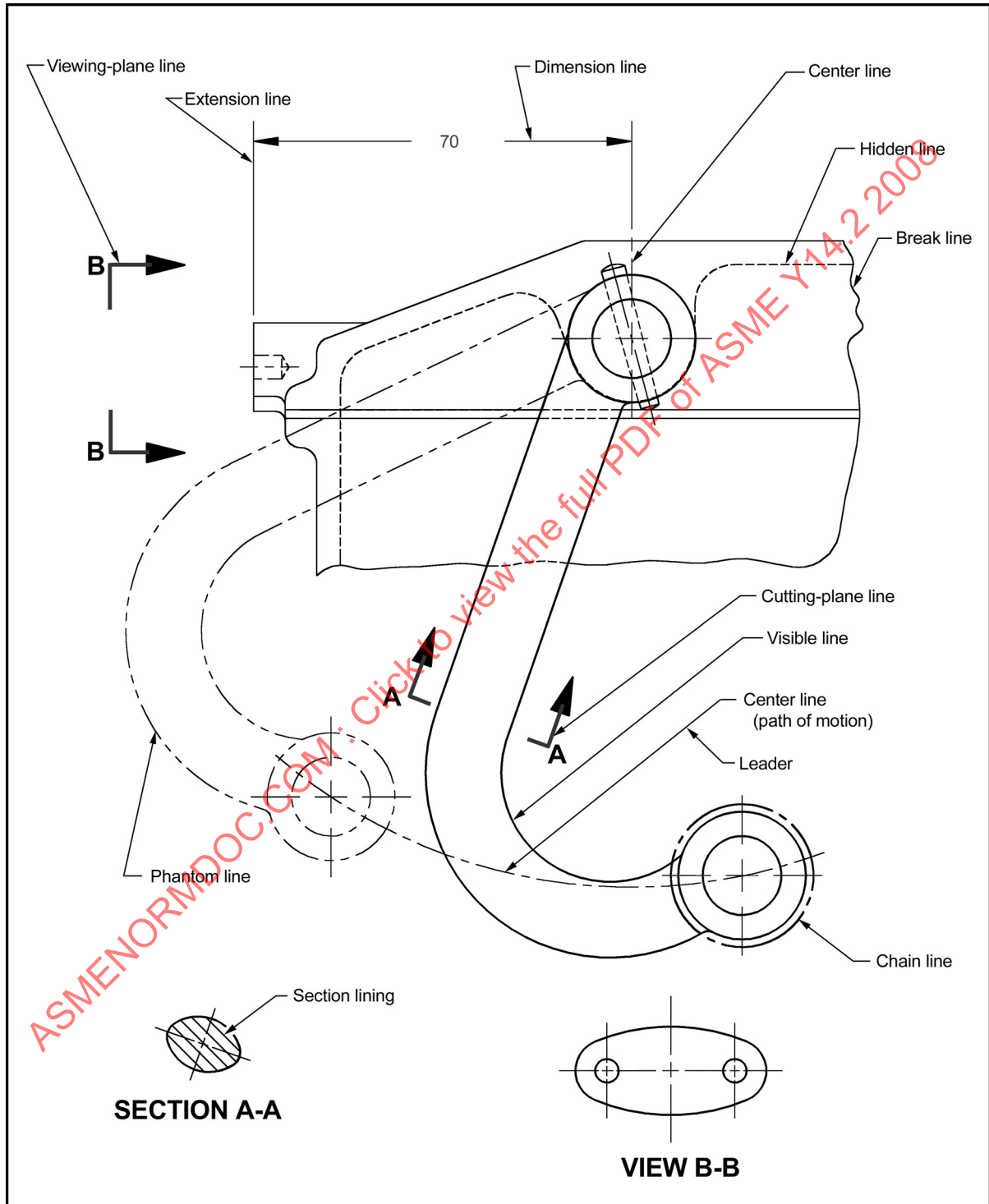


Fig. 3 Hidden Line Techniques and Symmetry Line Application

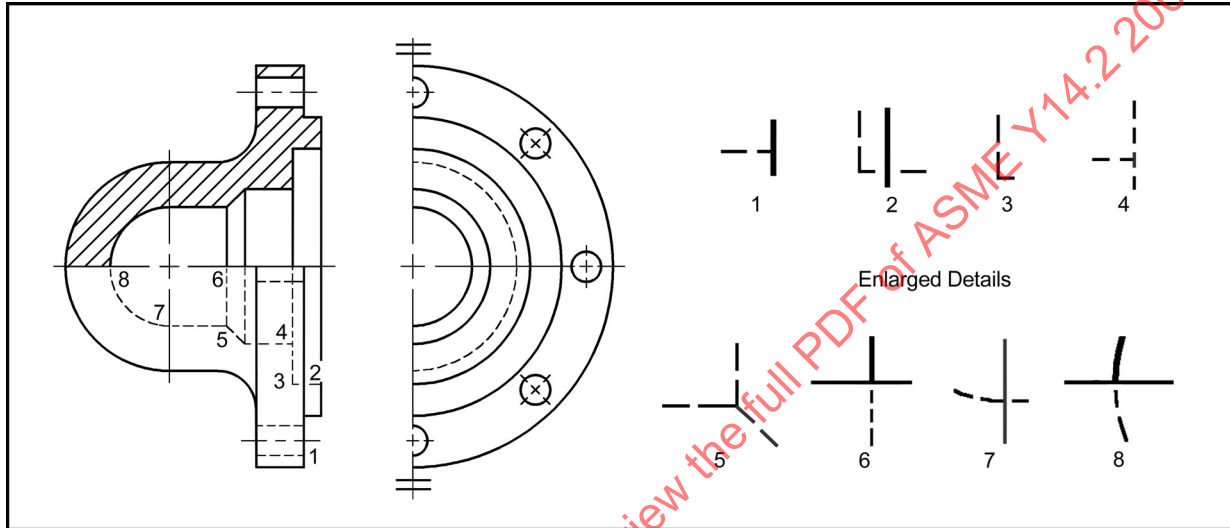


Fig. 4 Section Lining of Adjacent Parts

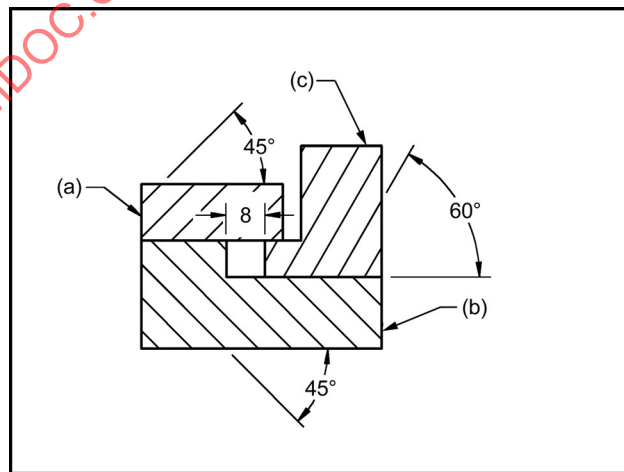
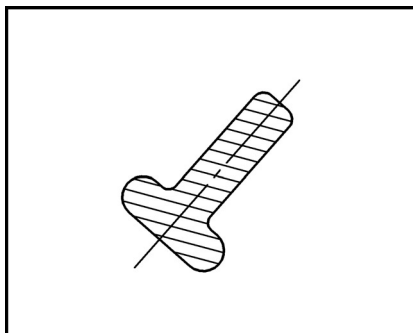
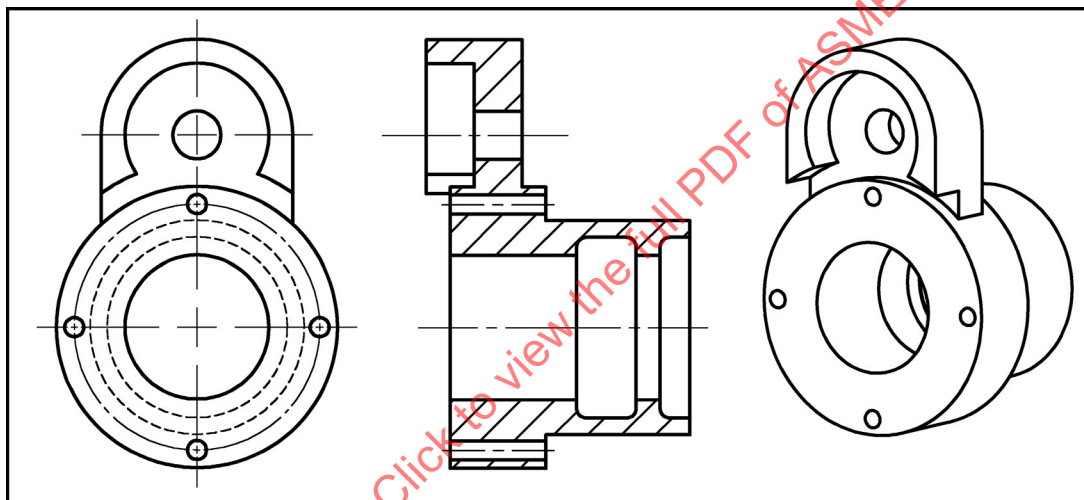


Fig. 5 Direction of Section Lines**Fig. 6 Full Section**

several adjacent parts are shown in a section view, the parts may be sectioned as shown in Fig. 4. For section views of thin materials, see ASME Y14.3M.

2.6.2 Direction and Spacing. Section lines should be drawn at a 45 deg angle within the view [see Fig. 4, item (a)]. On adjacent parts, these section lines should be drawn in the opposite direction [see Fig. 4, item (b)]. For additional adjacent parts, any suitable angle may be used to make each part stand out separately and clearly [see Fig. 4, item (c)]. A suitable angle should be chosen to avoid section lines that are parallel or perpendicular to visible lines (see Fig. 5). Section lines shall not meet at common boundaries.

Section lines shall be uniformly spaced a minimum of 1.5 mm, and spaced as generously as possible and yet preserve the unity and contrast of these sectioned areas (see Fig. 6).

Outline section lines are drawn adjacent to the boundaries only of the sectioned area, and are preferred for large areas when section lines are required, provided clarity is not sacrificed (see Fig. 7).

2.7 Center Lines

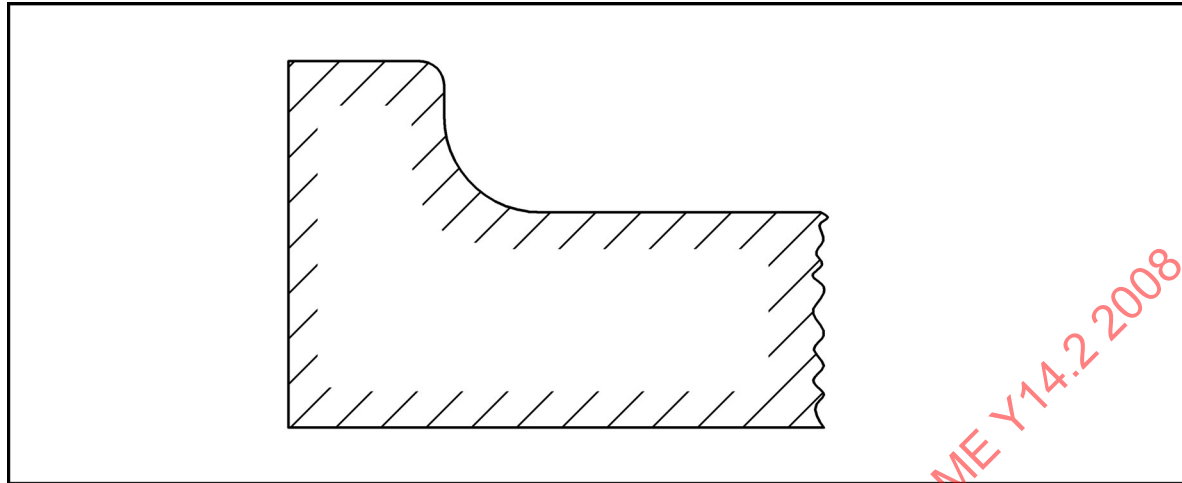
Center lines are used to represent axis, center points, or center planes of symmetrical parts and features, bolt circles, and paths of motion (see Figs. 2 and 3).

Center lines shall start and end with long lines and shall intersect by crossing the long lines or short dashes (see Fig. 1). The long line portion of the center line may vary in length depending on the scale of the view. Center lines shall extend uniformly and distinctly a short distance beyond the object or feature. The center line may be extended for dimensioning or for some other purpose.

Center lines shall not extend through the space between views. Short center lines may be unbroken when no confusion results with other lines.

2.8 Symmetry Line

Symmetry lines are used to identify a plane of symmetry. The plane of symmetry is identified by placing two short parallel lines (symmetry lines), drawn at right angles, crossing a center line near each end and outside the boundary of the part (see Fig. 1).

Fig. 7 Outline Section Lining

Symmetry lines are used when representing partially drawn views and partial sections of symmetrical parts (see Fig. 3). Visible and hidden lines in symmetrical views may extend past the center line when clarity is improved.

2.9 Dimension, Extension, and Leader Lines

These are solid lines used to dimension drawings as described in paras. 2.9.1 through 2.9.3.2 (see ASMEY14.5M).

2.9.1 Dimension Line. Dimension lines are used to indicate the extent and direction of dimensions, and are terminated with uniform arrowheads (see Figs. 1 and 2). Arrowheads shall be drawn within the limits of the dimension line when possible [see Fig. 8, illustration (a)]. When inadequate space is available, the dimension lines and arrowheads may be shown outside the dimensional limit [see Fig. 8, illustration (b)].

2.9.2 Extension Lines. Extension lines are used to indicate the point or line on the drawing to which the dimension applies (see Figs. 1 and 2). They are also used to indicate the extension of a surface to a theoretical intersection (see Fig. 9).

2.9.3 Leader Lines. Leader lines are used to direct notes, dimensions, symbols, item numbers, or part numbers on the drawing (see Figs. 1 and 2). A leader line should be a straight inclined line, except for a short horizontal portion extending to the center of the height of the first or last letter or digit of the note. Leader lines may consist of one or more line segments (see Fig. 10). Leaders may be drawn with a hidden line style when pointing to a hidden surface. The horizontal portion of the leader shall not underline the note, and may be omitted entirely.

A vertical line may be used at the end of the leader to group information. When the vertical line is used,

the leader line may terminate at any point on the vertical line.

2.9.3.1 Terminate leaders as follows:

- (a) without an arrowhead or dot, when they end on a dimension line [see Fig. 10, illustration (a)]
- (b) with a dot 1.5 mm minimum diameter, when they end within outlines of an object [see Fig. 10, illustration (b)]
- (c) with an arrowhead, when they end on the outline of an object [see Fig. 10, illustration (c)]
- (d) without a terminator for a datum target

2.9.3.2 Leader lines

- (a) should not cross
- (b) should not be excessively long
- (c) shall not be parallel to adjacent dimension, extension, or section lines
- (d) shall not be drawn at small angles to terminating surfaces
- (e) shall not be vertical or horizontal

2.10 Cutting-Plane and Viewing-Plane Lines

Cutting-plane and viewing-plane lines are used to indicate the location of cutting planes for sectional views and the viewing position for removed views (see Figs. 1 and 2). Cutting-plane and viewing-plane lines shall be drawn to stand out clearly on the drawing. The ends of the lines are at 90 deg, and terminated by arrowheads to indicate the direction of sight for viewing (see Fig. 2 and ASMEY14.3M). Three forms of cutting-plane and viewing-plane lines are as follows:

- (a) evenly spaced dashes [see Fig. 1 (line 9)].
- (b) alternating long dashes and pairs of short dashes. The long dashes may vary in length, depending on the size of the drawing [see Fig. 1 (line 10)].
- (c) Figure 1 (line 11), same as lines 9 and 10, except the dashes between line ends are omitted.

Fig. 8 Arrowhead Placement on Dimension Lines

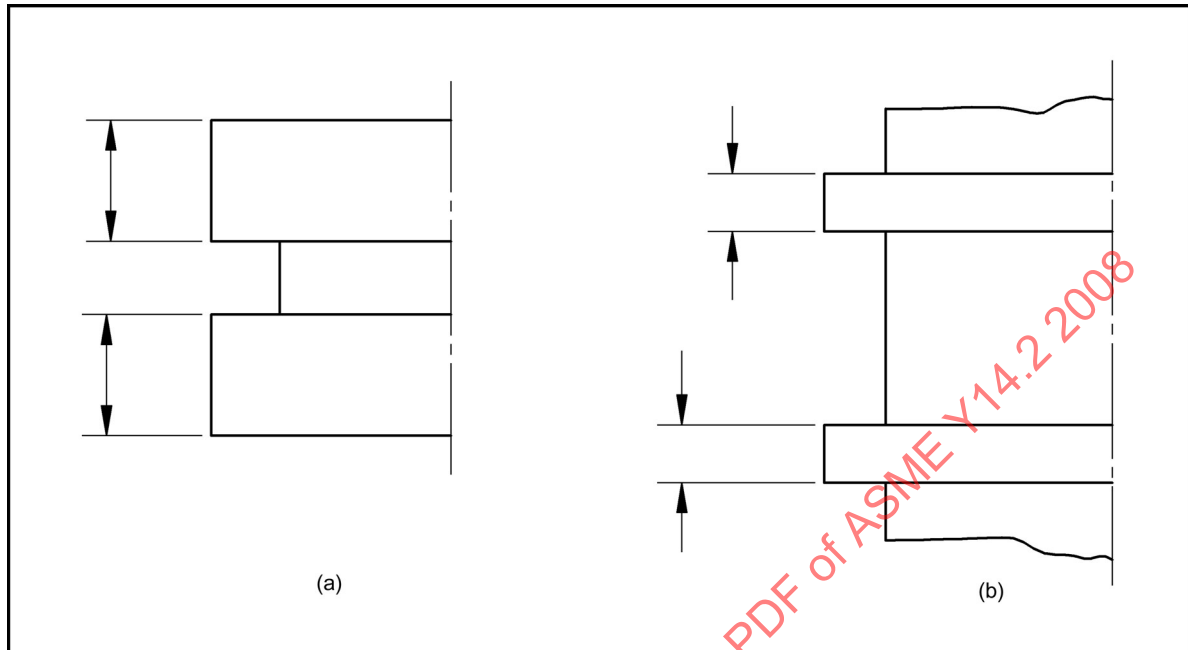


Fig. 9 Special Applications of Extension Lines

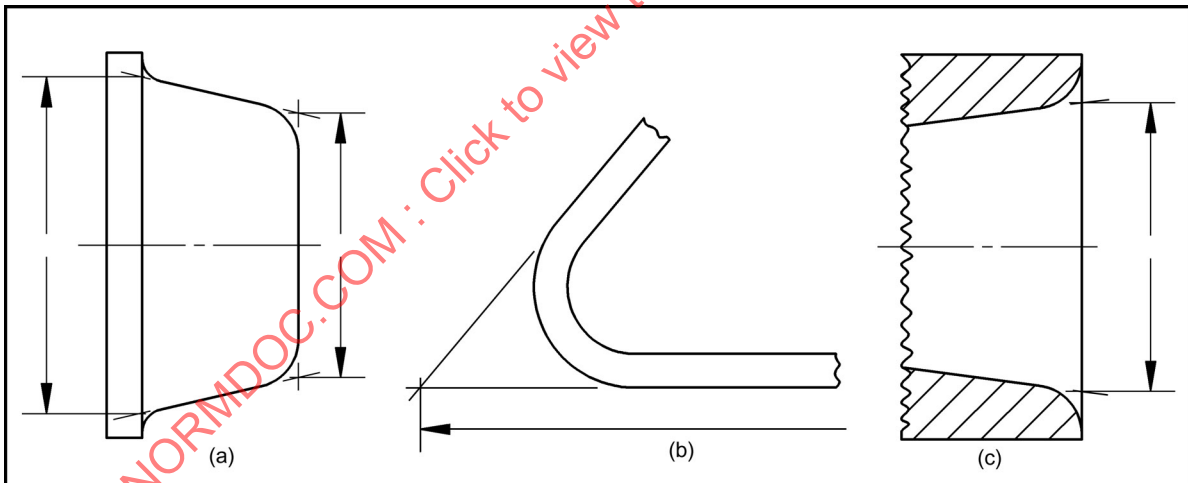
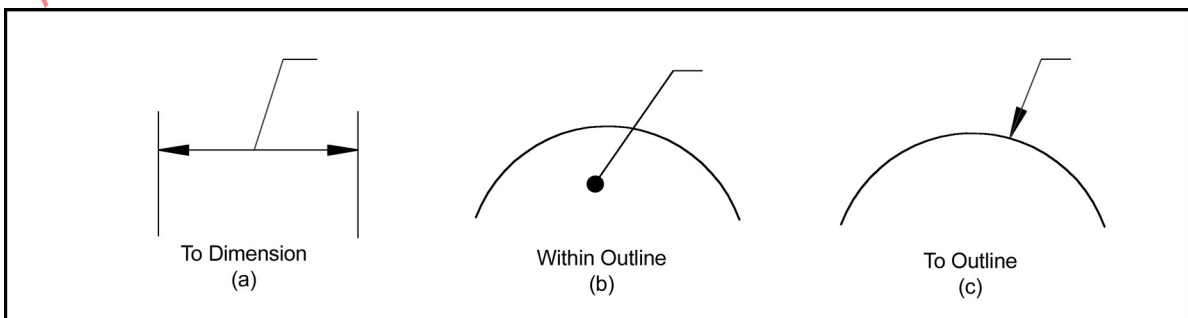


Fig. 10 Termination of Leaders



2.11 Break Line

Break lines are used when complete views are not required. The two forms of break lines are

- (a) freehand line [see Fig. 1 (line 12) and Fig. 2]
- (b) long lines joined by zigzags [see Fig. 1 (line 13) and Fig. 11, illustration (a)]

2.12 Phantom Line

Phantom lines are used to indicate

- (a) alternate positions of moving parts (see Fig. 2)
- (b) reference parts [see Fig. 11, illustration (a)]
- (c) repeated detail [see Fig. 11, illustrations (b) and (c)]
- (d) filleted and rounded corners [see Fig. 11, illustration (d)]
- (e) a reference plane between adjacent orthographic views

Phantom lines consist of long lines separated by pairs of short dashes. Phantom lines should start and end with long lines which may vary in length depending on the size of the drawing [see Fig. 1 (line 14)].

2.13 Stitch Line

Stitch lines are used for indicating a sewing or stitching process [see Fig. 1 (lines 15 and 16)]. The two forms of stitch lines are as follows:

- (a) short dashes and spaces of equal lengths
- (b) dots approximately 0.3 mm diameter, and 3 mm apart

2.14 Chain Line

Chain lines are used to indicate a surface or surface zone receiving additional treatment or consideration within limits specified on the drawing (see Fig. 2). They may also be used to indicate the location of a projected tolerance zone as defined in ASMEY14.5M. Chain lines consist of alternating lines and short dashes [see Fig. 1 (line 17)].

3 ARROWHEADS

Arrowheads are used to terminate dimension, leader, and cutting and viewing plane lines (see paras. 2.9.1, 2.9.3, and 2.10). Arrowhead length and width should be a ratio of approximately 3:1. The width of the arrowhead should be proportionate to the thickness of the lines used. A single style of arrowhead shall be used throughout the drawing (see Fig. 12).

4 LETTERING

For clarity within this Standard, lettering means both letters and numerals. Paragraphs 4.1 through 4.6 identify the type and style of lettering for use on drawings.

4.1 Lettering Type

Lettering should be single stroke gothic, opaque, and well spaced characters as shown in Figs. 13 and 14. When additions or revisions are made to a drawing, the original style of lettering shall be maintained.

4.2 Letter Style

Either inclined or vertical lettering is permissible. Only one style of lettering shall be used throughout a drawing. The preferred slope for the inclined characters is approximately 68 deg from the horizontal (see Fig. 13).

4.3 Letters — Upper and Lower Case

Upper case letters shall be used for all lettering on drawings unless lower case letters are required (see Figs. 13 and 14).

4.4 Letter Height

The minimum letter heights for various sized drawings are shown in Tables 1 and I-1.

4.5 Letter Spacing

Letters in words should be spaced so the background areas between the letters are approximately equal, and words are clearly separated. The space between two numerals having a decimal point between them is to be a minimum of two-thirds the height of the lettering. The vertical space between lines of lettering shall be no more than the height of the lettering, or no less than half the height of the lettering.

4.6 Legibility

The lettering heights, spacing, and proportions in Figs. 13 and 14, and also Table 1, normally provide acceptable reproduction. When applying lettering manually, or by typewriter, or CAD equipment which utilizes heights, spacing, or proportions other than those recommended, the lettering is acceptable when the minimum legibility and reproduction requirements of the accepted industry or military reproduction specifications are met. Therefore, the basic requirement for lettering on a drawing is to produce fully legible copies.

Fig. 11 Phantom Line Applications

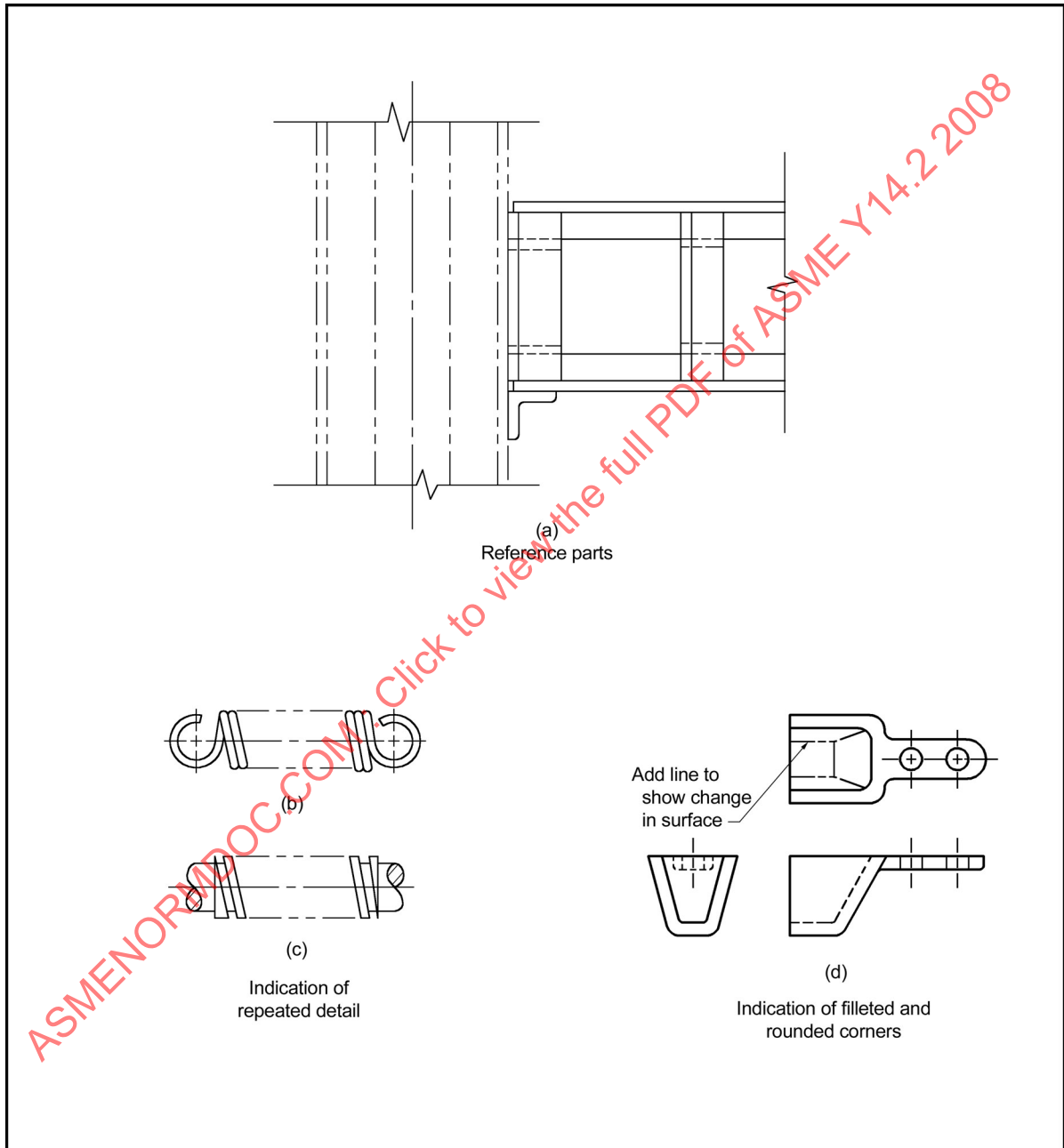


Fig. 12 Arrowhead Styles

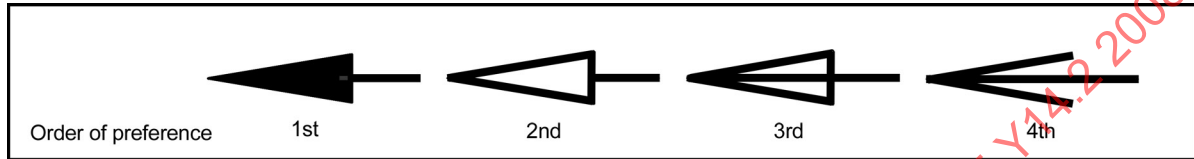


Fig. 13 Inclined Letters

