DRAFT Y14.8-20XX
Revision of Y14.8-2009

ASME Y14.8

Castings, Forgings and Molded Parts

Engineering Product Definition and Related Documentation Practices

TENTATIVE SUBJECT TO REVISION

Specific Authorization required for republication or quotation

ASME STANDARDIZATION AND TESTING DEPARTMENT

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CONTENTS

FOREWORD

This issue is a revision of ASME Y14.8-2009 Castings, Forgings, and Molded Parts. Based on guidance from the Y14 Committee, the material formerly in Section 1 has been reorganized into Sections 1 through 3, and the subsequent sections have been renumbered. The scope of the standard has expanded to include “full feature” concepts as a result of draft. Changes to both the text and figures have been made to better illustrate drafting practices pertaining to cast, forged and molded part drawings.

Figures for plus draft, minus draft and draft included are improved. A new symbol for full feature is created and figures are added to show application of the full feature symbol. Customized datum references are shown, to demonstrate control of specific degrees of freedom due to process variations, such as mismatch and die closure. The effect of applying profile of a surface with datum references to surfaces containing datum targets is continued for the increased use of form tolerancing in model-based CAD systems. Text and figures are revised to reflect these changes.

The successful revision of this Standard is attributed to the commitment of the committee members and the support of their sponsoring companies. The commitment of their time and contributed expertise are gratefully acknowledged. Don E. Day, former chairman of this committee, is acknowledged for his tireless leadership, commitment, and knowledge that has made this revision possible.

Suggestions for improvement of this Standard will be welcomed. They should be sent to Secretary, Y14 Standards Committee, The American Society of Mechanical Engineers, Two Park Avenue, New York, NY 10016-5990.

This Standard was approved as an American National Standard on _____.

Section 1
Scope

This Standard covers definitions of terms and features unique to casting, forging and molded part technologies with recommendations for their uniform specification on engineering drawings and related documents. Castings, forgings and molded parts are delineated as “part” or “parts” throughout the Standard.

1.1 GENERAL

Unless otherwise specified, any reference to features, parts or processes shall be interpreted as applying to castings, forgings and molded parts. Sections 2 through 5 establish related references, definitions, drawing presentation methods, and drafted feature considerations. Datum referencing is presented in Section 6 and Section 7 provides drawing notes and drawing items. Additional information unique to castings, forgings and moldings is found in Appendices A through C.

1.2 DIMENSIONING and TOLERANCING

The methods of dimensioning and tolerancing shall be in accordance with ASME Y14.5 and this Standard.

1.3 ASME Y14 SERIES CONVENTIONS

The conventions in paras. 1.3.1 through 1.3.9 are used in this and other ASME Y14 standards.

1.3.1 Mandatory, Recommended, Guidance, and Optional Words

(a) The word “shall” establishes a requirement.
(b) The word “will” establishes a declaration of purpose on the part of the design activity.
(c) The word “should” establishes a recommended practice.
(d) The word “may” establishes an allowed practice.
(e) The words “typical,” “example,” “for reference,” or the Latin abbreviation “e.g.” indicate suggestions given for guidance only.
(f) The word “or” used in conjunction with a mandatory requirement or a recommended practice indicates that there are two or more options for complying with the stated requirement or practice.
(g) The phrase “unless otherwise specified” or UOS shall be used to indicate a default requirement. The phrase is used when the default is a generally applied requirement and an exception may be provided by another document or requirement.

1.3.2 Cross-Reference of Standards

Cross-reference of standards in text with or without a date following the standard designator shall be interpreted as follows:
(a) Reference to other ASME Y14 standards in the text without a date following the Standard identity indicates the issue of the standard as identified in the References section (Section 2) shall be used to meet the requirement

(b) Reference to other ASME Y14 standards in the text with a date following the standard identity indicates that only that issue of the standard shall be used to meet the requirement.

1.3.3 Invocation of Referenced Standards

The following examples define the invocation of a standard when specified in the References section (Section 2) and referenced in the text of this Standard:
(a) When a referenced standard is cited in the text with no limitations to a specific subject or paragraph(s) of the standard, the entire standard is invoked. For example, “Dimensioning and tolerancing shall be in accordance with ASME Y14.5” is invoking the complete standard because the subject of the standard is dimensioning and tolerancing and no specific subject or paragraph(s) within the standard are invoked.
(b) When a referenced standard is cited in the text with limitations to a specific subject or paragraph(s) of the standard, only the paragraph(s) on that subject is invoked. For example, “assign part or identifying numbers in accordance with ASME Y14.100” is only invoking the paragraph(s) on part or identifying numbers because the subject of the standard is engineering drawing practices and part or identifying numbers is a specific subject within the standard.
(c) When a referenced standard is cited in the text without an invoking statement such as “in accordance with”, the standard is invoked for guidance only. For example, “For gaging principles see ASME Y14.43” is only for guidance and no portion of the standard is invoked.

1.3.4 Parentheses Following a Definition

When a definition is followed by a standard referenced in parentheses, the standard referenced in parentheses is the source for the definition.

1.3.5 Notes

Notes depicted in this Standard in ALL UPPERCASE letters are intended to reflect actual drawing entries. Notes depicted in initial uppercase or lowercase letters are to be considered supporting data to the contents of this Standard and are not intended for literal entry on drawings. A statement requiring the addition of a note with the qualifier “such as” is a requirement to add a note, and the content of the note is allowed to vary to suit the application.

1.3.6 Acronyms and Abbreviations

Acronyms and abbreviations are spelled out the first time used in this Standard followed by the acronym or abbreviation in parentheses. The acronym is used thereafter throughout the text.

1.3.7 Units

The International System of Units (SI) is featured in this Standard. It should be understood that U.S. Customary units could equally have been used without prejudice to the principles established.

1.3.8 Figures

The figures in this Standard are intended only as illustrations to aid the user in understanding the practices described in the text. In some cases, figures show a level of

detail as needed for emphasis. In other cases, figures are incomplete by intent so as to illustrate a concept or facet thereof. The absence of figure(s) has no bearing on the applicability of the stated requirements or practice. To comply with the requirements of this Standard, actual data sets shall meet the content requirements set forth in the text. To assist the user of this Standard, a listing of the paragraph(s) that refer to an illustration appears in the lower right-hand corner of each figure. This listing may not be all inclusive. The absence of a listing is not a reason to assume inapplicability. Some figures are illustrations of models in a three-dimensional environment. The absence of dimensioning and tolerancing annotations in a view may indicate that the product definition is defined in 3D. Dimensions that locate or orient and are not shown are considered basic and shall be queried to determine the intended requirement. When the letter “h” is used in figures for letter heights or for symbol proportions, select the applicable letter height in accordance with ASME Y14.2. Multiview drawings contained within figures are third angle projection.

1.3.9 Precedence of Standards

The following are Y14 standards that are basic engineering drawing standards:
ASME Y14.1, Drawing Sheet Size and Format
ASME Y14.1M, Metric Drawing Sheet Size and Format
ASME Y14.2, Line Conventions and Lettering
ASME Y14.3, Orthographic and Pictorial Views
ASME Y14.5, Dimensioning and Tolerancing
ASME Y14.24, Types and Applications of Engineering Drawings
ASME Y14.34, Associated Lists
ASME Y14.35, Revision of Engineering Drawings and Associated Documents
ASME Y14.36, Surface Texture Symbols
ASME Y14.38, Abbreviations and Acronyms for Use on Drawings and Related Documents
ASME Y14.41, Digital Product Definition Data Practices
ASME Y14.100, Engineering Drawing Practices
All other ASME Y14 standards are considered specialty types of standards and contain additional requirements or make exceptions to the basic standards as required to support a process or type of drawing.

Section 2
References

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 Y14.1-2020, Drawing Sheet Size and Format

ASME Y14.2-2014, Line Conventions and Lettering
ASME Y14.3-2012, Orthographic and Pictorial Views
ASME Y14.5-2009, Dimensioning and Tolerancing
ASME Y14.24-2020, Types and Applications of Engineering Drawings
ASME Y14.34-2013, Associated Lists – Engineering Drawings and Related Documentation Practices
ASME Y14.35-2014, Revision of Engineering Drawings and Associated Documents
ASME Y14.38-2019, Abbreviations and Acronyms for Use on Drawings and Related Documents
ASME Y14.100-2017, Engineering Drawing Practices
ASME Y14.43-2011 Dimensioning and Tolerancing Principles for Gages and Fixtures
Publisher: The American Society of Mechanical Engineers (ASME),
Three Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, P.O. Box 2900, Fairfield, NJ 07007-2900 (www.asme.org)

IEEE/ASTM SI 10, Standard for Use of the International System of Units (SI): The Modern Metric System
Publisher: Institute of Electrical and Electronics Engineers, Inc. (IEEE),
445 Hoes Lane, Piscataway, NJ
08854 (www.ieee.org)

Section 3
Definitions

3.1 DEFINITIONS

The following terms are defined as their use applies in this Standard. Other commonly used casting/forging/molded part terms are defined in Appendix A.

3.1.1 Casting

casting: a part obtained by solidification of material in a die or mold.

3.1.2 Corner Radius (Edge Radius)

corner radius (edge radius): the convex radius on the surface of a part connecting two or more surfaces. See Figure 3-1.

3.1.3 Die

die: any of various tools or devices for imparting a desired shape, form, or finish to a material or for impressing an object or material.

3.1.4 Die Closure

die closure: allowable part variation caused by inconsistent mating of opposing segments of a mold or die. See Figures 5-15(a), (b), and (c).

3.1.5 Draft

draft: the angle given to a feature on a part so that it can be withdrawn from the mold or die. See Figure 5-14.

3.1.5.1 Drafted Fillet and Corner (Edge) Radii *Drafted fillet and corner (edge) radii:* Filleted and cornered surfaces normal to the forging plane or parallel to the die removal direction require draft.

Note 1: Drafted fillet surfaces occur when the fillet connects two or more adjacent draft surfaces with the same draft angle. These drafted fillets and corners create a conical surface. See Figure 3-2(a).

Note 2: Fillets and corners that connect two or more adjacent drafted surfaces without the same draft angle, do not create a conical fillet surface; it is a canted cylindrical surface. See Figure 3.2(b).

3.1.6 Drawing

drawing: an engineering document or data set that discloses, directly or by reference, by means of graphic or textual presentations, or by combinations of both, the physical or functional requirements of an item (ASME Y14.100).

3.1.7 Fillet Radius

fillet radius: the concave radius on the surface of a part connecting two or more surfaces. See Figure 3-1.

Note: Fillet radii are intended to minimize stress concentrations, aid in proper fill, and minimize defects.

3.1.8 Flash

flash: excess material which results from leakage between mating surfaces of a mold or die. See Figure 5-11(a) and (b).

3.1.9 Flash Extension

flash extension: allowable flash remnant. See Figures 5-11(a) and (b).

3.1.10 Forging

forging: a part created by plastically deforming metal. Also, the process by which metal is plastically deformed to a desired shape.

3.1.11 Forging Plane

forging plane: a plane perpendicular to the opening and closing direction of the die. See Figures 5-2(a) and (b).

3.1.12 Full Feature Axis

full feature axis: Similar to feature axis as defined in ASME Y14.5-2009, except that the unrelated actual mating envelope is a conical drafted feature, with its included angle being the sum of draft angles.

3.1.13 Full Feature Center Plane

full feature center plane: Similar to feature center plane as defined in ASME Y14.5-2009, except that the unrelated actual mating envelope is a wedge of a drafted feature, with its included angle being the sum of draft angles.

3.1.14 Gate

gate: a channel in a mold though which material flows into the mold cavity.

3.1.15 Grain Direction

grain direction: the predominant orientation of the fibrous crystalline structural units of wrought materials. See Figure 5-23.

3.1.16 Grain Flow (Flow Lines)

grain flow (flow lines): the directional elongation in the grain structure of the material, and its non-homogenous constituents, resulting from the forging process.

Note: Grain flow follows the direction of working during forging and is usually revealed by polishing and etching sections of the forging.

3.1.17 Match Draft

match draft: draft allowance permitted on matching surfaces at parting lines when the normal draft allowance would result in an offset of the surfaces at the parting line. See Figure 5-10.

3.1.18 Mismatch
mismatch: the offset of features on a part caused by misalignment of opposing segments of a mold or die. See Figures 5-16(a) and (b).

3.1.19 Mold
mold: a form made of sand, metal or other material. Also, the process of pouring or injecting material into a form to produce a part.

3.1.20 Mold Line
mold line: a line generated by the intersection of projected surfaces. See Figure 5-14.

3.1.21 Mold Line Center Point
mold line center point: The point of the center of a circular mold line. See Figures 5-12 and 5-13.

3.1.22 Mold Line Center Line
mold line center line: The line centered between a pair of mold lines, where the mold lines lie in a common plane. See Figure 5-14(c).

3.1.23 Parting Line
parting line: (a) the location on the part where mold or die segments separate. (b) a line on the drawing representing the mating surfaces of the die or mold segments. See Figures. 5-14, 5-15(a), (b), and (c), 5-17, 5-18 and Nonmandatory Appendix C.

3.1.24 Parting Plane
parting plane: a plane perpendicular to the opening and closing direction of the die segments. See Forging Plane.

3.1.25 Parting Surface
parting surface: the mating surfaces of die segments.

3.1.26 Pattern
pattern: a form made of wood, metal, or other material around which sand or other suitable material is placed to make a mold.

3.1.27 Riser
riser: a reservoir built into a mold to prevent shrinkage cavities in the part.

3.1.28 Riser Stub
riser stub: the allowable remaining riser.

3.1.29 Round
round: corner radius, see Para. 3.1.2.

3.1.30 Scale

scale: an encrustation formed on the surface of a hot worked metal (forging) as a result of oxidation.

3.1.31 Sink

sink: a shallow depression in the surface of a cast or molded part due to internal shrinkage.

3.1.32 Vent Marks

vent marks: small protrusions on the surface of a part caused by material entering the vents (air escape passages) in the mold or die.

3.1.33 Wall

wall: a solid feature at any physical orientation comprised of opposing surfaces having a nominally uniform thickness. See Figure 5-24.

3.1.34 Wall Thickness

wall thickness: the actual local size between all sets of opposing points on the surfaces of a wall. See Figure 5-24.

Note: Perfect form at maximum wall thickness tolerance is not a requirement. (i.e. Rule #1 does not apply to “wall thickness” tolerance.)

Figure 3-1 Fillet and Corner Radii

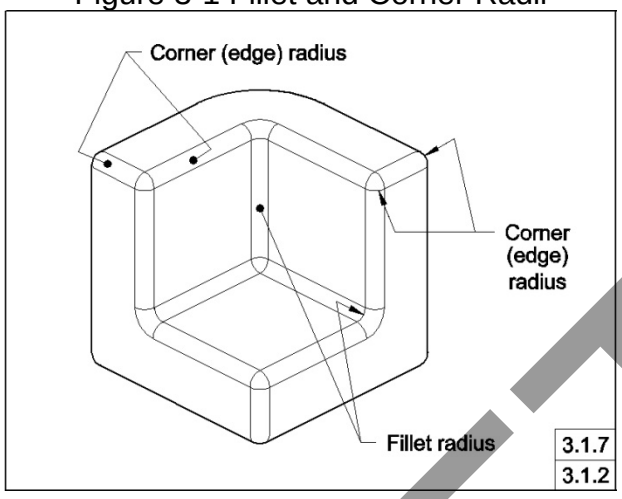


Figure 3.2(a) Fillet and Corner Radii

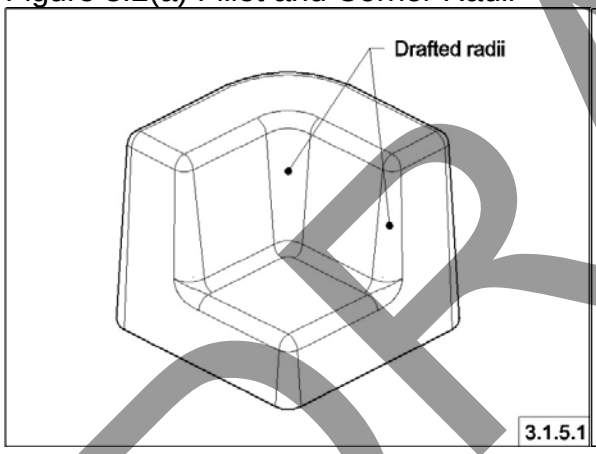
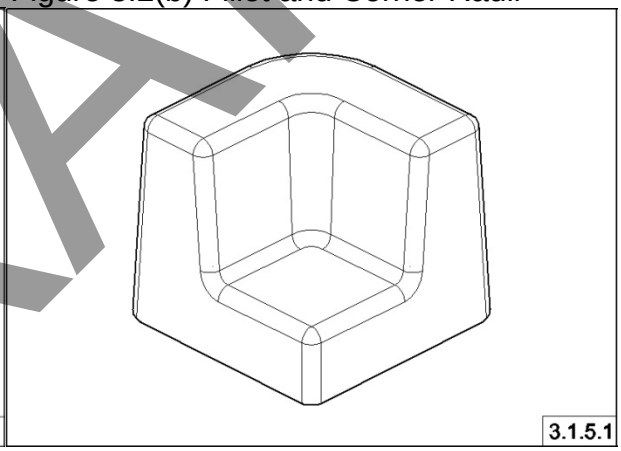


Figure 3.2(b) Fillet and Corner Radii



Section 4
Drawing Presentation Methods

4.1 GENERAL

This section establishes methods of preparing casting/forging/molded part drawings. See ASME Y14.24 for complete description and suggested usage of "Types and Application of Engineering Drawings".

4.2 SEPARATE REQUIREMENTS DRAWING METHOD

This method shows casting/forging/molded part requirements and post-processing (finishing, machining, etc.) requirements on separate drawings in the same document or on separate documents. See Figure 4-1.

4.3 COMBINED REQUIREMENTS DRAWING METHOD

This method shows the part requirements and the end item requirements in superimposed views. Phantom lines may be used to show the casting/forging/molded part outline. See Figure 4-2.

Casting/forging/molded part notes shall be separated from the end-item notes.

NOTE: The decision to combine drawings should be made cautiously. Potential disadvantages resulting from combining drawings include (1) increased complexity of the drawing which may diminish clarity and usefulness and (2) frequent change activity to the drawing which may increase the need to update associated records(s), material control data, manufacturing planning, etc.

Figure 4-1 Separate Drawing Method – Casting/Forging/Molding Requirements (Recommended practice.)

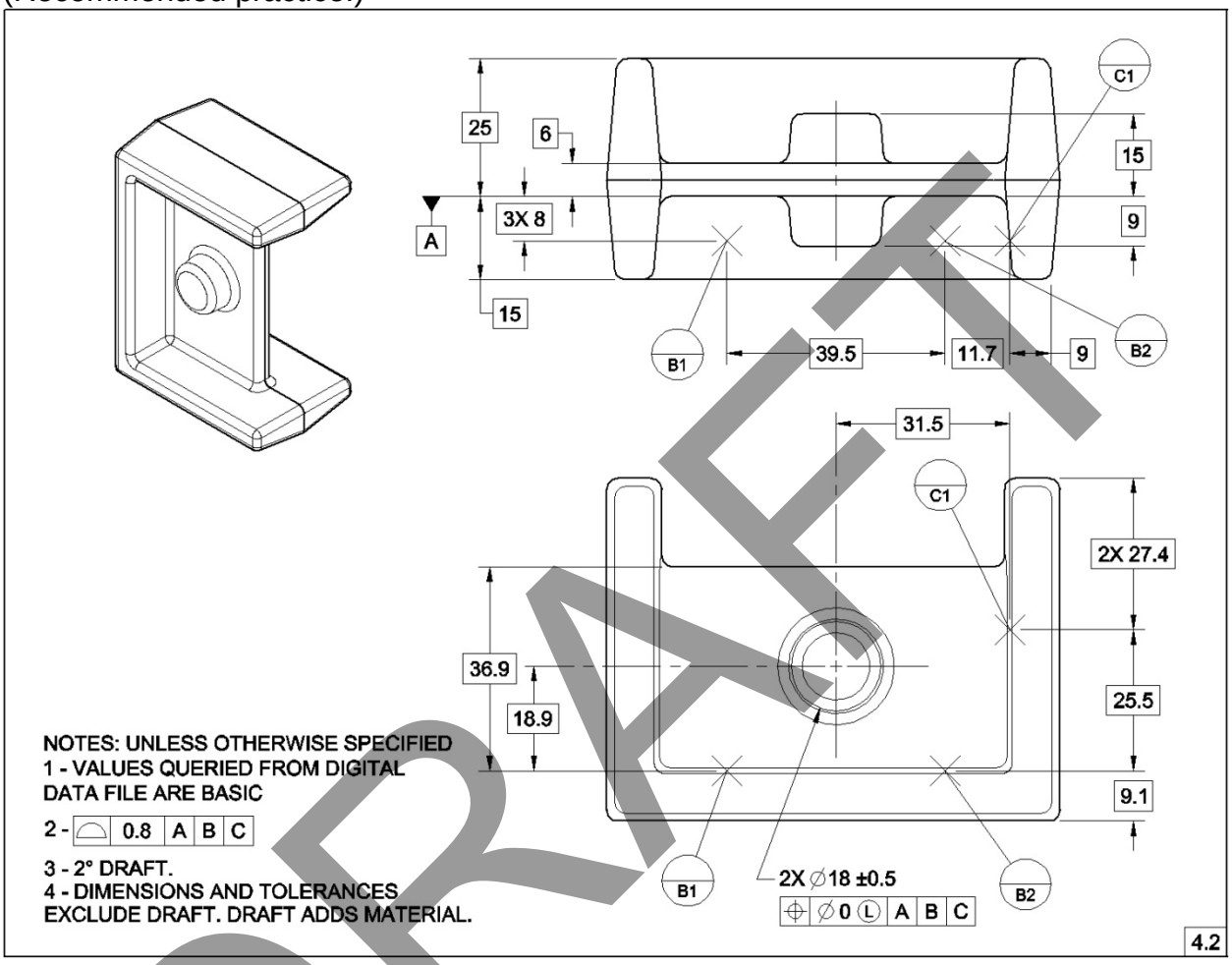


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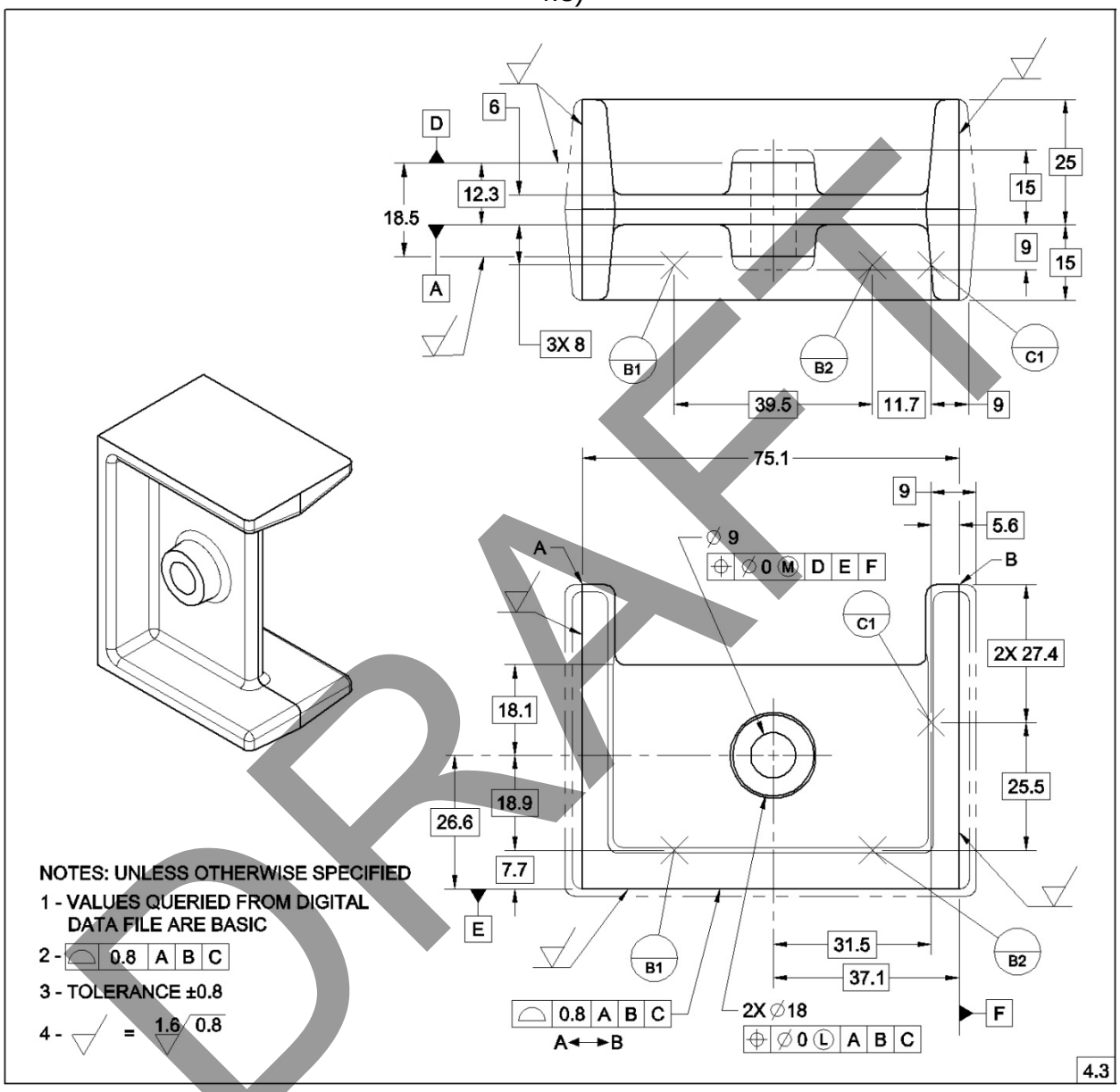
Figure 4-2 Combined Drawing Method (Not recommended practice. See note paragraph 4.3)



Section 5
Drawing Practices

5.1 GENERAL
This section establishes items unique to castings/forgings/molded parts not defined by other standards that should be defined on the drawing.

5.2 AS-CAST/AS-FORGED/AS-MOLDED SURFACES
Drawings shall specify whether machining as-cast, as-forged, as-molded surfaces is permitted or prohibited other than for removing gates, risers, flash, etc. Where machining is permitted, the surface texture shall be specified. Gates, riser stubs, flash, etc., may exceed tolerance boundaries unless otherwise specified. Where a surface may retain gates, riser stubs, flash, etc. beyond the tolerance boundary, a specified limit beyond the tolerance boundary shall be defined.

5.3 CORNER AND FILLET RADII
Corner and fillet radii values and tolerances shall be specified on the drawing.

5.4 DRAFT
Draft shall be defined. Draft should be shown for clarity. See Figure 5-1. Forged part draft angles are related to the forging plane. See Figures 5-2(a) and (b). Cast/molded part draft angles are related to mold parting action. Draft may exceed the perfect form boundary at MMC unless otherwise specified. Draft angles specified are per side (not included angle) unless otherwise specified. Draft angles may be specified with a stated value, a max value or defined in a 3D model. Drafted features may be controlled using profile of a surface. See Figures 5-1 and 5-3.

5.4.1 Methods for Specifying Dimensions Affected by Draft.
Provision for draft may be addressed by a general note, directly on the field of the drawing, or both which states “DRAFT ADDS MATERIAL” to specify that material is added relative to the dimensions. See Figure 5-4. Exceptions to this are:

(a) The local note “DRAFT REDUCES MATERIAL”. See Figure 5-5.

(b) The application of the DFT INCL (“Draft Included”) symbol which is the means of indicating that any draft shall be contained within the stated tolerance. See Figure 5-6.

(c) Controlling drafted features by applying toleranced dimensions at specific locations. See Figure 5-7.

(d) The application of the +DFT (plus draft) symbol which is the means of indicating that the dimension may increase due to draft in addition to the increase allowed by any applicable tolerance applied to the considered feature. The value of the draft angle may be included before DFT. See Figure 5-8.

(e) The application of the -DFT (minus draft) symbol which is the means of indicating that the dimension may decrease due to draft in addition to the decrease allowed by any applicable tolerance applied to the considered feature. The value of the draft angle may be included before DFT. See Figure 5-9.

(f) A size dimension with a geometric form or orientation tolerance, such as cylindricity or perpendicularity indicates that the feature has zero draft.

CAUTION: The symbols for "+DFT" and "–DFT" or "DRAFT ADDS MATERIAL" or "DRAFT REDUCES MATERIAL" should not be used for critical features due to the limitations of measurements being only near, rather than at, a given end of the feature.

For fully defined features a geometric tolerance such as a profile of a surface tolerance should be used.

5.4.2 Match Draft

Match draft shall be specified where applicable. See Figure 5-10.

5.5 FLASH EXTENSION

The limits of permissible flash extension shall be specified on the drawing. See Figures 5-11(a) and (b).

5.6 EJECTOR PIN DEPRESSIONS OR PROTRUSIONS

The limits of permissible ejector pin marks (for example height or depth) shall be specified on the drawing.

5.7 MOLD LINE DIMENSIONS AND TOLERANCES

Dimensions and tolerances (size, position, etc.) shall be applied at the mold line(s) at one end of features unless otherwise specified. See Figures 5-12, 5-13, and 5-14.

5.7.1 Circular Mold Line

The following text is a description of design intent where a position tolerance is associated with a drafted feature dimensioned to mold lines, on drawings of parts prepared in accordance with this Standard.

Basic dimensions (shown or not shown) in the figures of this section locate and orient the tolerance zone relative to the specified datum reference frame. Because of the draft, the feature is dimensioned to the mold line (the theoretical line generated at the intersection of the extended draft and the dimensioned end of the feature). The feature will be a circular mold line. The mold line center point must fall within the tolerance zone defined in the feature control frame associated with the size dimension. The tolerance zone is a circle. See Figures 5-12 and 5-13.

5.7.2 Parallel Line Elements at a Mold Line

The following text is a description of design intent where a position tolerance is associated with a drafted feature dimensioned to mold lines, on drawings of parts prepared in accordance with this Standard.

Basic dimensions (shown or not shown) in the figures of this section locate and orient the tolerance zone relative to the specified datum reference frame. Because of the draft, the feature is dimensioned to the mold lines (the theoretical lines generated at the intersection of the extended draft and the dimensioned end of the feature). The feature is the two parallel mold lines. The mold line center line must fall within the tolerance zone defined in the feature control frame associated with the size dimension. The tolerance zone is two parallel lines.

5.8 FULL FEATURE MODIFIER

The note “FULL FEATURE” or a full feature symbol is used as a modifier applied to a position or orientation tolerance (perpendicularity, parallelism, or angularity). A full feature modifier may be applied to a feature control frame that is placed below a size tolerance that applies to one mold line of a drafted feature. When a full feature modifier is applied, the associated tolerance controls the feature’s full feature axis or full feature center plane, rather than the default control which applies to the mold line center point or mold line center line at one end of the drafted feature. The tolerance zone for the position or orientation tolerance is bounded by the mold line at each end of the feature. The full feature modifier shall only be applied at regardless of feature size. See Figures 5-14(a), (b), (c), and (d).

5.9 DIE CLOSURE

Die closure tolerance is applied to the appropriate dimensions as shown in Figure 5-15(a), (b), and (c). Unless otherwise specified, die closure tolerances shall be included in the dimensional limits.

5.10 SURFACE IRREGULARITIES CAUSED BY MANUFACTURING PROCESSES

The limits of surface irregularities created by processing (such as ejector pin marks, flash extension and gate marks) may exceed tolerance boundaries unless otherwise specified. If limited, these limits shall be identified on the drawing or in a related document. See Figures 5-11(a) and (b) and notes in Section 7 for examples. Features created for tooling considerations, such as ejector pin pads or bosses, shall be specified.

5.11 ORIENTATION OF FORGING PLANE

The orientation of the forging plane shall be indicated by defining a basic angular relationship between the forging plane and an appropriate datum reference frame. See Figures 5-2(a) and (b).

5.12 MARKING

The part drawing shall define applicable identification information. See para. 7.2(k) and 7.4(e).

5.13 MISMATCH

Mismatch tolerance, where applied, shall be specified as a maximum value. Mismatch may cause features to exceed specified tolerance limits unless otherwise specified. See Figures 5-16(a) and (b).

5.14 PARTING LINES

Parting lines shall be depicted on drawings as a phantom line extending beyond the part in applicable views, with the parting line symbol added. See Figures 5-2(a) and (b), 5-17, and 5-18. Parting line symbols shall be shown on drawings of closed die forged parts or when all around this side of parting line, or all over this side of parting line symbols are used. The parting line symbol may be required for other applications, such as when trimming specifications are indicated.

5.14.1 All Around This Side of Parting Line.

To apply a requirement to all features all around one side of a parting line, the symbol for all around this side of parting line shall be indicated on the leader line. See Figure 5-19. The symbol is shown in the view or section showing the desired basic profile. The all around this side of parting line symbol shall be applied to orthographic views. See Figure 5-20.

5.14.2 All Over This Side of Parting Line.

To apply a requirement to all features all over one side of a parting line, the symbol for all over this side of parting line shall be indicated on the leader line. See Figure 5-21. An example of the application of the symbol is given in Figure 5-22.

5.15 SHARP CORNERS

Drawings shall specify the requirements of corners and fillets shown sharp. See paragraphs 7.3(m), 7.3(n), 7.3(y), and 7.3(z).

5.16 GRAIN DIRECTION

Where a grain direction requirement is specified on the drawing, it shall be shown in the appropriate view. See Figure 5-23.

5.17 PRODUCT DEFINITION DATA REQUIREMENTS

This section establishes the minimum requirements for product definition data and items unique to castings/forgings/molded parts not defined by other standards. See ASME Y14.41.

5.17.1 3D Model

Product definition data that defines the entire casting/forging/molded part directly or by reference is required. The product definition data shall include the location of the parting line(s), all draft, all radii, and finish machine stock where needed.

5.17.2 Controlling Document

If product definition data and a drawing graphic sheet are both supplied, the controlling document shall be clearly identified before the start of the tool build.

5.17.3 Concurrent Engineering

It is recommended for the casting/forging/molding product design team to consult with their supplier prior to finalizing the product definition data. During this review the supplier can assist in locating the desired parting line and make design recommendations for the best casting/forging/molding practices.

5.18 WALL THICKNESS AS A REFINEMENT OF PROFILE OF A SURFACE

Where it is necessary to maintain a uniform wall thickness throughout a region of a part or an entire part, a local or general note indicating the wall thickness shall be stated. The wall thickness is a refinement of the control provided by the profile of a surface tolerance.

In Figure 5-24, the basic thickness of the part walls from the product definition data is 4 mm. The profile of a surface tolerance applied to the basic digital data allows the wall thickness to range from 3.2 mm to 4.8 mm with respect to the datum reference frame.

The addition of the wall thickness general note of 4±0.2 limits the range of the wall thickness from 3.8 mm to 4.2 mm. Since the wall thickness tolerance is an actual local size specification, it does not relate to the datum reference frame and is free to float but is bounded by the profile of a surface tolerance of 0.8 mm.

Figure 5-1 Draft Angle

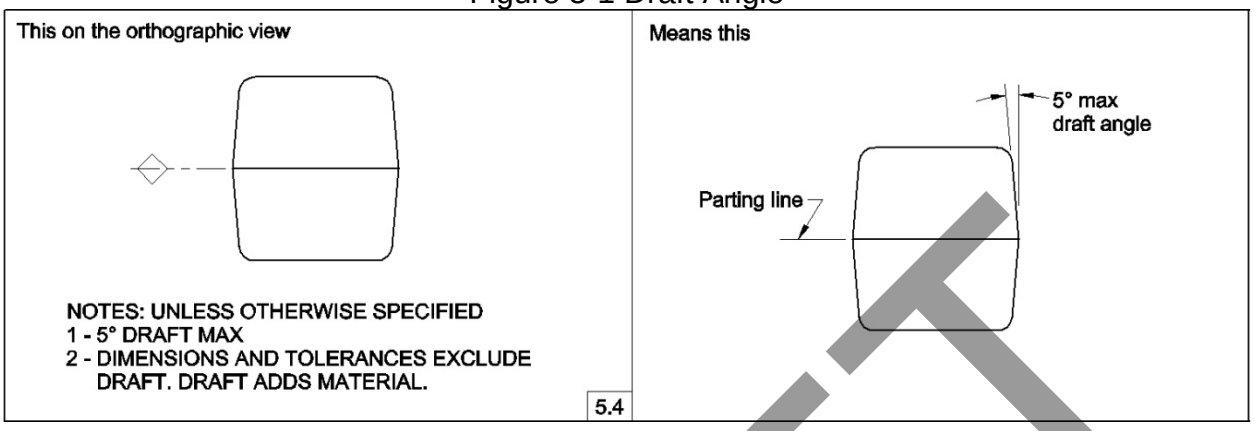


Figure 5-2(a) Datum Plane and Forging Plane Parallel

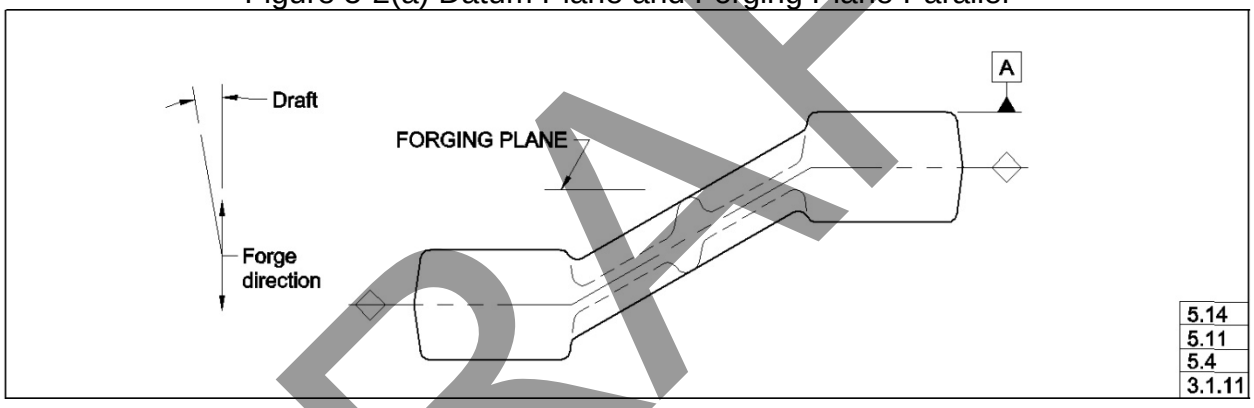
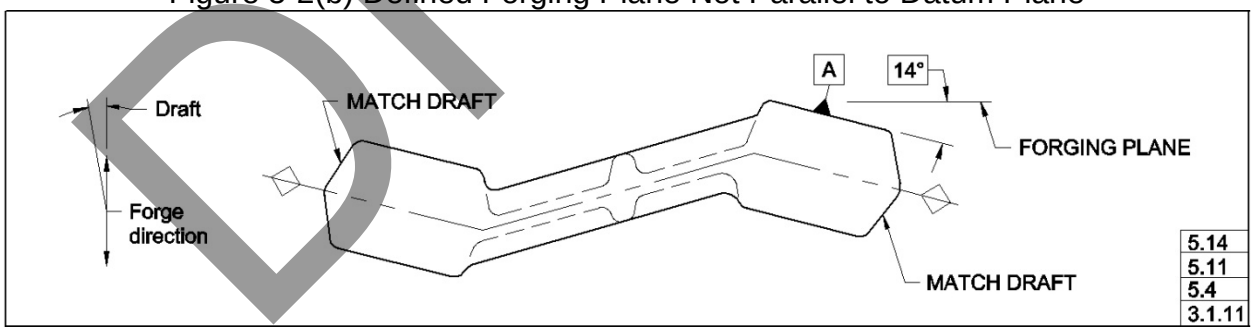


Figure 5-2(b) Defined Forging Plane Not Parallel to Datum Plane



..

Figure 5-3 Drafted Surfaces Controlled With Profile of a Surface

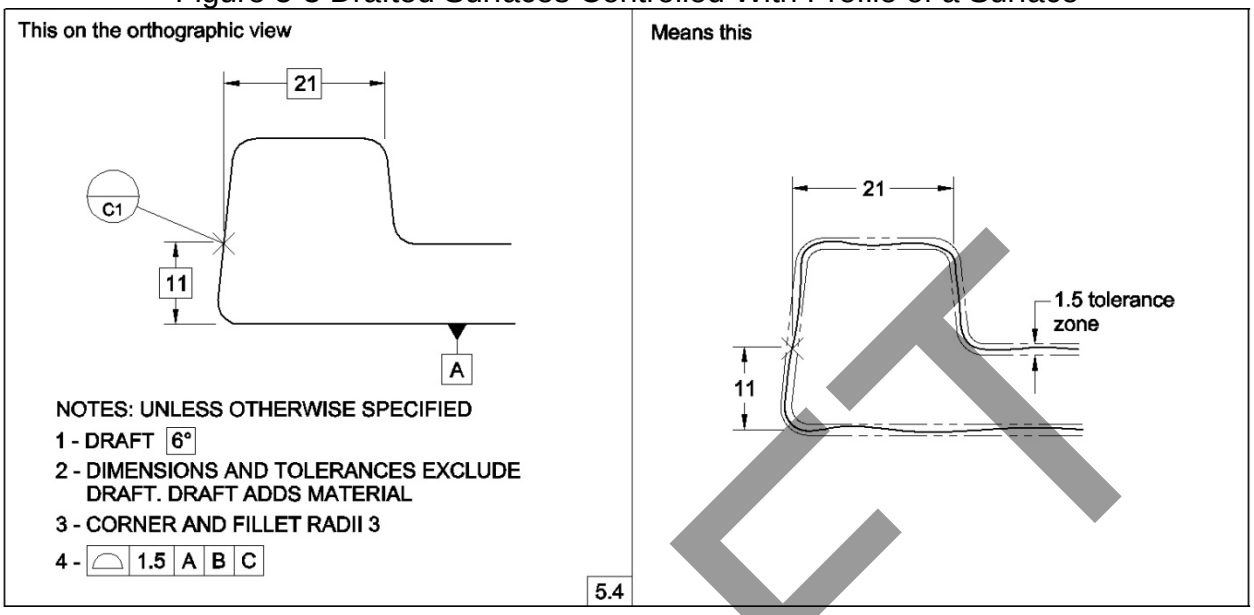


Figure 5-4 Draft Adds Material

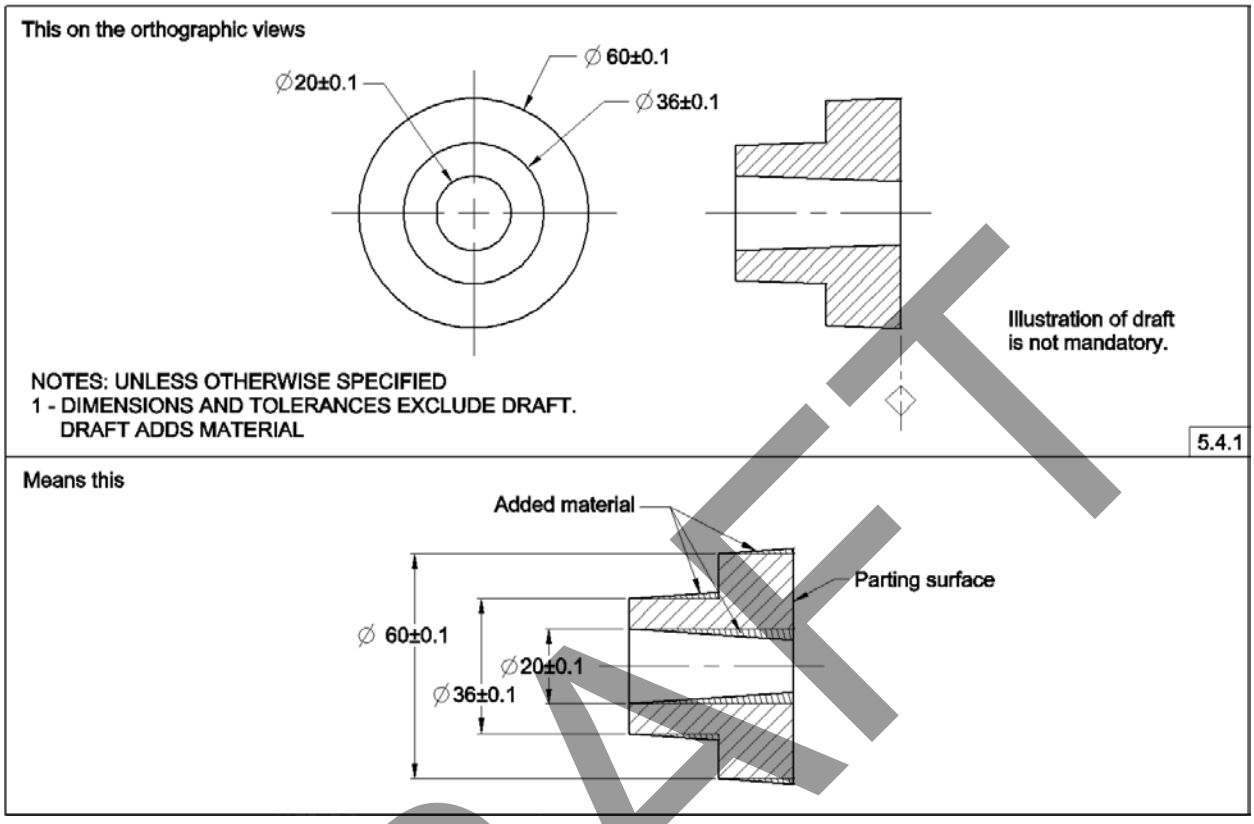


Figure 5-5 Draft Reduces Material

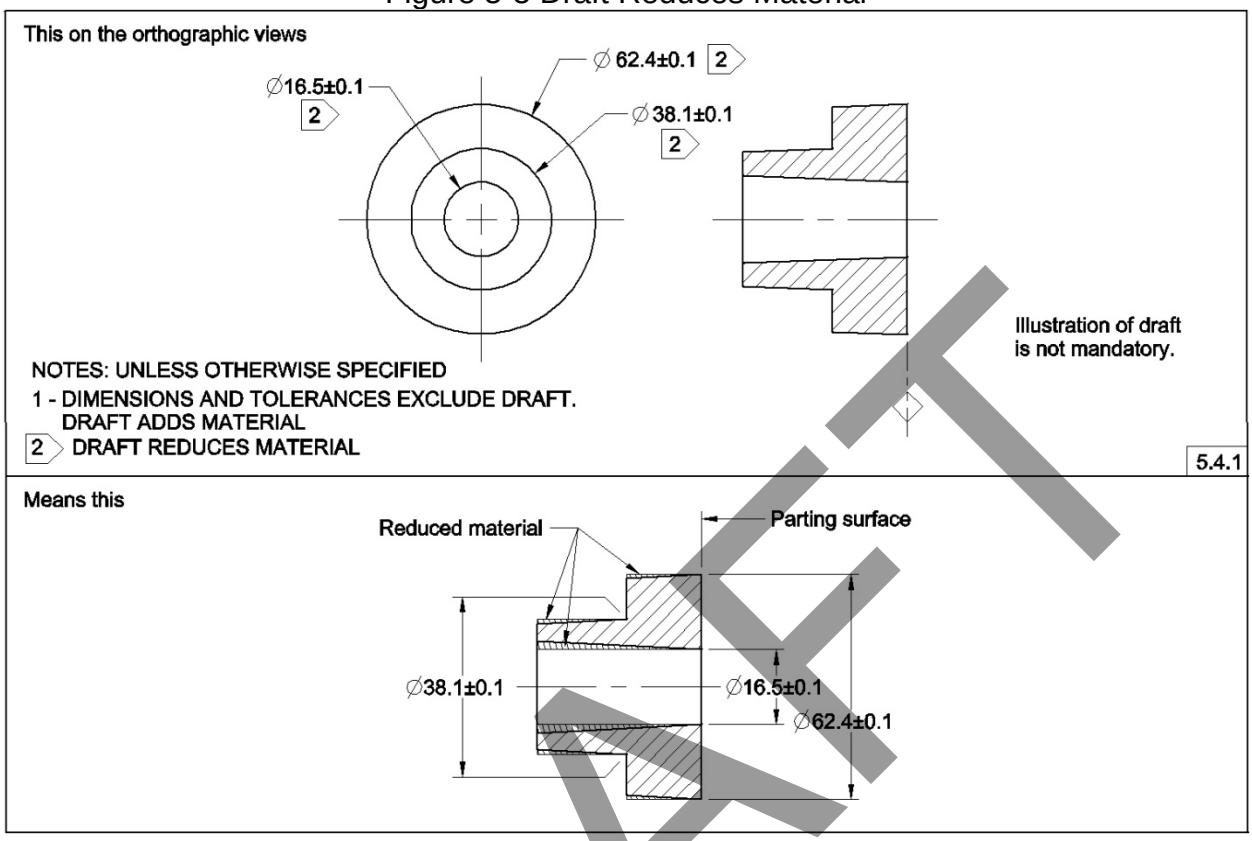


Figure 5-6 “DFT INCL” Example

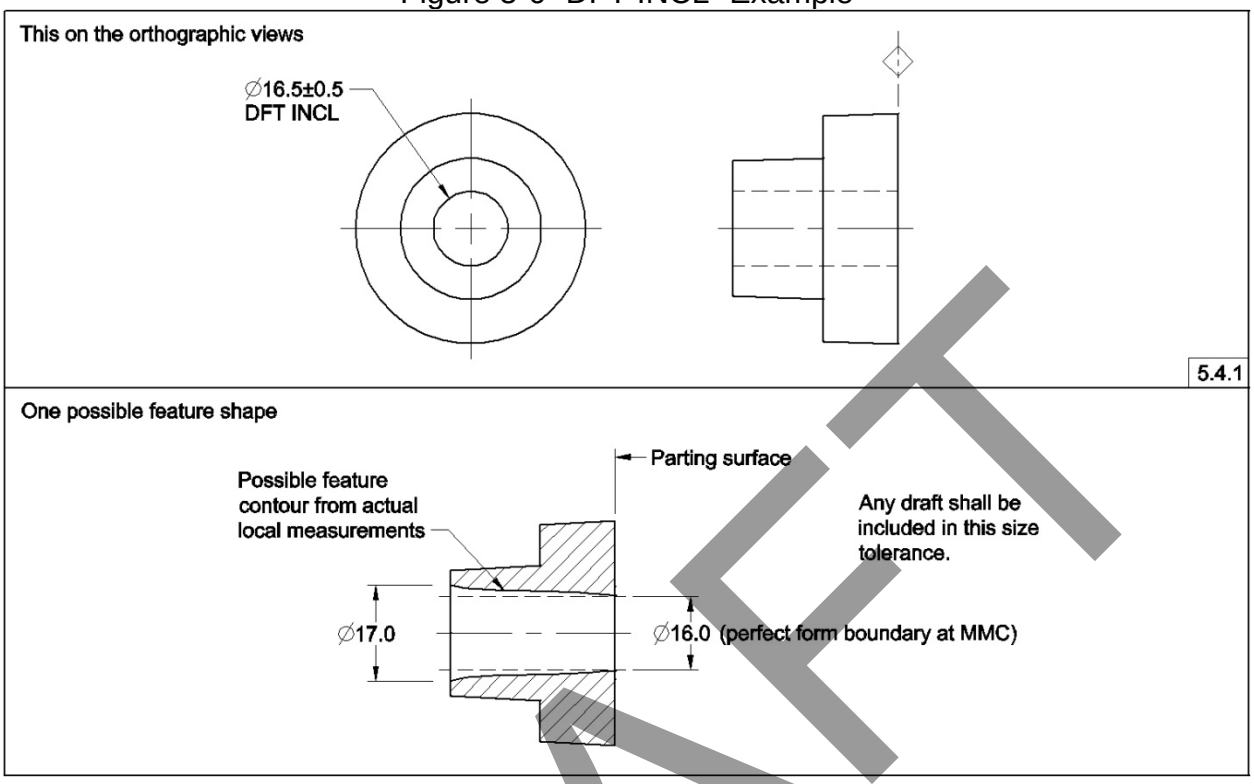


Figure 5-7 Size At Specific Locations For A Drafted Feature

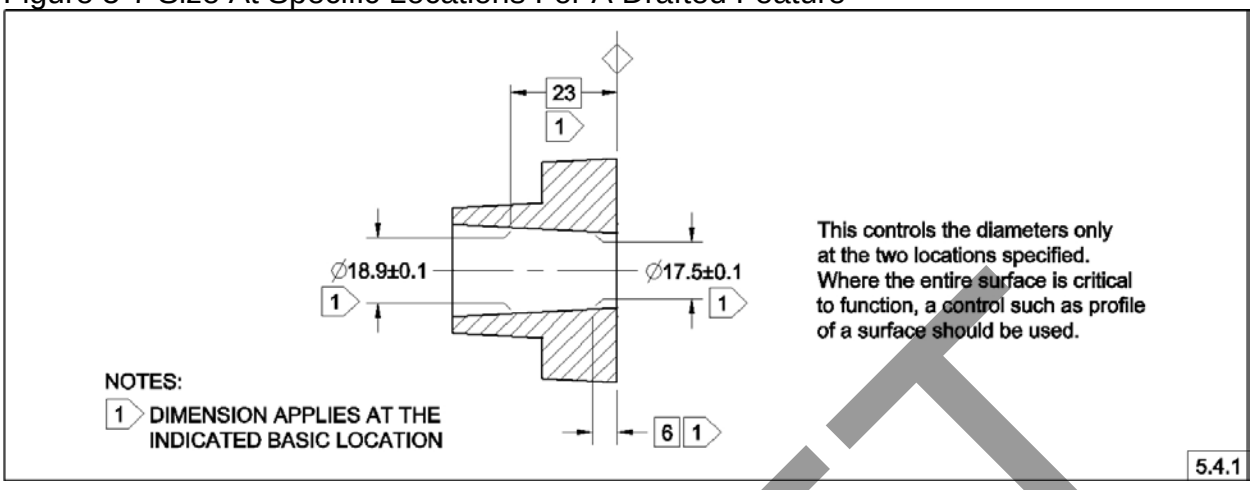


Figure 5-8 “+DFT” Example

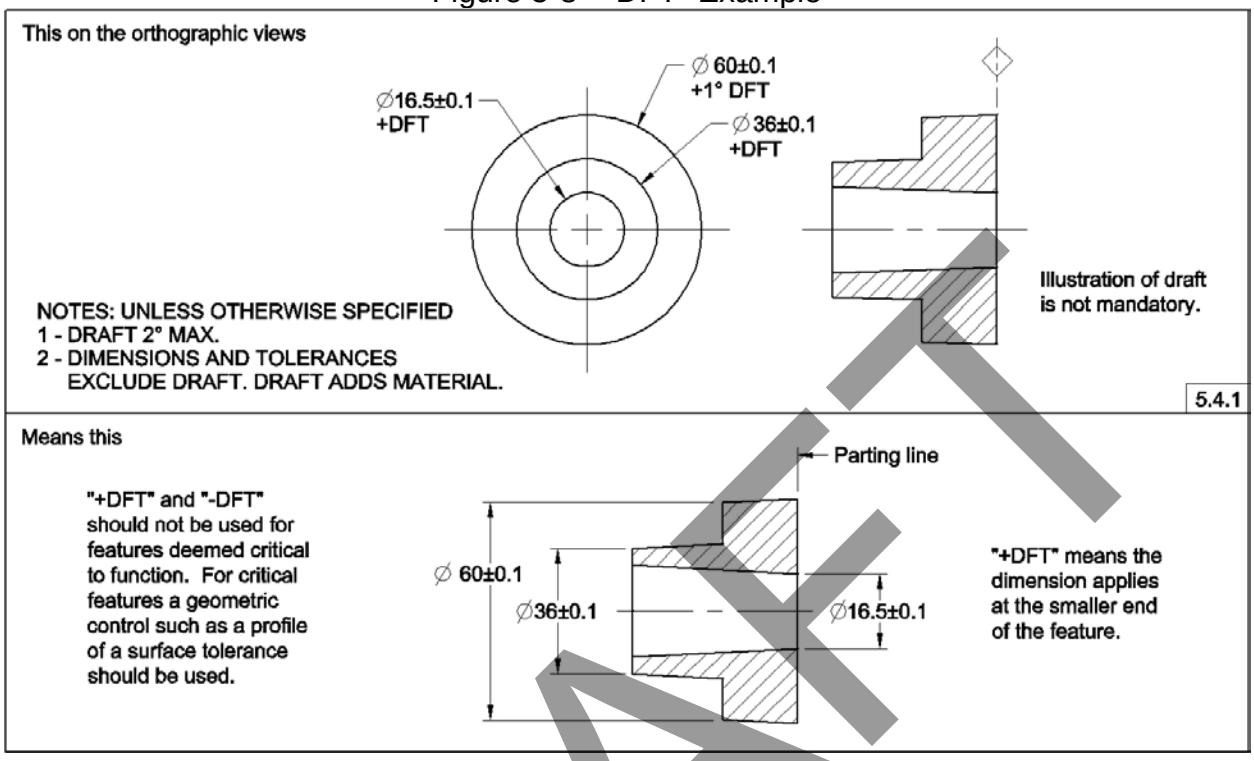


Figure 5-9 “-DFT” Example

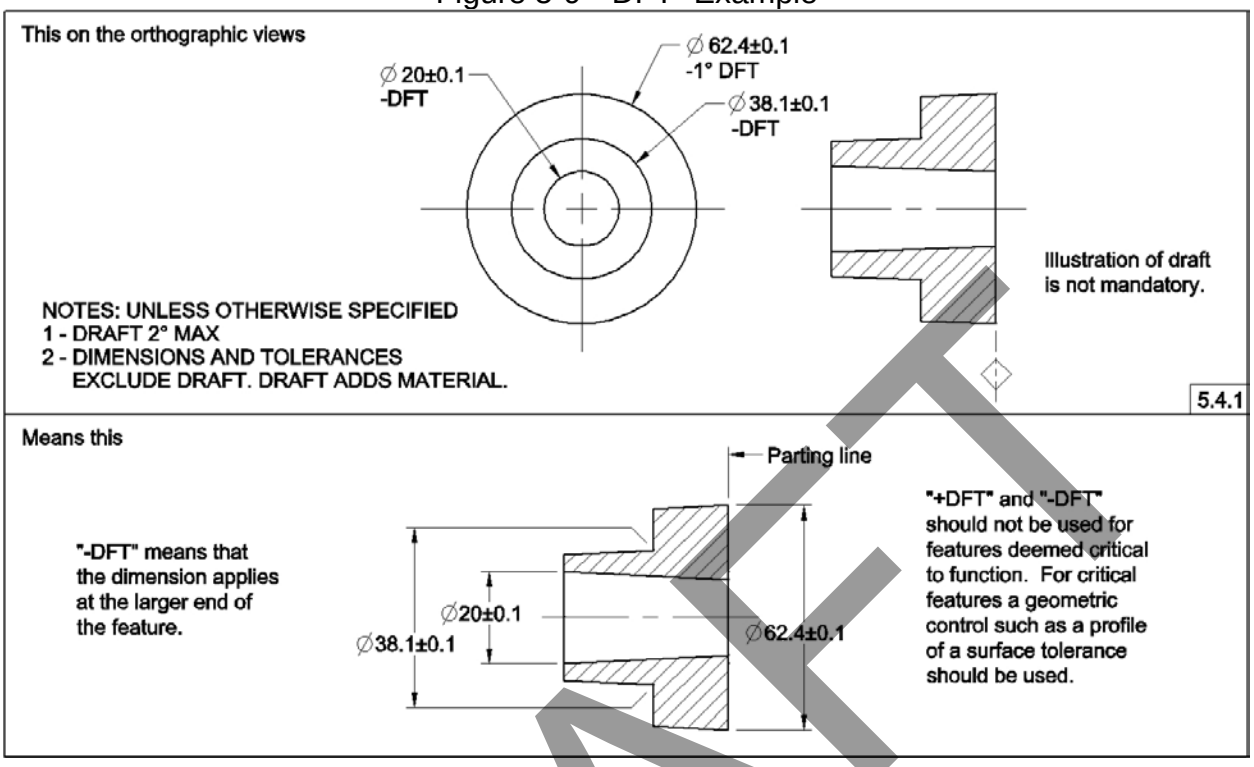


Figure 5-10 Match Draft

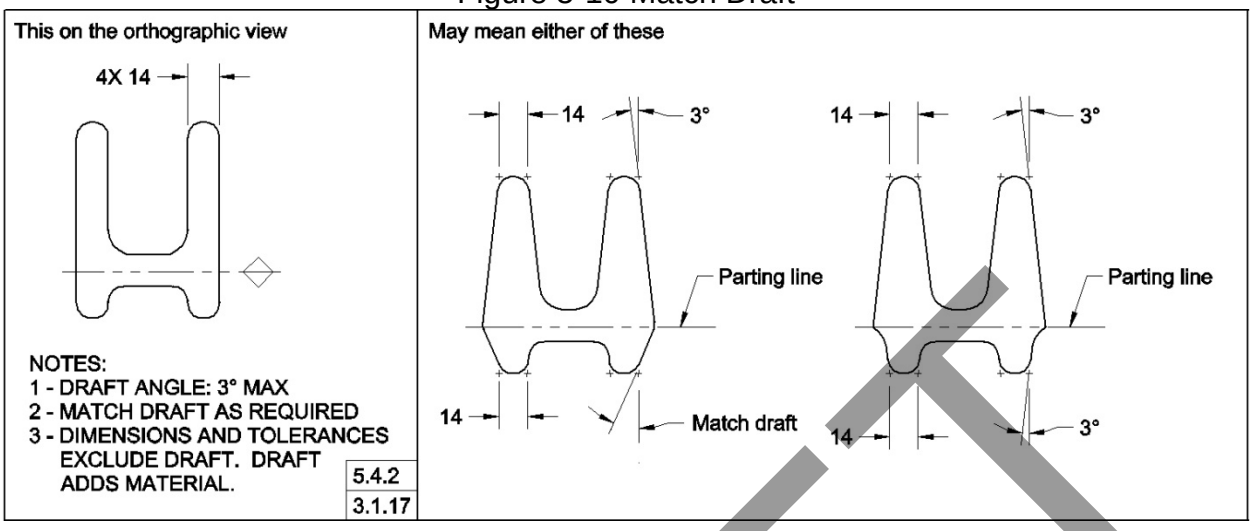


Figure 5-11(a) Flash Extension

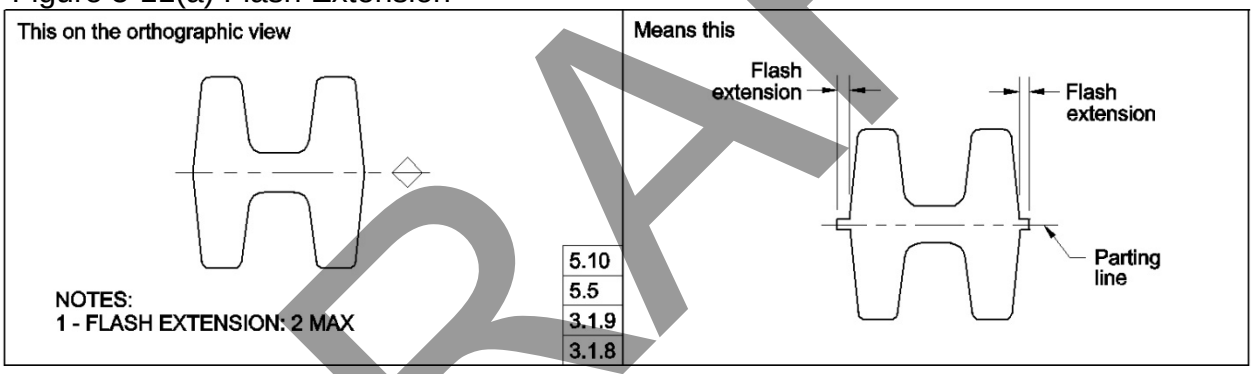


Figure 5-11(b) Flash Extension and Mismatch

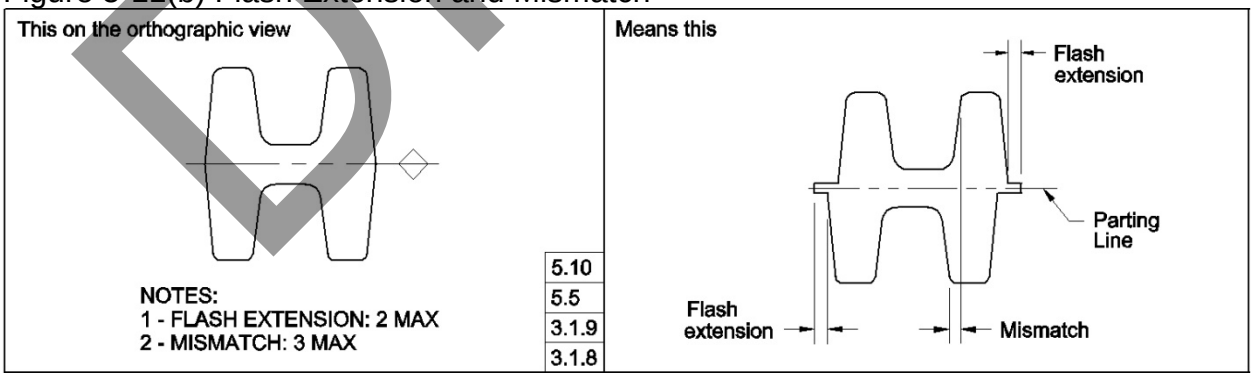


Figure 5-12 Boss Circular Mold Line and Mold Line Center Point

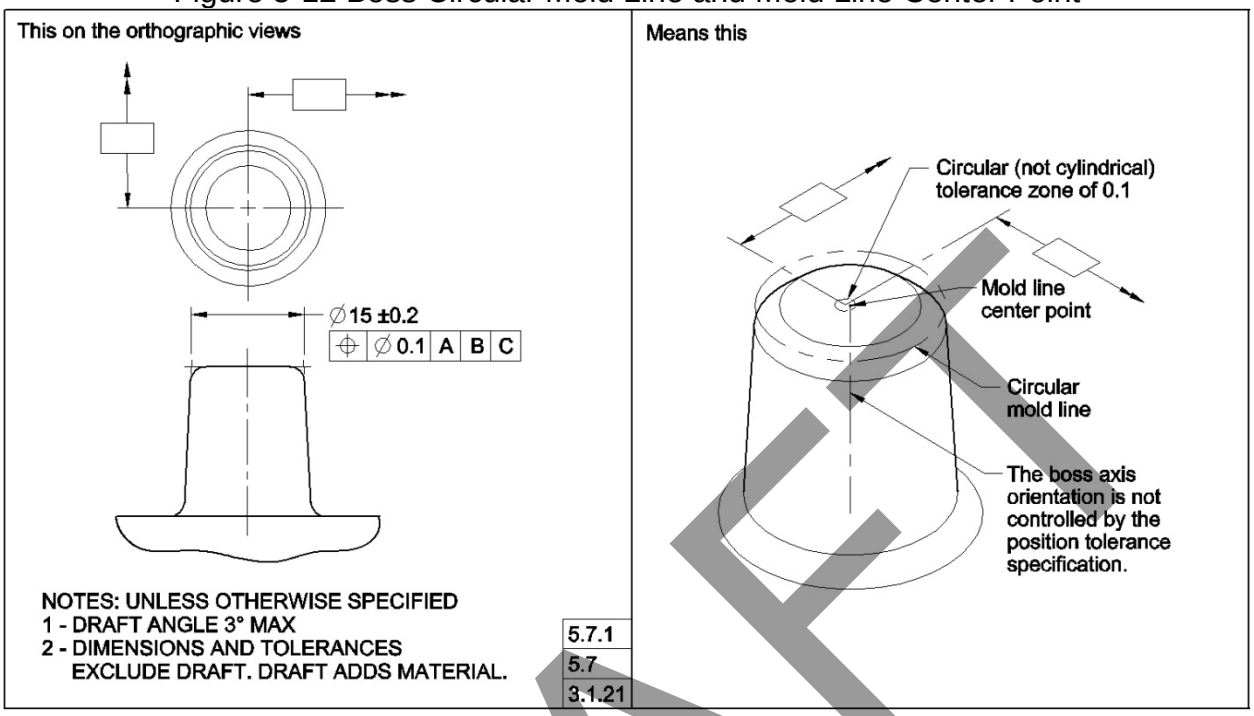


Figure 5-13 Hole Circular Mold Line and Mold Line Center Point

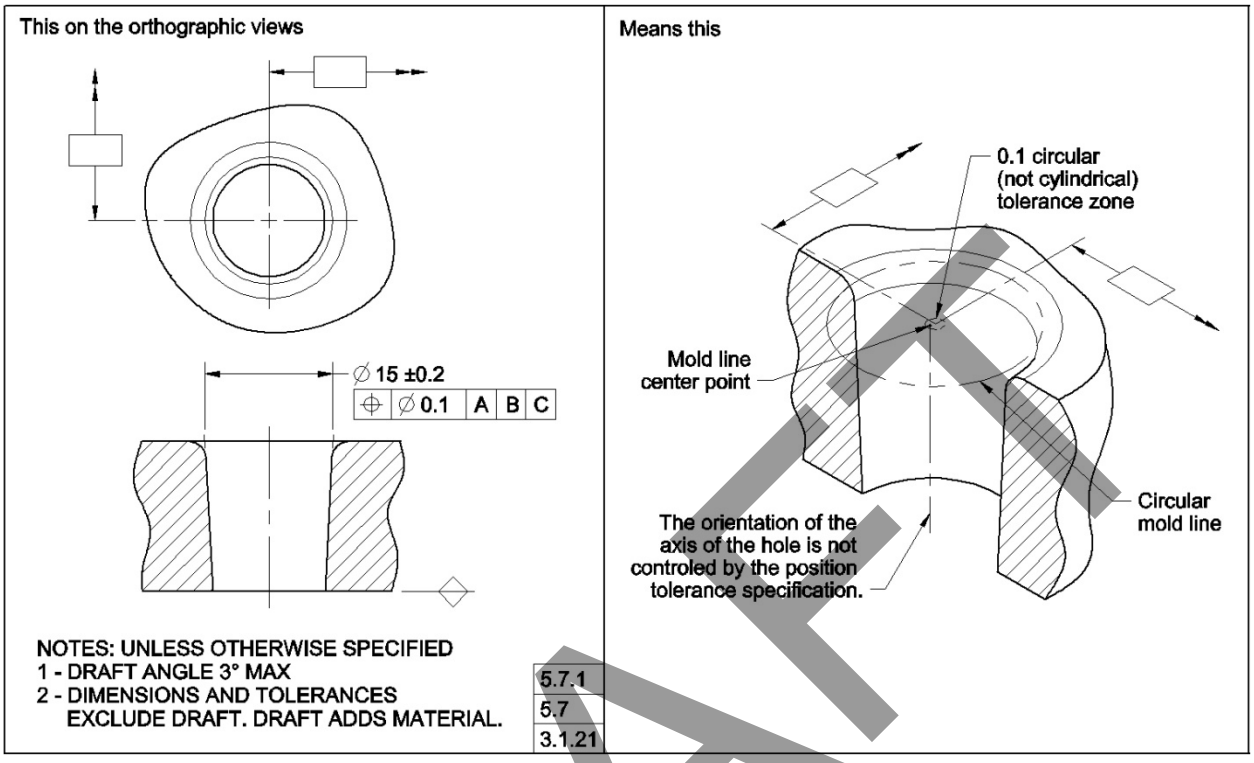


Figure 5-14 Draft Construction and Mold Lines

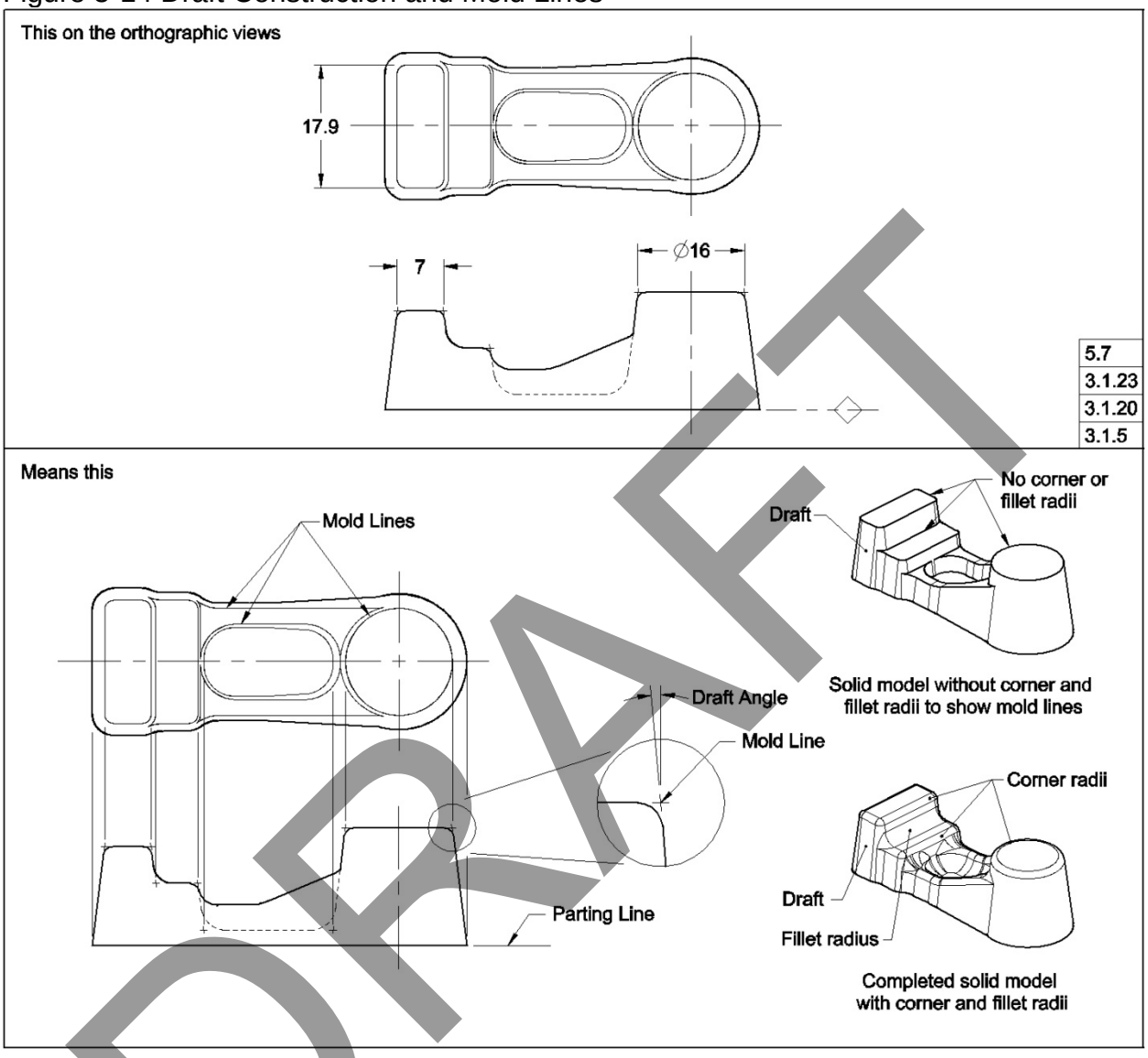


Figure 5-14(a) Boss Full Feature Modifier for Position

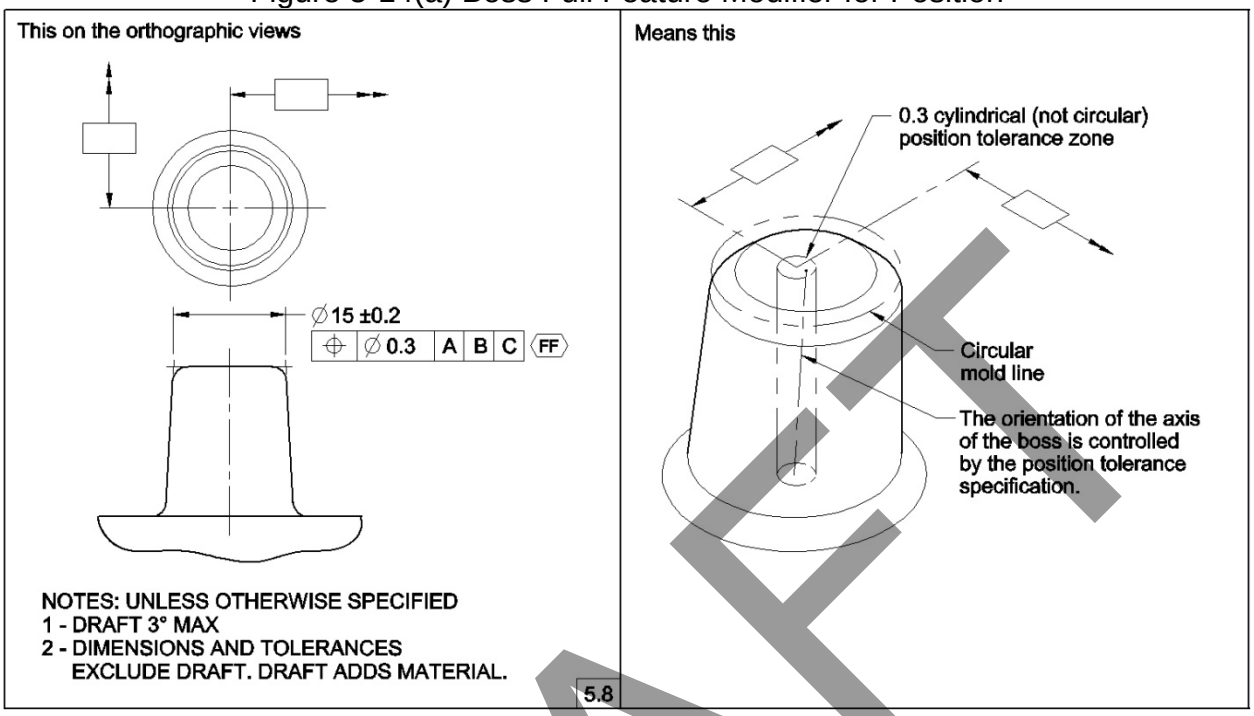


Figure 5-14(b) Boss Full Feature Modifier for Orientation

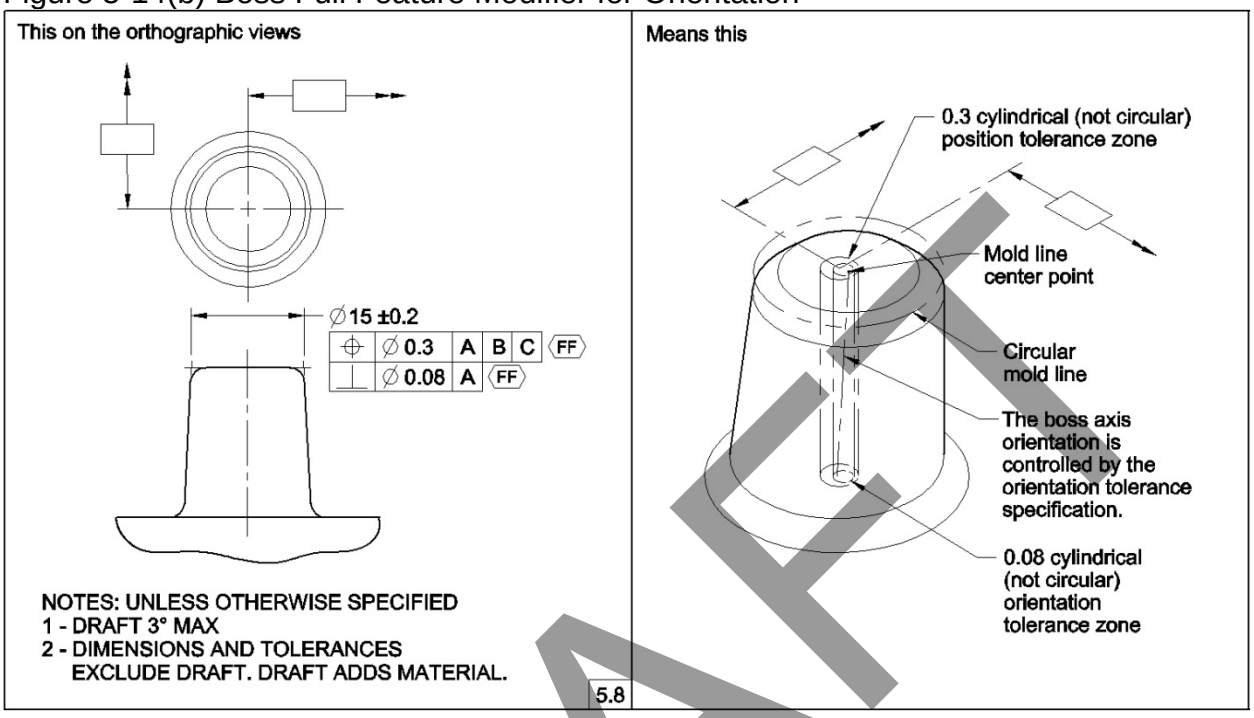


Figure 5-14(c) Rib Full Feature Modifier for Position

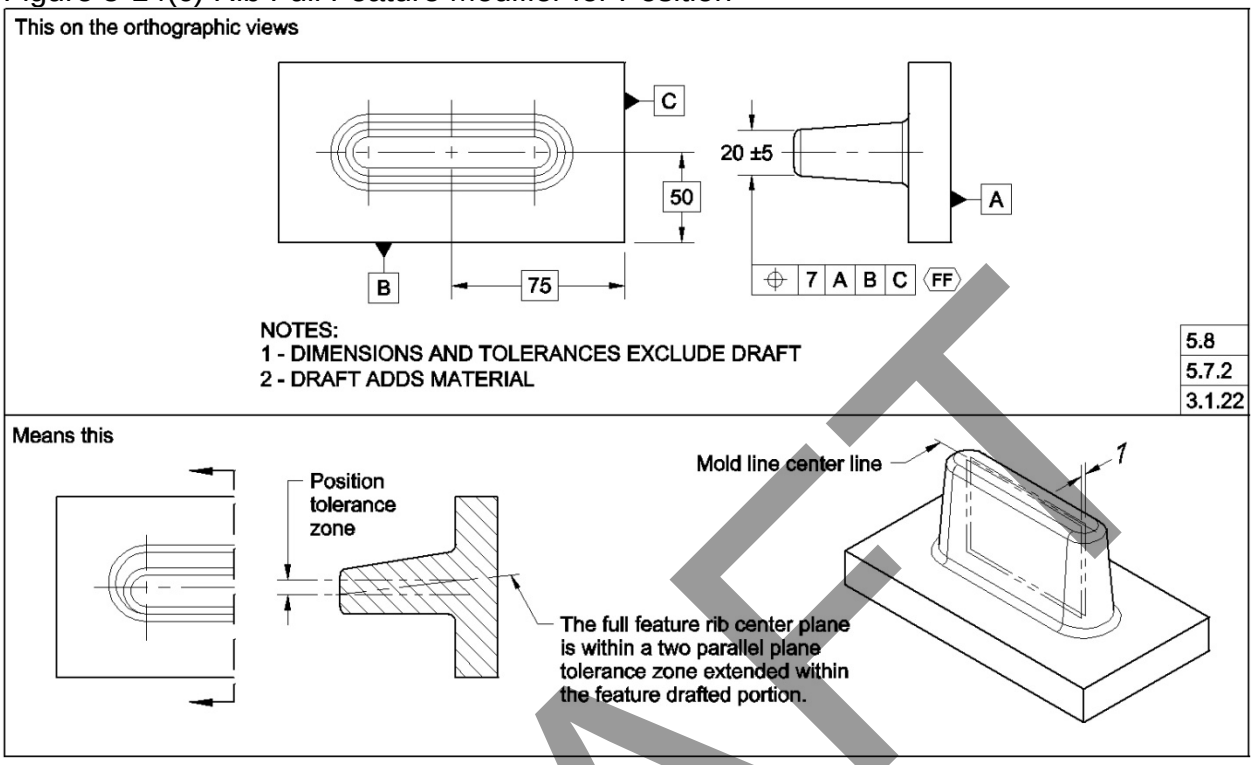


Figure 5-14(d) Rib Full Feature Modifier for Orientation

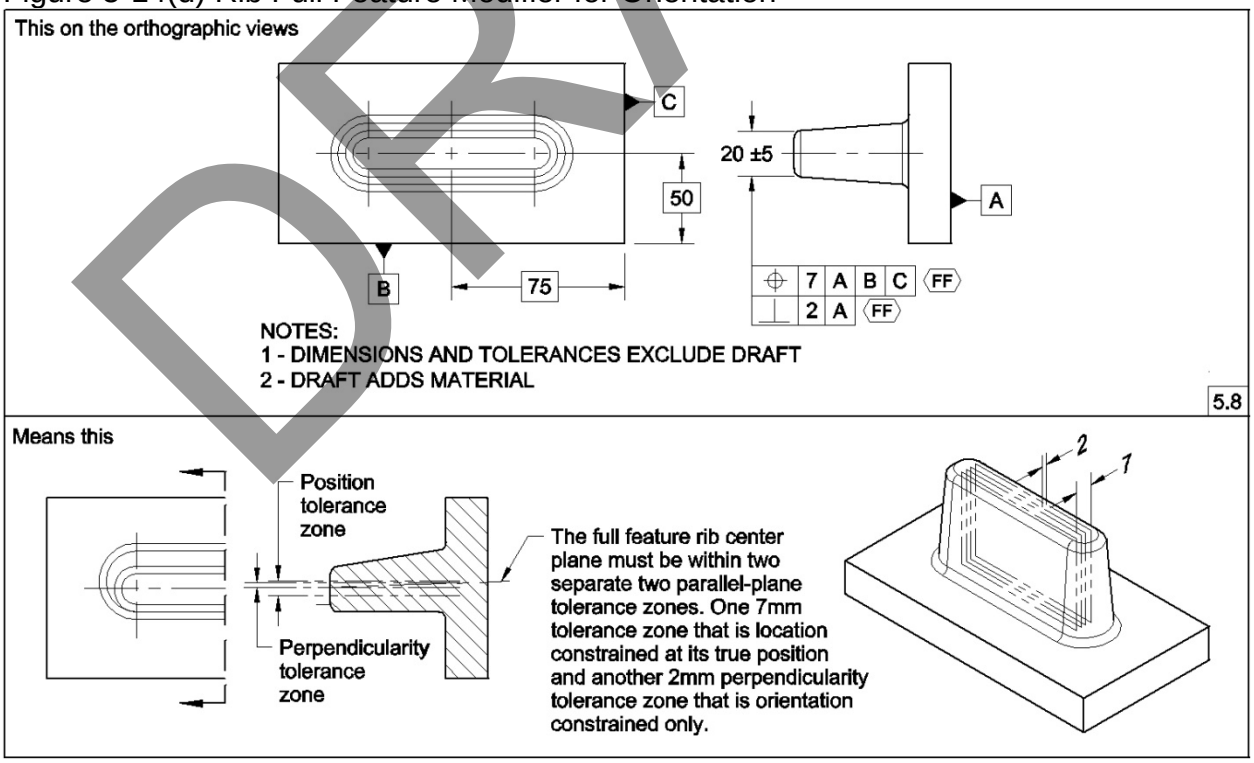


Figure 5-15(a) Die Closure Not Specified

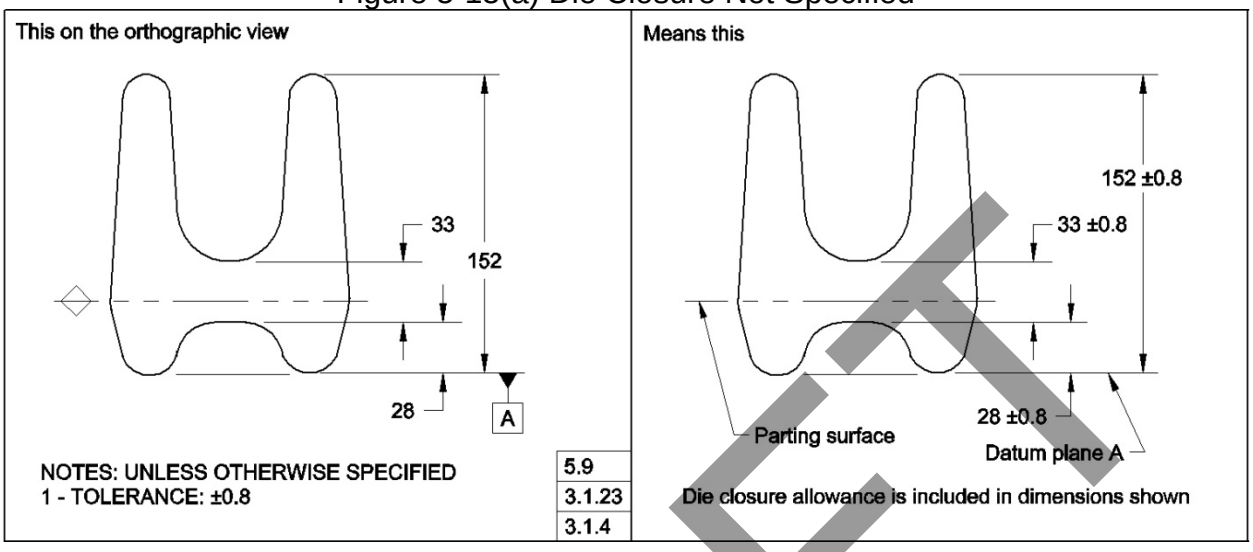


Figure 5-15(b) Die Closure Specified and Parting Line Indicated

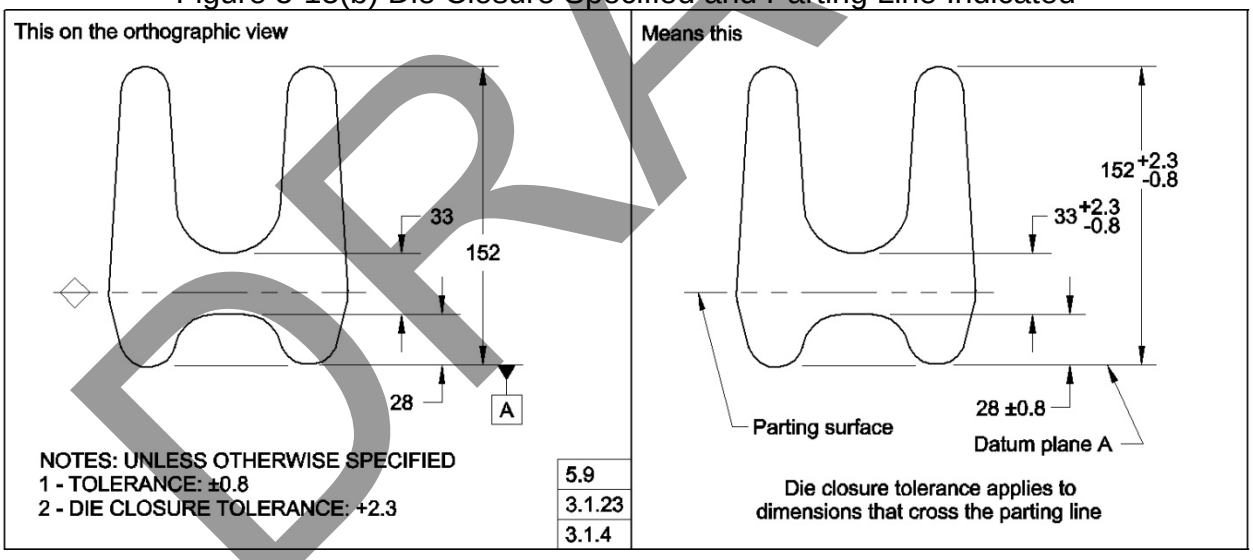


Figure 5-15(c) Die Closure Specified and Parting Line Not Indicated

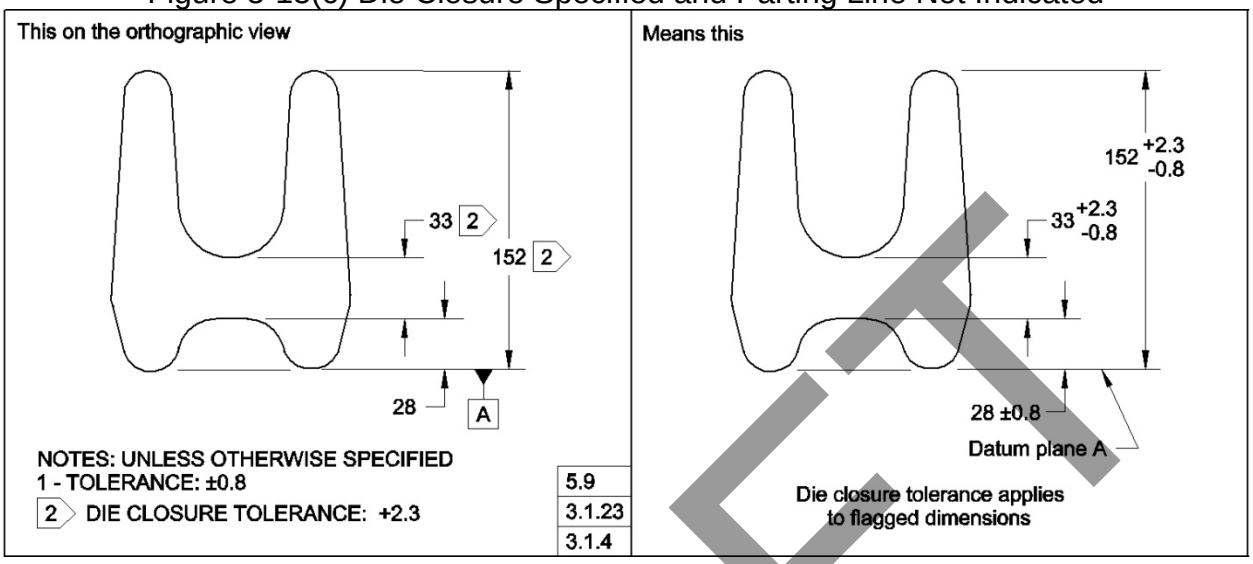


Figure 5-16 (a) Mismatch Tolerance

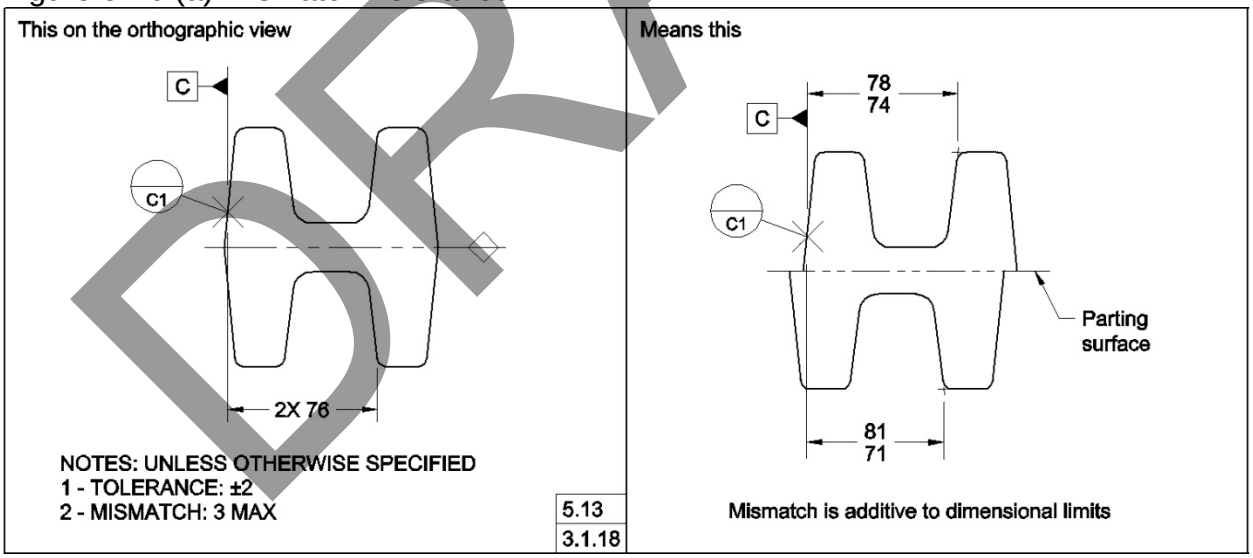


FIG 5-16(b) – Control of Die Closure and Mismatch

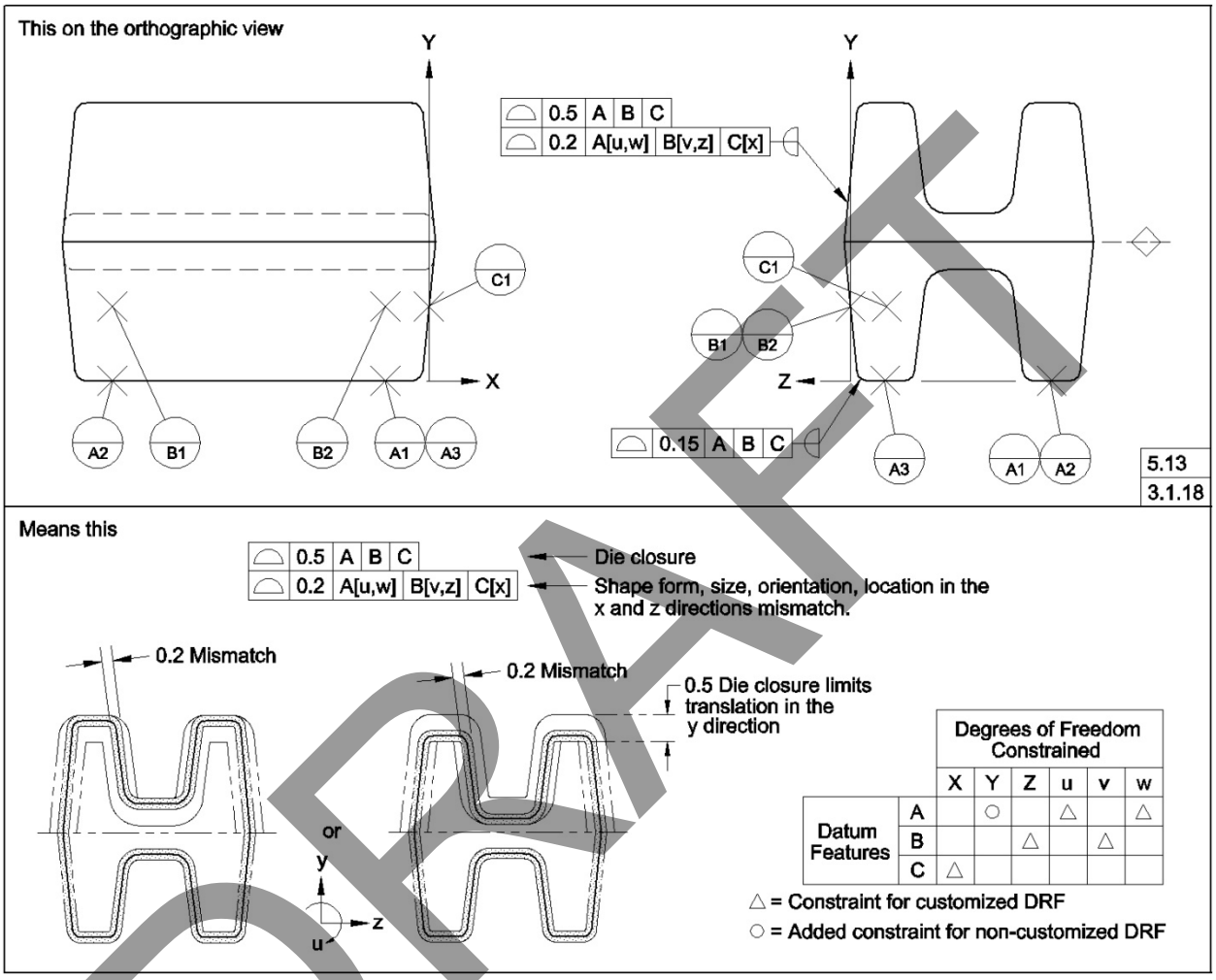


Figure 5-17 Parting Line Locations

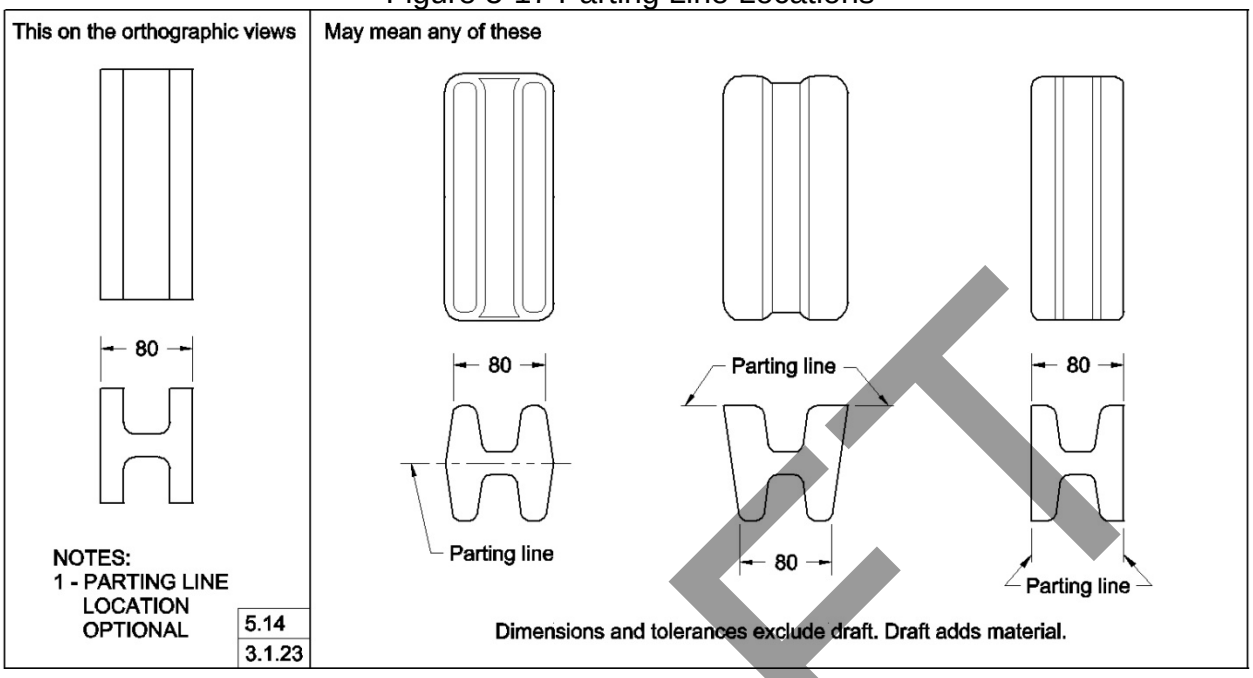


Figure 5-18 Parting Line Symbol Application

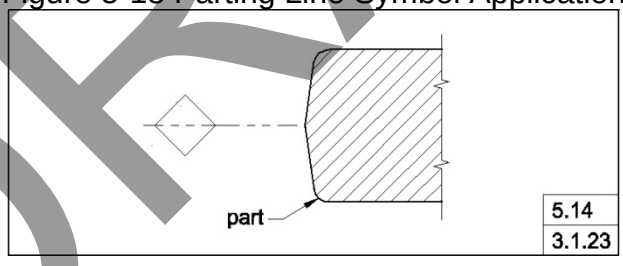


Figure 5-19 All Around This Side of Parting Line Symbol Application

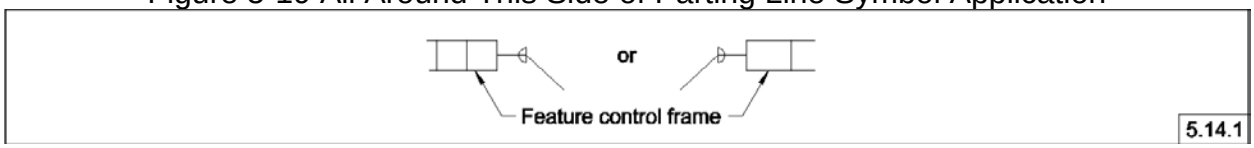


Figure 5-20 All Around This Side of Parting Line

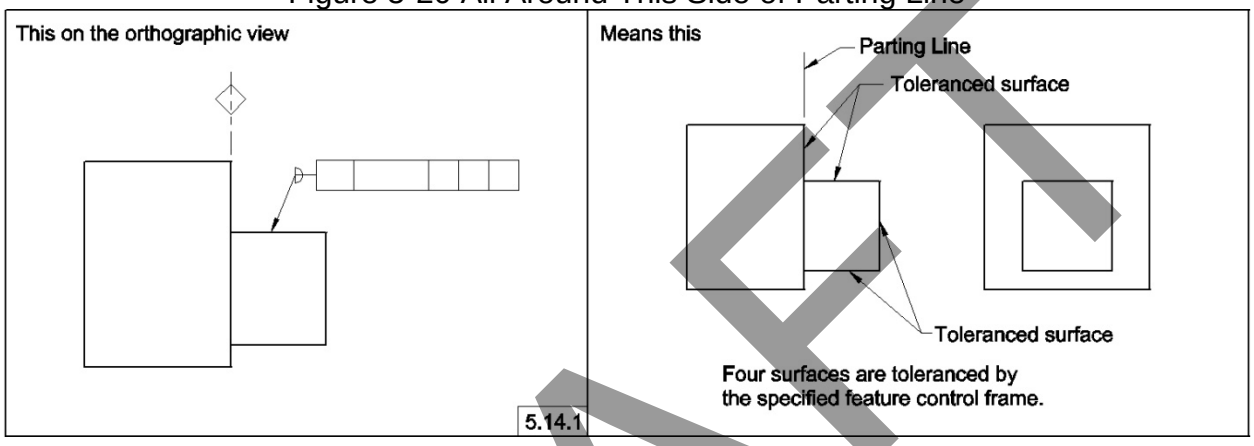


Figure 5-21 All Over This Side of Parting Line Symbol Application

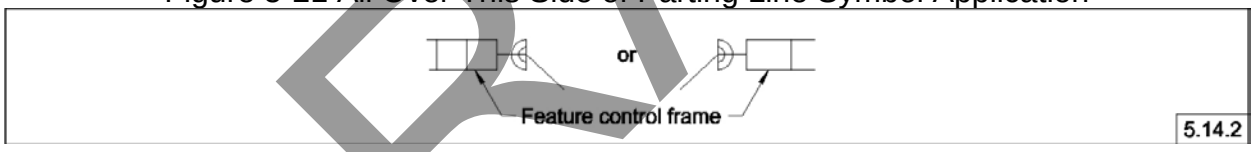


Figure 5-22 All Over This Side of Parting Line

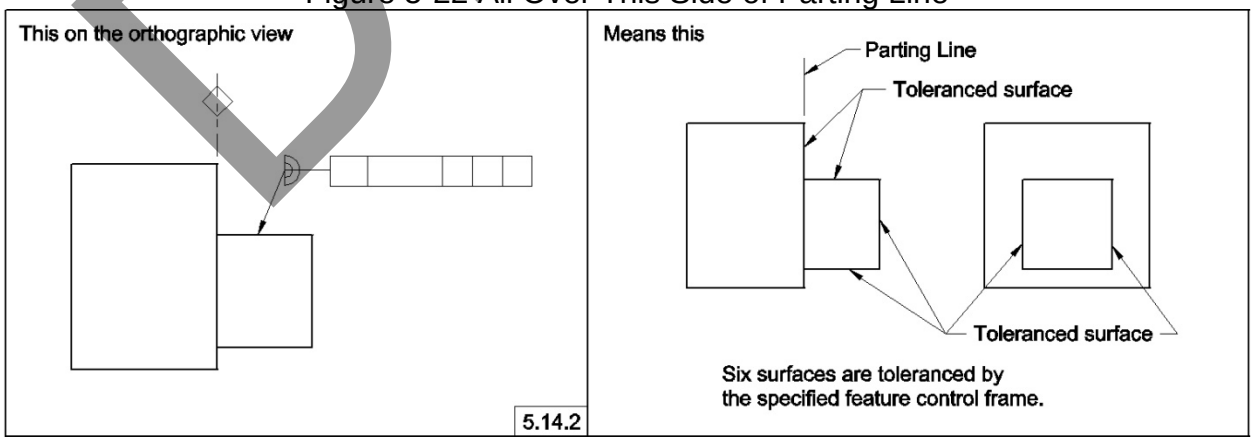


Figure 5-23 Grain Direction Specified

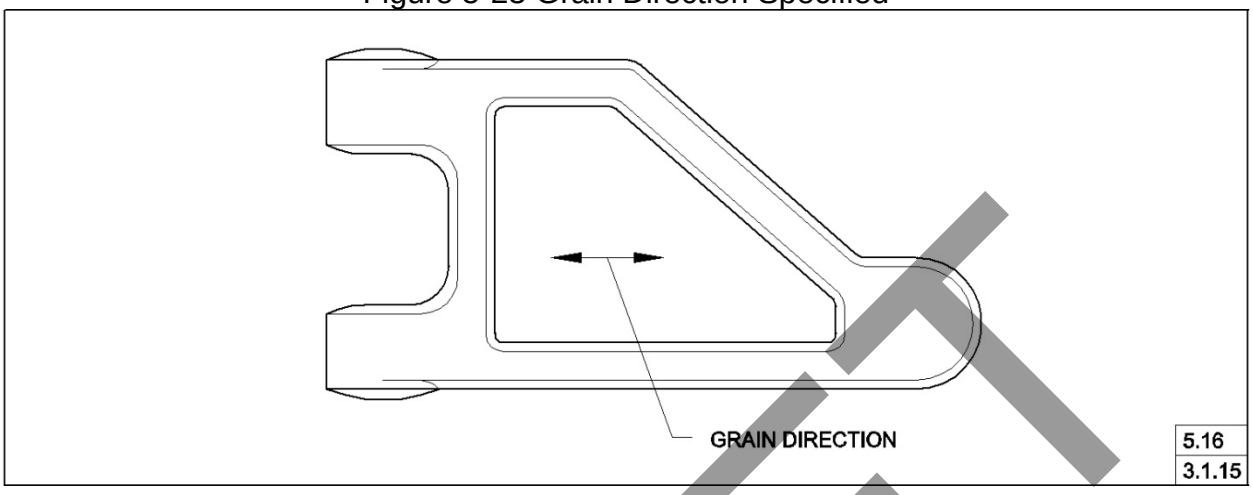
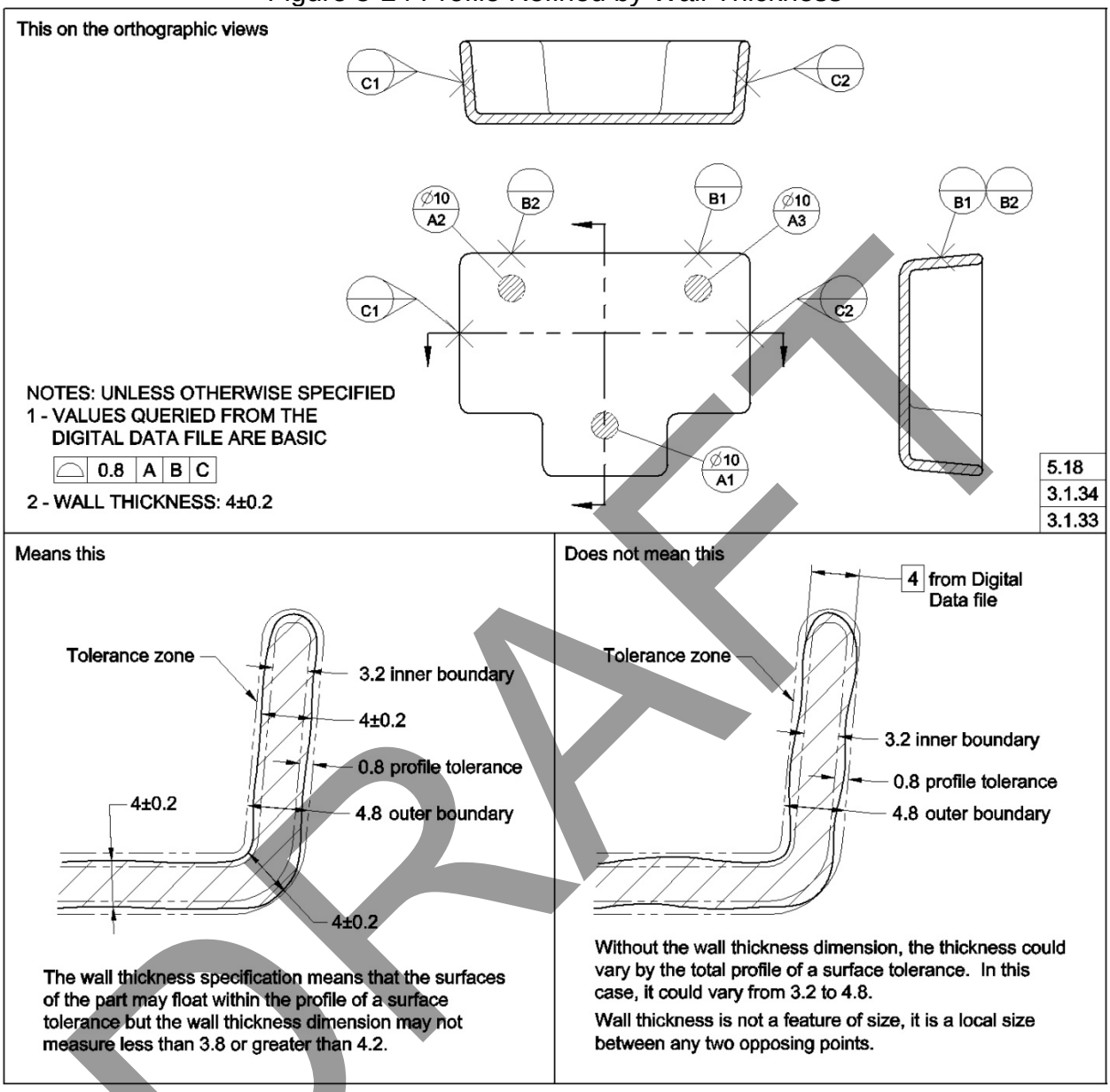


Figure 5-24 Profile Refined by Wall Thickness



Section 6
Datum Referencing

6.1 GENERAL

This section establishes the principles of datum referencing for cast, forged and molded parts. It contains the criteria for selecting and designating features to establish the datum reference frame and relate it to the finished part. See Figure 6-1.

6.2 DATUM TARGETS

Because of inherent irregularities, the entire surface of some features cannot be effectively used to establish a datum. Such surfaces are common on castings, forgings and molded parts. Datum targets and datum features may be combined to establish a datum reference frame.

6.2.1 Datum Target Location

Datum targets should be located as follows:

(a) on features produced by one segment of a die or pattern, except in the case of equalizing datum targets. See Figures 6-2 through 6-4.

(b) on features opposite machining cuts which establish a subsequent machining datum reference frame. See Figure 6-5.

(c) on features not subject to processing variables, such as parting lines, flash extensions, etc.

(d) on features not subsequently altered or removed.

(e) with optimum spacing considering function and producibility. See Figure 6-4.

(f) on non-coplanar features where the area or location requires one or more datum targets offset from the datum plane. See Figure 6-6.

6.2.2 Effect of Draft and Parting Lines

The relationship of features of a part to datums established by targets can be affected by draft and parting lines. See Figure 6-7.

6.2.3 Placement of Local Dimensions

Dimensions not intended to be from the datum reference frame (local dimensions) shall be clearly indicated to apply to the mold lines. See Figure 6-8.

6.3 MACHINED DATUM FEATURES

Machined datum features should be controlled relative to a datum reference frame established from cast/forged/molded datum features. The cast, forged or molded surfaces selected as datum features should be surfaces that will exist after machining, maintaining dimensional traceability back to cast/forged/molded datums.

6.3.1 Machined Datum Reference Frame

Machined datum features should be established relative to a cast/forged/molded part datum reference frame. The relationship between datum features of multiple datum reference frames shall be specified. See Figure 6-9.

6.3.2 Machined Datum Reference Frame Established With Optimization of Material

Where the complexity of design, or variations in tooling capabilities preclude the assignment of datum targets to as-cast/forged/molded parts, machined datum targets may be created by optimizing the material distribution in a simulated datum reference frame. Where only machined datum features are shown on the drawing, the part mass shall be optimized to establish the location of these machined datum features. See Figure 6-10.

NOTE: Utilization of the optimized material distribution method of creating datum targets will require close co-operation between all elements of the concurrent engineering team.

6.4 EQUALIZING DATUMS

Where it is desirable to center a casting/forging/molded part, the application of equalizing datums should be considered. See Figure 6-4. The associated datum plane or axis may be identified by note. Figure 6-11 illustrates the application of an equalizing datum established by two fixed datum targets, B1 and B2, and two movable target simulators, C1 and C2. Figure 6-12 illustrates the establishment of two equalizing datums resulting from datum B targets being movable. Figure 6-13 illustrates the establishment of two equalizing datums resulting from six fixed datum targets.

6.4.1 Movable Target Simulators.

The readability of a drawing may be improved by indicating movable datum target simulators. (Y14.5). Figures 6-3, 6-11, and 6-12 illustrate applications of the movable datum target symbol. Where movable target simulators are used, RMB applies. Where the direction of the simulator motion is not indicated, a direction normal to the undrafted true surface is used.

6.5 DATUM TARGETS AND PROFILE TOLERANCING

Where a profile tolerance has been applied to a surface containing datum targets, the true profile of the surface and the extremities of the surface which contact the datum target simulators are coincident. Unless otherwise specified, the profile tolerance zone is equally disposed about the true profile. See Figure 6-14.

The underlying concepts are as follows:

(a) The profile tolerance zone is located and oriented to the datum reference frame.

(b) The datum reference frame is located and oriented by the datum target simulators.

(c) When the part is mated with the datum target simulators, the remaining surface of the considered feature is then related to the tolerance zone.

Figure 6-14, illustration (a) shows the workpiece with a midpoint surface element (neither a high point nor a low point) coincident with the datum target simulators. All surface elements shown are contained within the profile tolerance zone.

Figure 6-14, illustration (b) shows the same workpiece with a high point contacting the datum target simulators if the drawing specifies them in a different location. Several portions of the surface elements are now outside of the profile tolerance zone.

In both figures the true profile of the tolerance zone is aligned to the datum target simulators. The tolerance zone is then related to the feature surface by the contact of

the workpiece surface with the datum target simulators. The feature's form error does not exceed 0.8; however, the actual contact of the datum target simulator and the workpiece surface sets the location of the true profile relative to the workpiece. The use of targets to establish a datum reference frame and the variation from workpiece to workpiece may result in having some portions of the actual surface extend beyond the tolerance zone. When a balanced surface relative to the targets is desired, this method should be considered.

Allowable variation of the actual workpiece surface coincident with the target area is one-half the specified profile tolerance for an equal bilateral distribution, or the amount of the specified profile tolerance in the direction that removes material specified in an unequal bilateral control. Target lines and datum target points act in a similar fashion except the variation restriction applies to areas with the control being along the line or point of the simulator. The remaining surface variation outside the target area or line shall be contained within the total profile tolerance zone as established from the true profile related to the datum target location.

Profile of a surface without a datum reference frame specified could be applied to datum feature A and would control the surface variation independent of, and prior to, the establishment of any datum. This may be applied in cases when a forged or cast part is being evaluated to determine whether sufficient material is available to produce a machined part. An "ALL OVER" profile of a surface control without datum features referenced could also be applied, when the tolerance zone for the entire surface is intended to be best-fit to the workpiece, rather than fixed relative to a datum reference frame.

Figure 6-1 Datum Targets Establishing a Datum Reference Frame

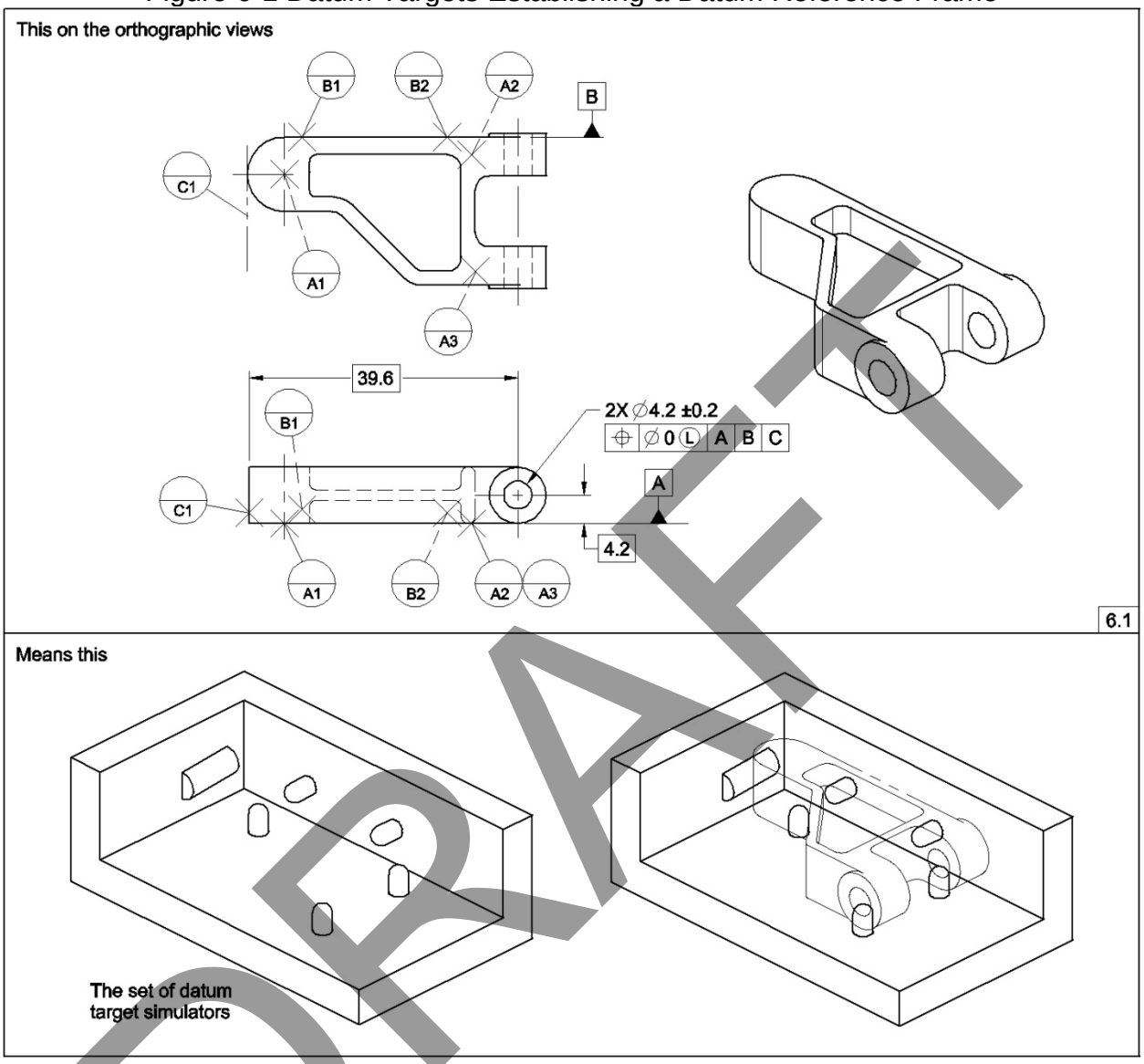


Figure 6-2 Datum Targets Within Same Die Segment

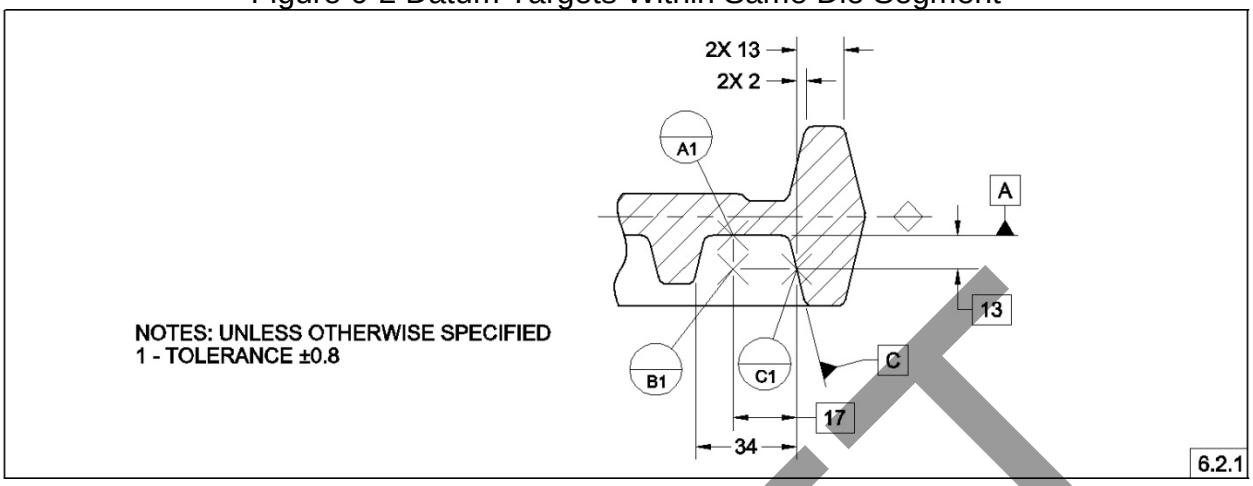
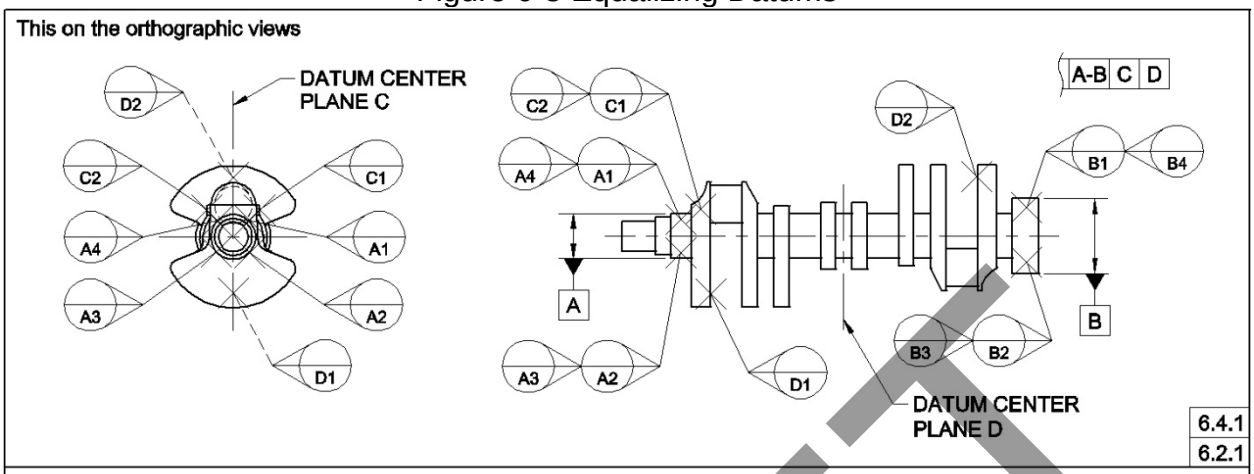


Figure 6-3 Equalizing Datums



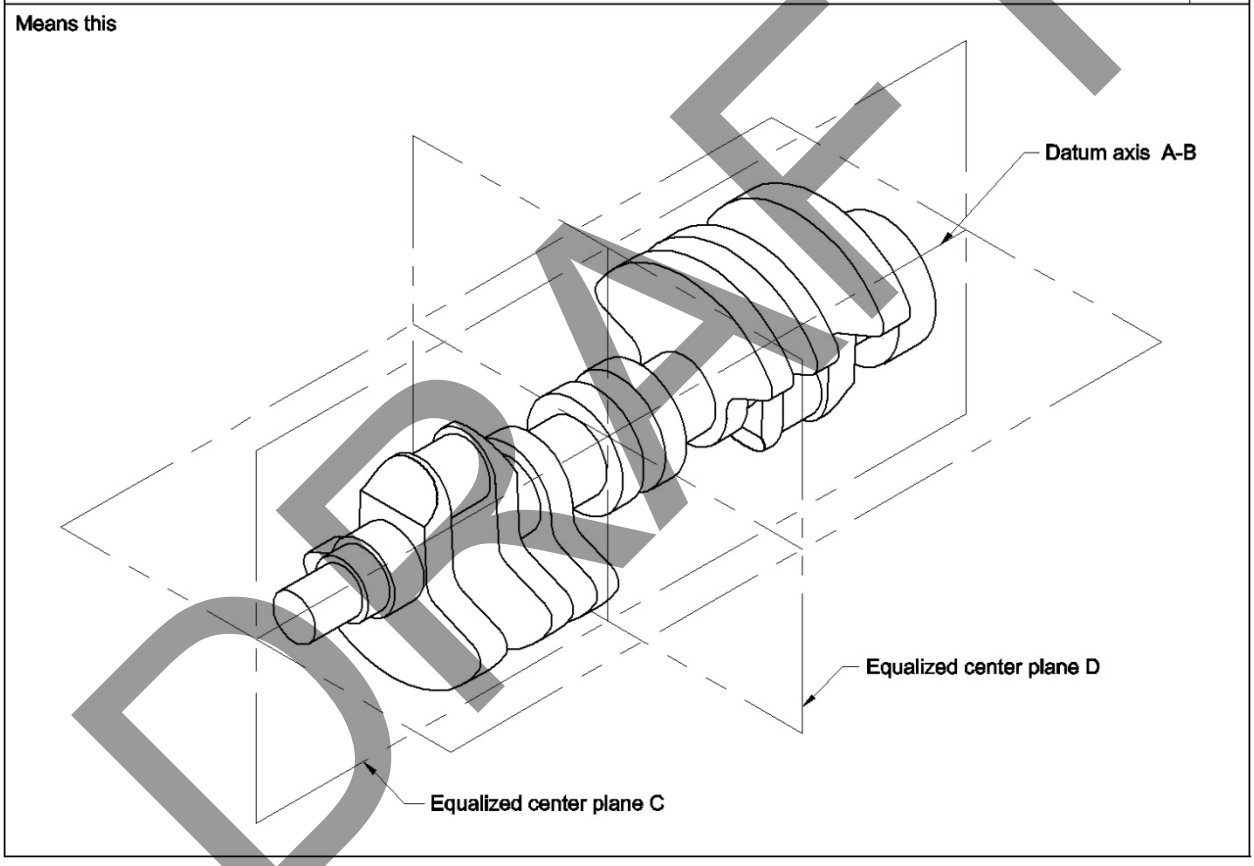


Figure 6-4 Optimum Location of Equalizing Datum Targets

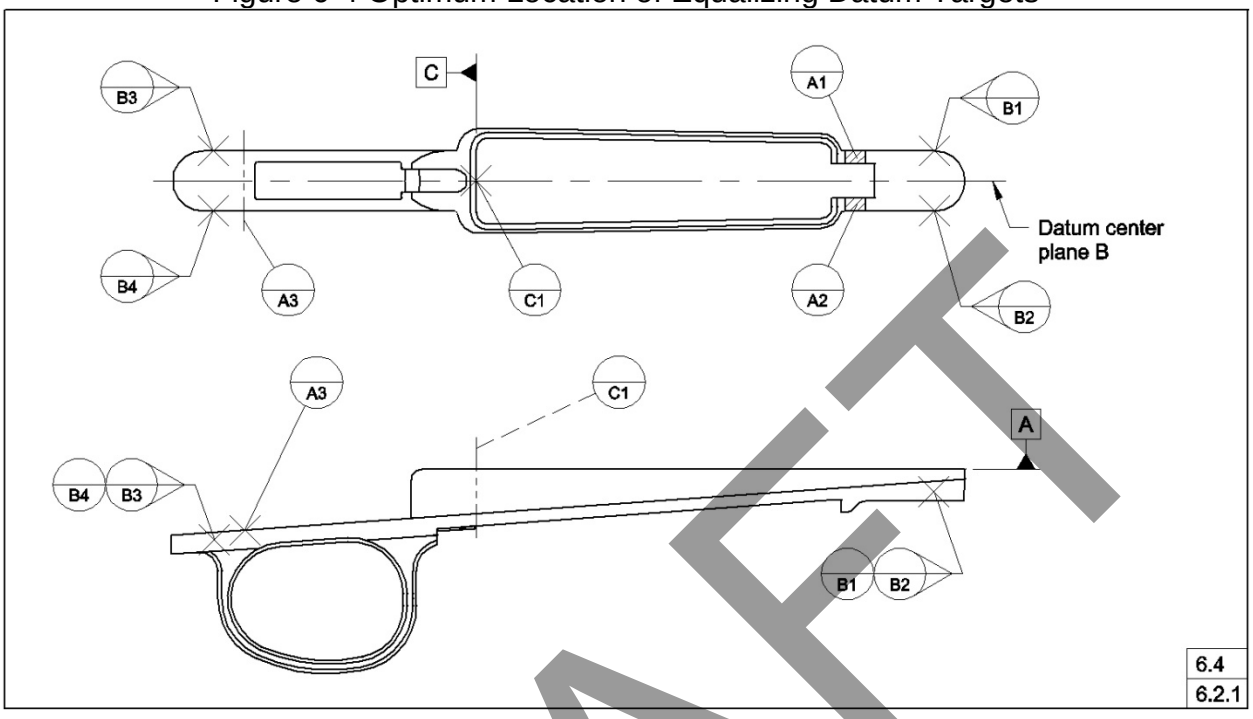


Figure 6-5 Datum Targets Located opposite Machined Surfaces

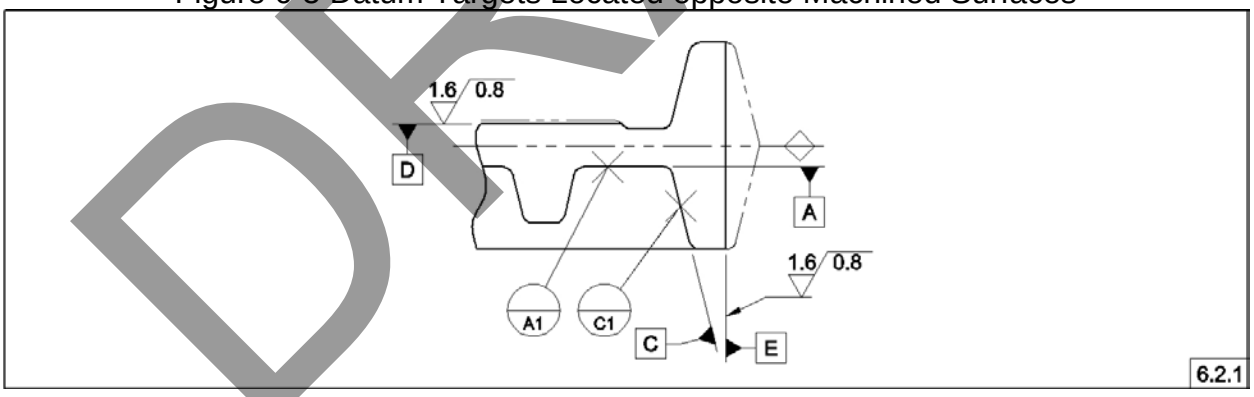


Figure 6-6 Datum Targets Offset From the Datum Plane

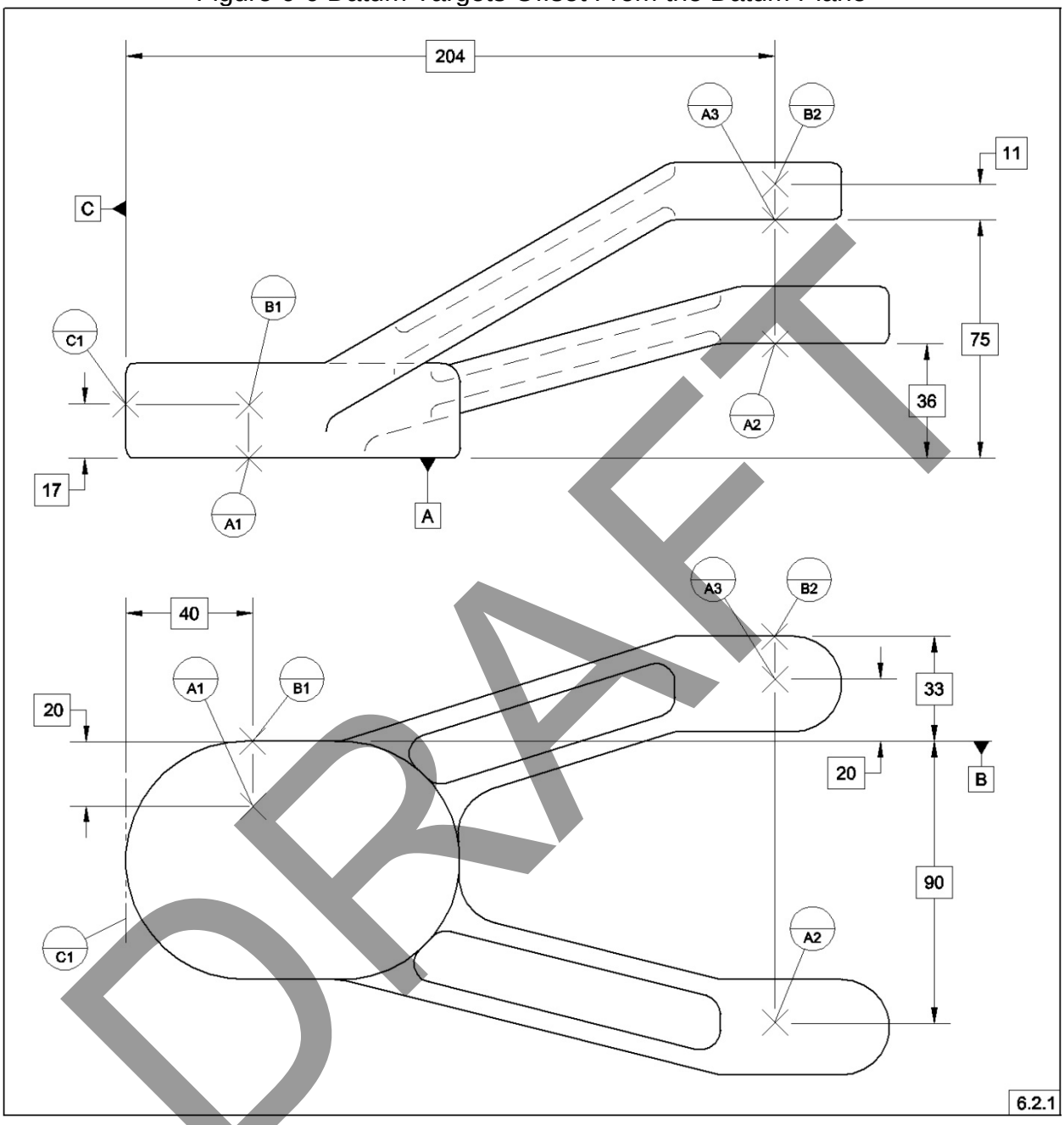


Figure 6-7 Effect of Draft and Parting Line on Datums

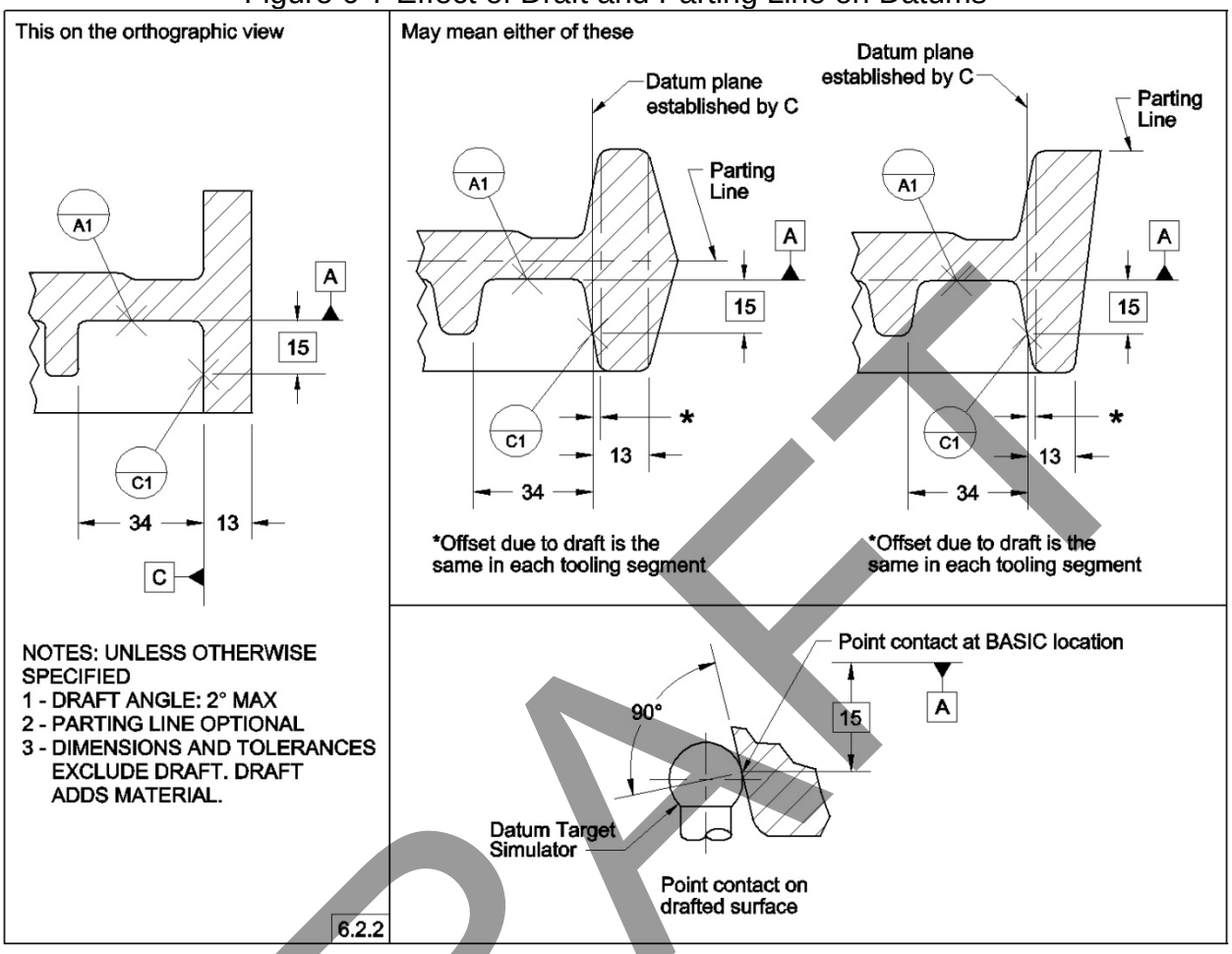


Figure 6-8 Placement of Local Dimensions Affected By Draft

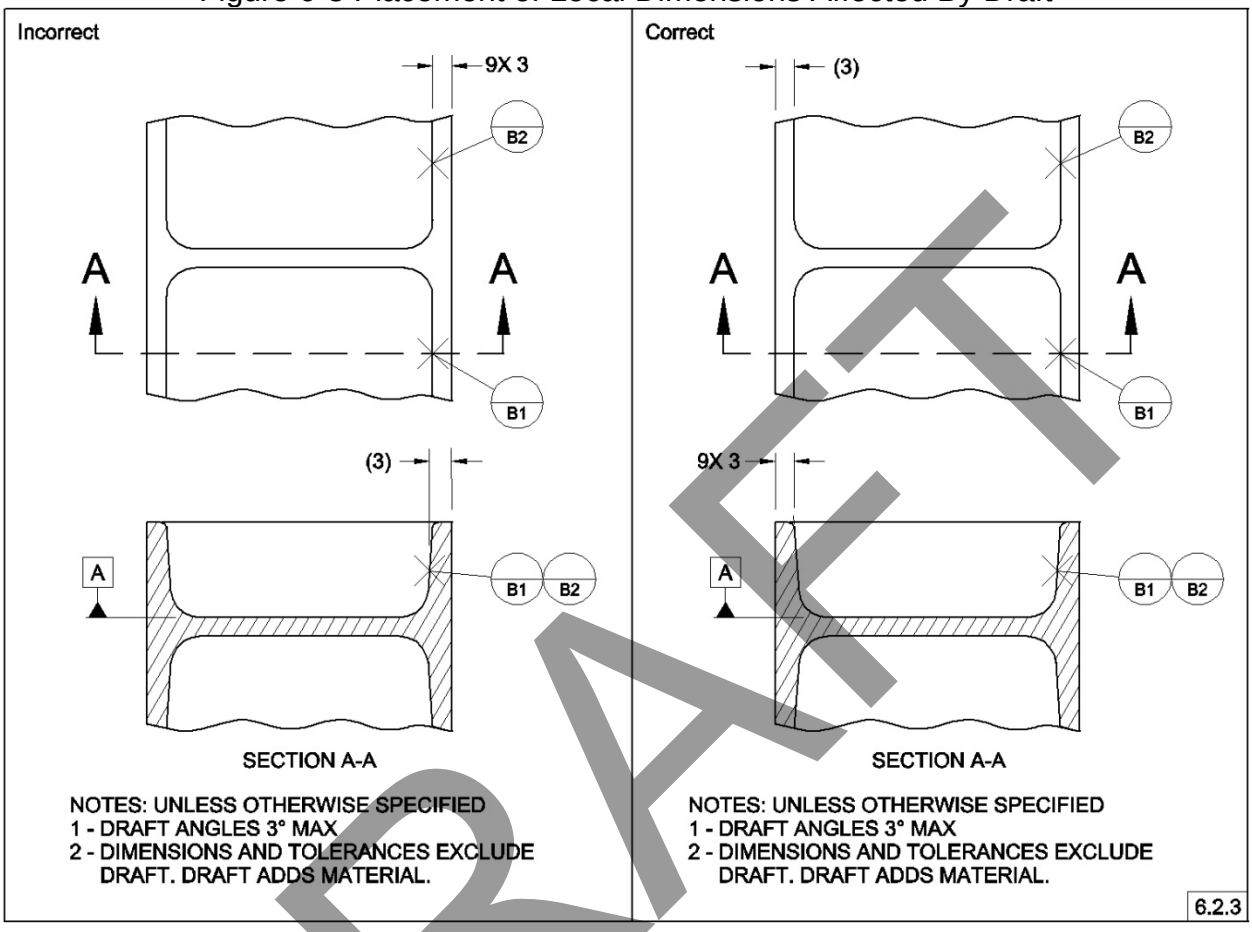


Figure 6-9 Machined Datum Features Located From Cast/Forged Molded Datum Features

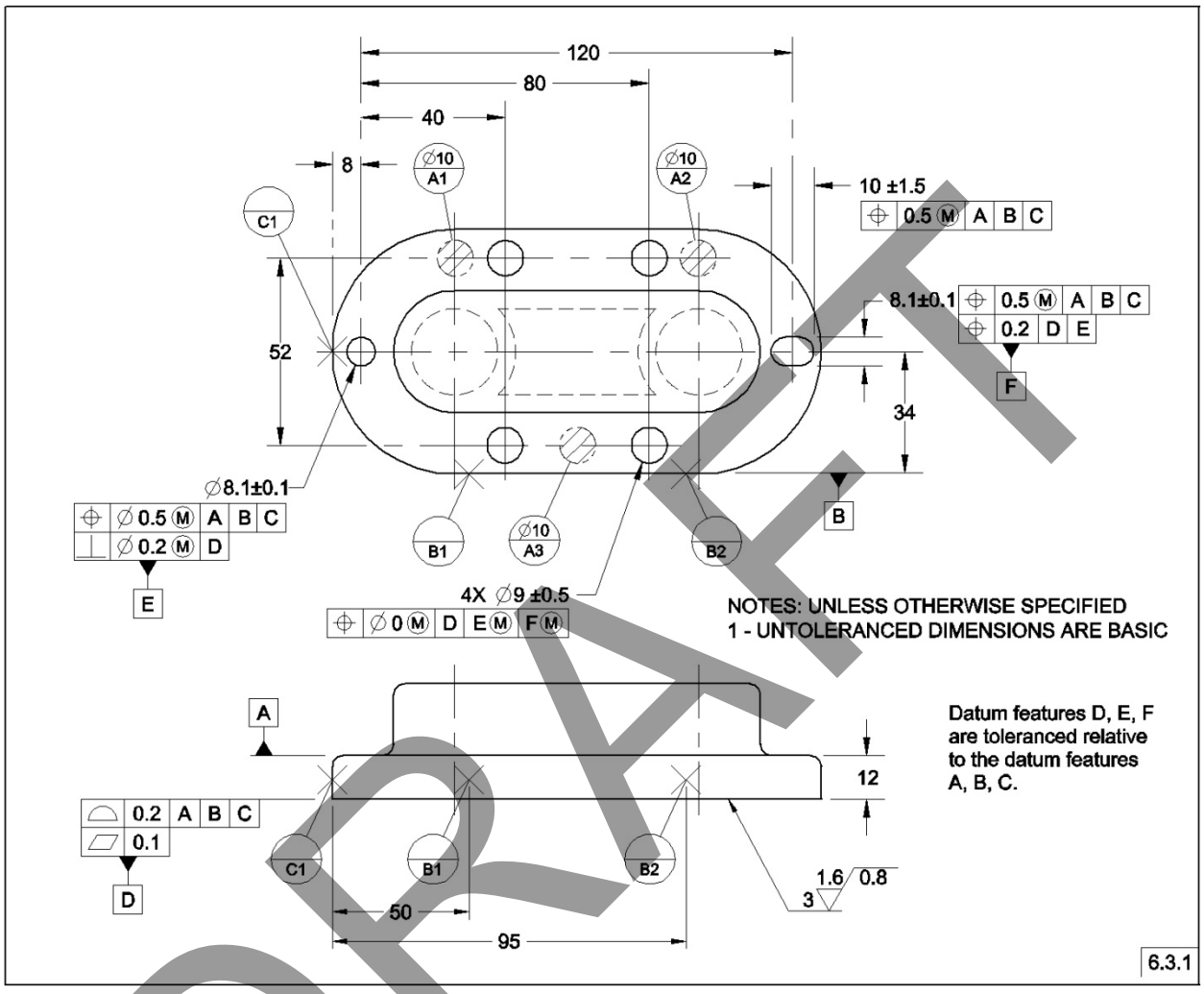


Figure 6-10 Machine Centers Establishing a Datum Axis

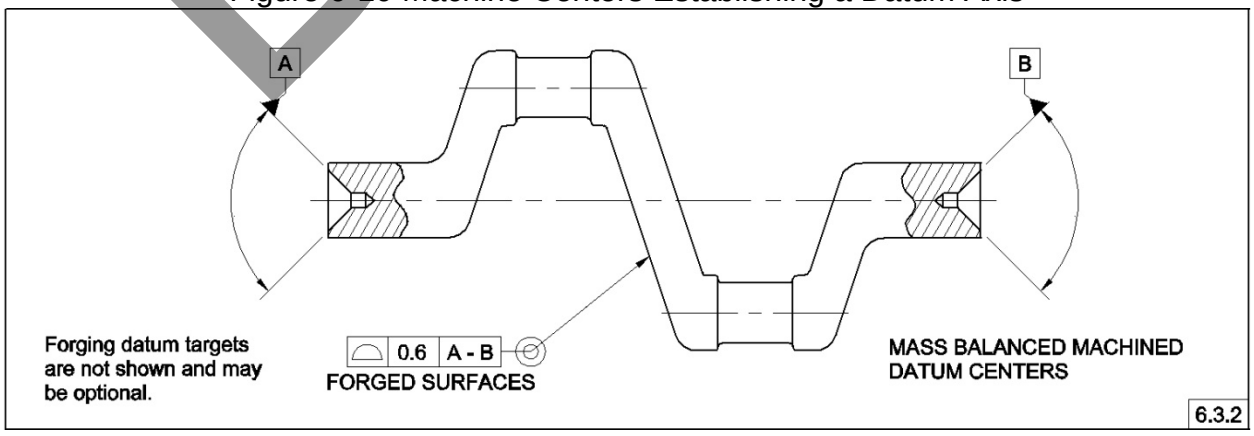


Figure 6-11 Movable Datum Target Simulators Establishing A Datum Center Plane

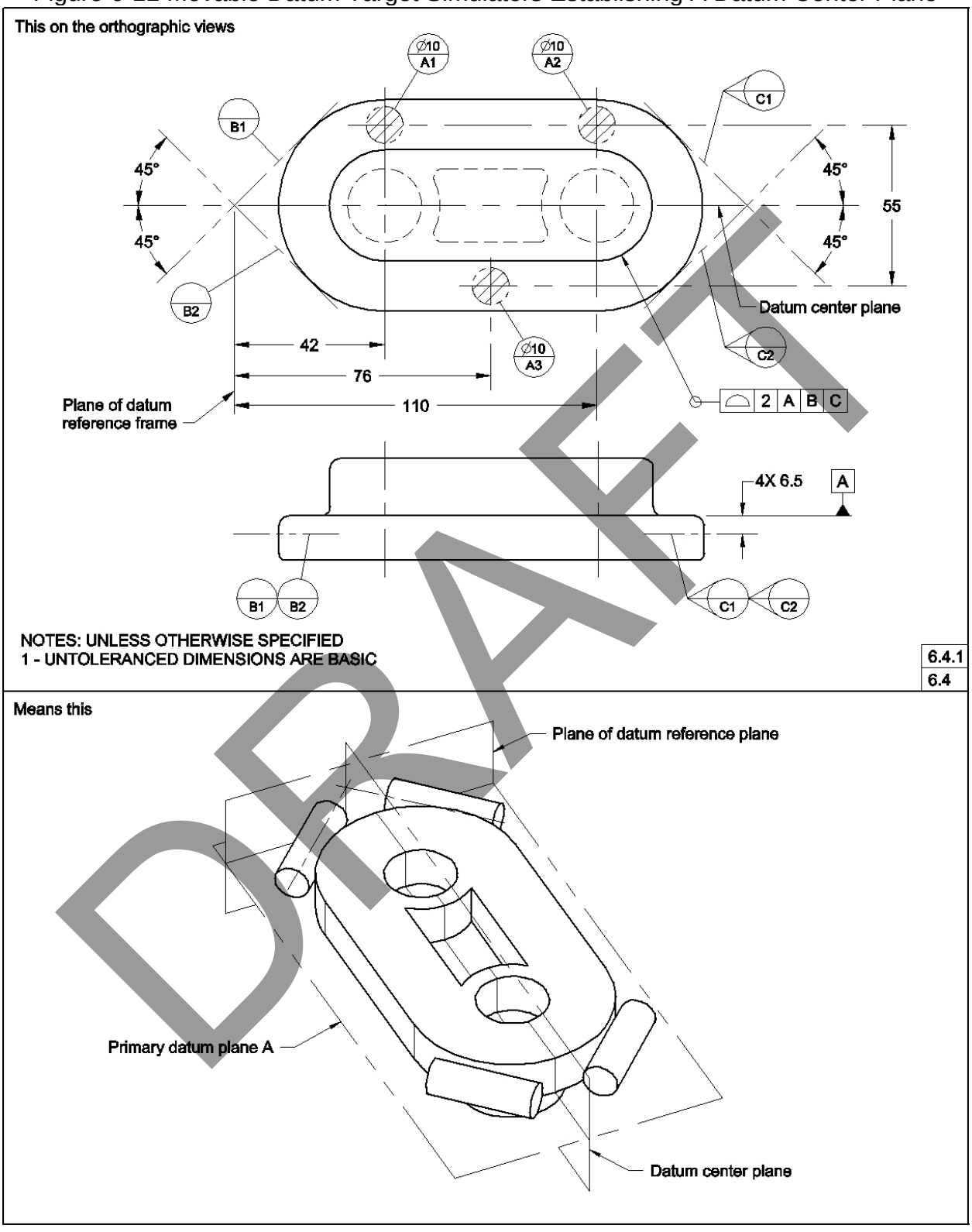


Figure 6-12 Movable Datum Target Simulators Establishing Two Datum Center Planes

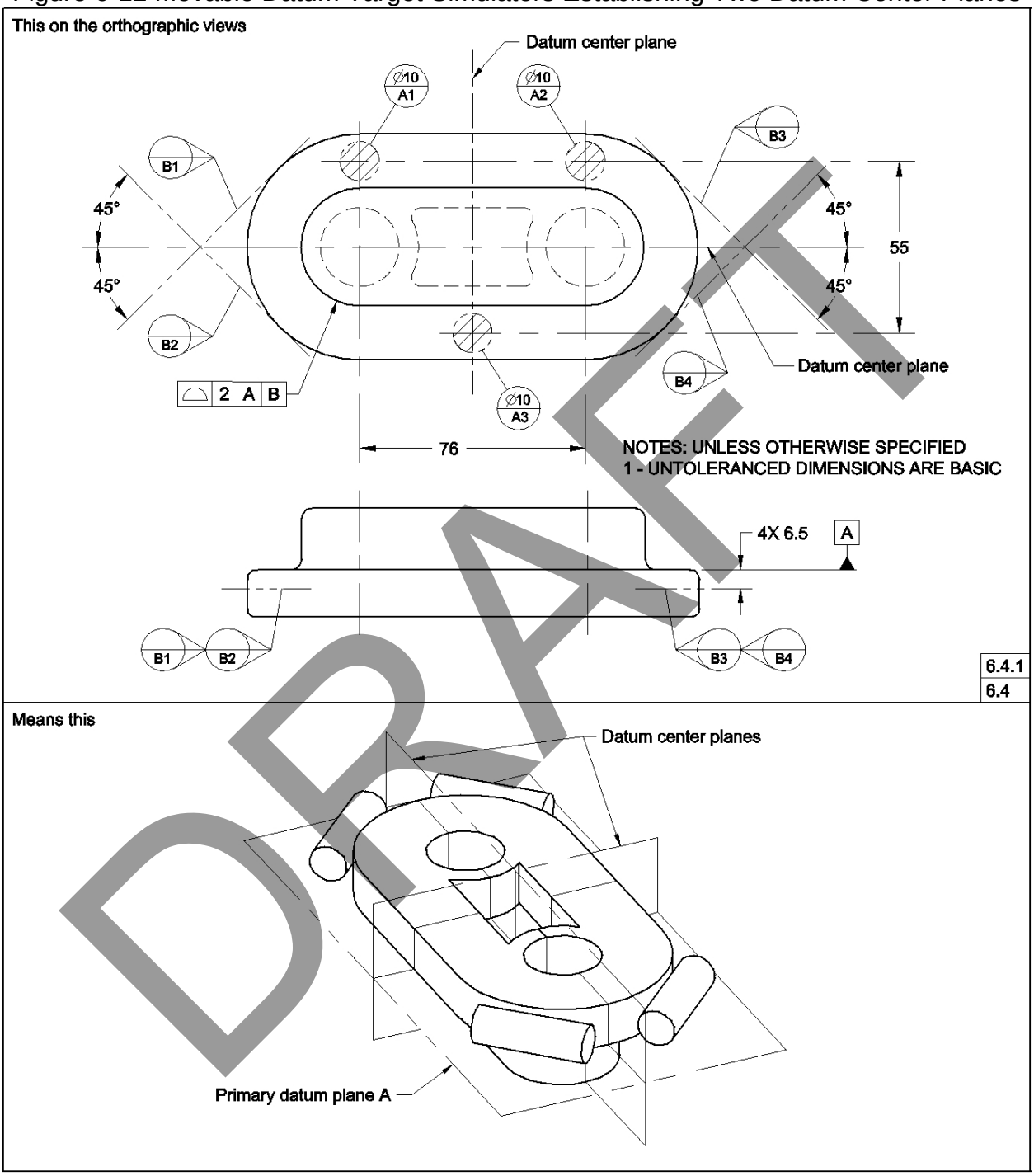


Figure 6-13 Equalized Datums Established by Fixed Datum Target Simulators

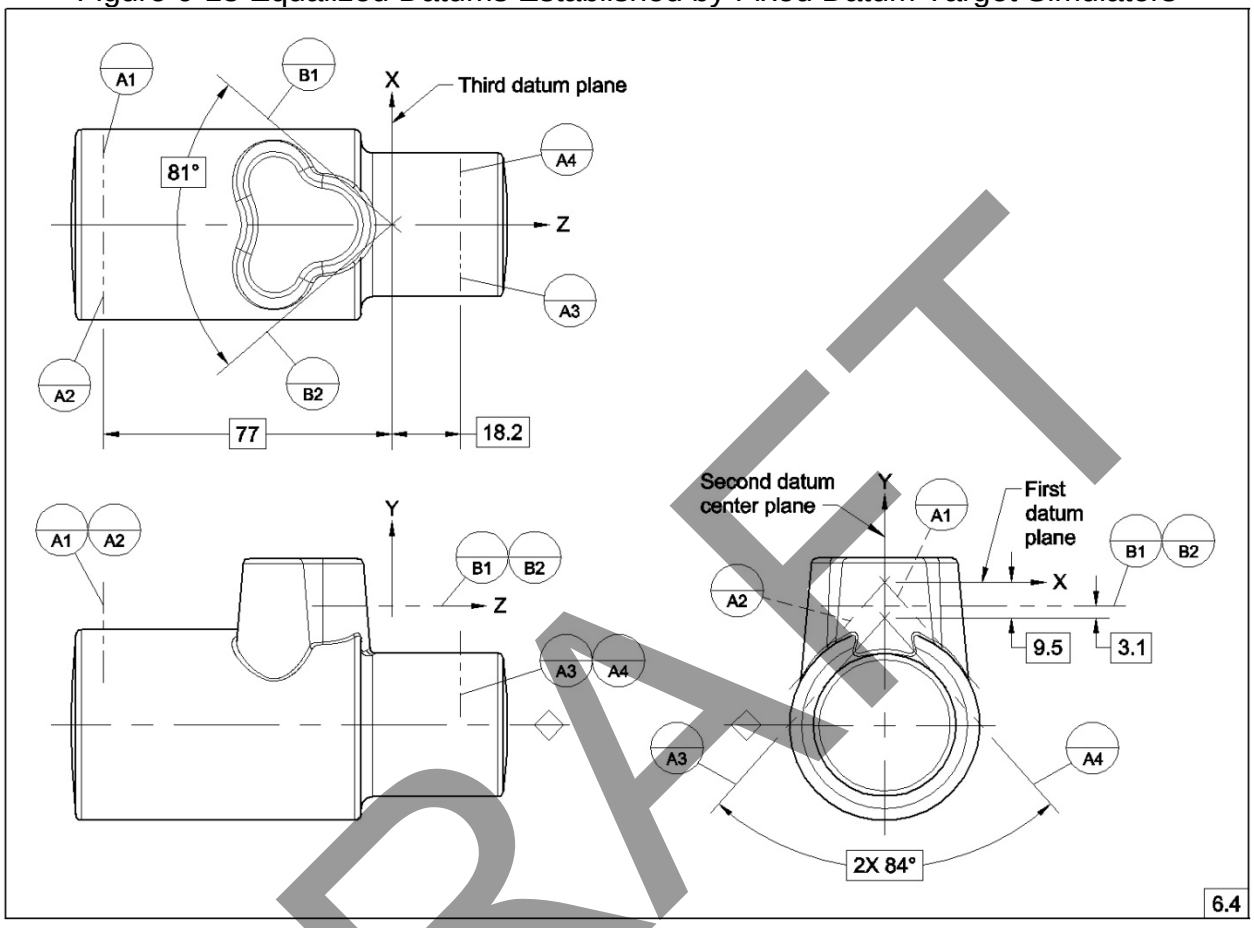
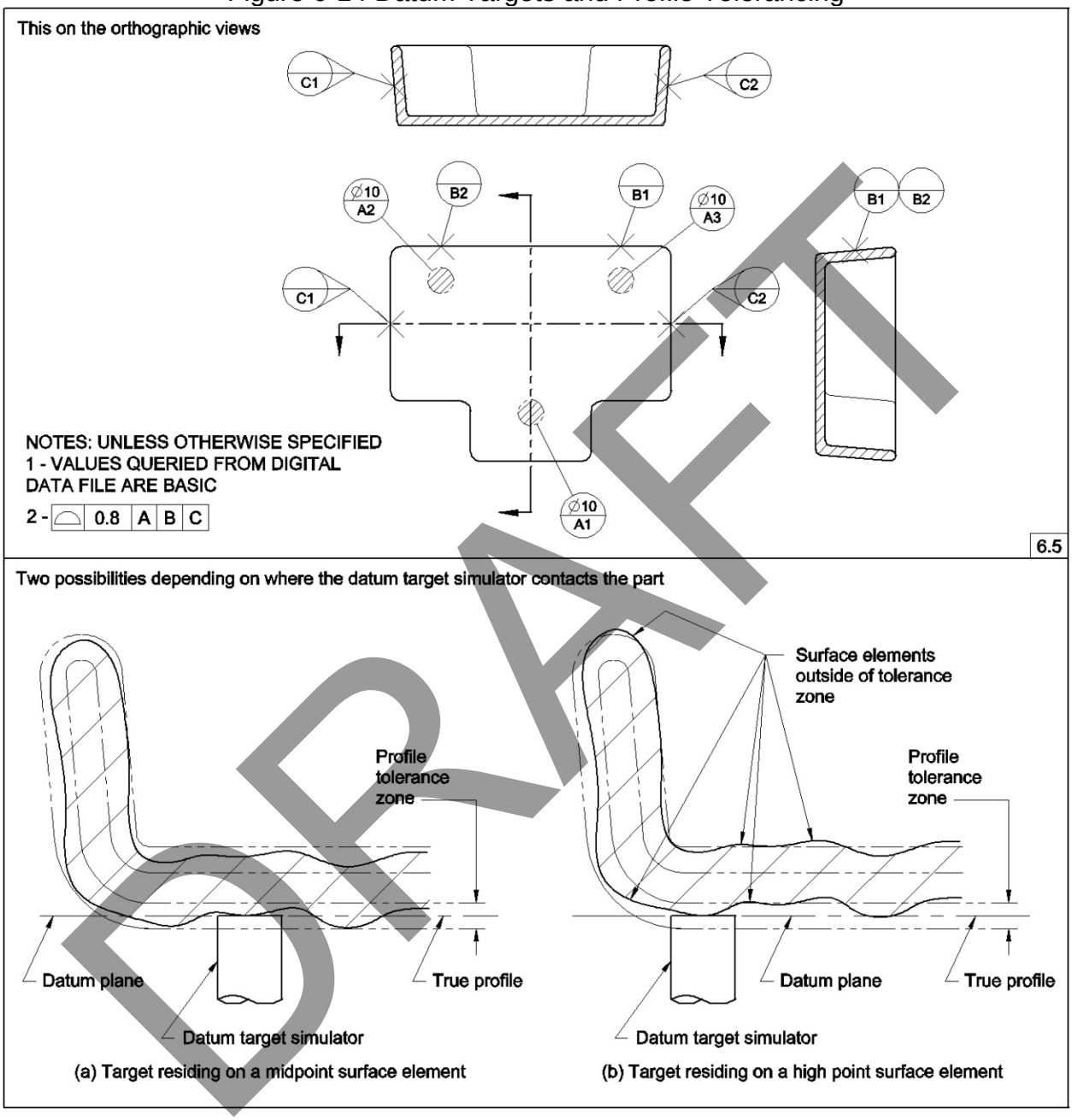


Figure 6-14 Datum Targets and Profile Tolerancing



Section 7
Drawing Notes and Items

7.1 GENERAL

This section lists notes and items to be considered for notations on all casting/forging/molded part drawings. The absence of a suggested note or item is neither reason to assume inapplicability nor basis for drawing rejection.

7.2 DRAWING ITEMS

The following notes and items should be considered as applicable:

- *(a)* drafting and related standard references
- *(b)* estimated and/or actual part weight
- *(c)* material and process specifications such as:
  - *(1)* chemical composition
  - *(2)* material temper/condition
  - *(3)* thermal processing
  - *(4)* classification/grade
  - *(5)* material recycle code
  - *(6)* restricted and reportable substances
  - *(7)* other specifications as applicable
- *(d)* mechanical and physical properties
- *(e)* destructive/nondestructive testing
  - *(1)* radiographic examination
  - *(2)* pressure testing
  - *(3)* leak testing
  - *(4)* ultrasonic testing
  - *(5)* magnetic particle inspection
  - *(6)* penetrant inspection
  - *(7)* hardness testing
  - *(8)* grain flow examination
  - *(9)* metallographic examination
  - *(10)* overheating inspection
  - *(11)* decarburization inspection
  - *(12)* alpha case inspection
  - *(13)* separately cast/forged coupon testing
  - *(14)* cast/forged coupon location
- *(f)* surface texture requirements
- *(g)* cleaning requirements
- *(h)* surface protrusion removal requirements such as
  - *(1)* fins
  - *(2)* flash
  - *(3)* gates
  - *(4)* risers
  - *(5)* ejector flash
  - *(6)* vent marks

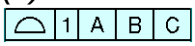
(7) temporary features for manufacturing
(i) allowances for scale
(j) general feature notes such as
(1) wall thickness
(2) corner radii
(3) fillet radii
(4) requirements of surface intersection shown as sharp corners
(5) draft allowances
(6) tolerances
(7) die closure allowance
(k) identification marking requirements
(1) type of marking (raised, depressed, rubber stamp, etc)
(2) location of marking
(3) casting/forging Part or Identifying Number (PIN)
(4) material identification
(5) heat/lot/melt number, date code
(6) serial number
(7) foundry or forging manufacturer identification
(8) equipment identification (pattern, die number, etc.)
(l) in-process weld requirements
(m) surface treatment requirements
(n) grain direction requirements
(o) packaging requirements
(p) permissible machining areas
(q) permissible chemical milling areas
(r) impregnation requirements
(s) preproduction approval requirements
(t) special dimensional inspection requirements
(1) part restraint
(2) temperature
(3) humidity
(4) reference to quality/measurement plan

7.3 SAMPLE GENERAL NOTES

Unless Otherwise Specified

(a) DRAWING PREPARED IN ACCORDANCE WITH ASME Y14.8-20xx
(b) GATE, RISER, VENT, PARTING LINE, EJECTOR PIN LOCATIONS AND OTHER FEATURES FOR TOOLING CONSIDERATIONS SHALL BE APPROVED BY PROCURING ACTIVITY BEFORE TOOL CONSTRUCTION
(c) EJECTOR PIN MARKS/GATES/FLASH TO BE INCLUDED WITHIN APPLICABLE GEOMETRIC AND LINEAR TOLERANCES
(d) EJECTOR PIN MARKS/GATES/FLASH MAY BE ADDITIVE TO APPLICABLE GEOMETRIC AND LINEAR TOLERANCES TO XX MAX
(e) EJECTOR PIN MARKS ACCEPTABLE TO XX RAISED XX DEPRESSED
(f) DIMENSIONS AND TOLERANCES EXCLUDE DRAFT. DRAFT ADDS MATERIAL
(g) DIMENSIONS AND TOLERANCES INCLUDE DRAFT
(h) DRAFT XX DEGREES MAX

(i) DRAFT INCLUDED IN CAD MODEL
(j) VALUES INDICATED ARE FOR INSIDE WALLS. DRAFT FOR OUTSIDE WALLS IS ONE-HALF VALUE SHOWN. VALUES ARE MAXIMUM DRAFT X°, MATCH WHERE REQUIRED
(k) TOLERANCES PER (insert industry standard #)
(l) FILLET RADII XX ± XX
(m) CORNER RADII XX ± XX
(n) CORNERS SHOWN SHARP BREAK TO XX MAXIMUM
(o) WALL THICKNESS XX ± XX
(p) WALL THICKNESS IS A REFINEMENT OF THE APPLICABLE GEOMETRIC TOLERANCES
(q) PARTING LINE FLASH, GATES, RUNNER, AND RISER STUBS XX MAXIMUM
(r) PARTING LINE FLASH, GATES, RUNNER, AND RISER STUBS ARE INCLUDED IN THE TOLERANCES
(s) EJECTOR PIN FLASH XX MAXIMUM
(t) SOLID PIN MARK FLASH ACCEPTABLE TO XX MAX
(u) PRESSURE TEST PER XXXX TO XX kPa MAXIMUM
(v) PENETRANT INSPECT PER XXXX
(w) RADIOGRAPHIC INSPECT PER XXXX
(x) SURFACE TEXTURE PER XXXX
(y) FILLETS SHOWN SHARP RXX MAX
(z) FILLETS SHOWN SHARP RXX ± XX
(aa) UNTOLERANCED DIMENSIONS ARE BASIC
(bb) GRAIN DIRECTION SHALL CONFORM TO THE GENERAL SHAPE OF THE PART
(cc) DIE CLOSURE TOLERANCE ± 0.X
(dd) MISMATCH TOLERANCE 0.X MAX
(ee) ALLOY AND TEMPER XXXX PER XXXX
(ff) MATERIAL SPECIFICATION PER XXXX
(gg) MARKING PER XXXX
(hh) ULTRASONIC INSPECT PER XXXX
(ii) MAGNETIC PARTICLE INSPECT PER XXXX
(jj) ALL TOLERANCES APPLY WITH DATUM FEATURE A RESTRAINED
(kk) ALL TOLERANCES APPLY WITH DATUM TARGETS A1-A6 RESTRAINED
(ll) ALL TOLERANCES APPLY WITH DATUM FEATURES D AND E RESTRAINED
(mm) HOLES AND THROUGH OPENINGS INCLUDING FLASH SHALL BE WITHIN SPECIFIED LIMITS OF SIZE
(nn) FLASH IN HOLES XX MAX
(oo) SINK TO BE INCLUDED WITHIN APPLICABLE GEOMETRIC AND LINEAR TOLERANCES
(pp) SINK MAY BE ADDITIVE TO APPLICABLE GEOMETRIC AND LINEAR TOLERANCES TO XX MAX
(qq) PARTS ARE TO BE CLEAN PER SPECIFICATIONS XXXX
(rr) USE OF A MOLD RELEASE PERMISSIBLE PER SPECIFICATION XXXX
(ss) PACKAGE PER SPECIFICATION XXXX
(tt) VALUES QUERIED FROM PRODUCT DEFINITION DATA ARE BASIC



7.4 SAMPLE LOCAL NOTES

(a) DRAFT REDUCES MATERIAL
(b) DRAFT WITHIN DIMENSIONAL TOLERANCE
(c) X° MAXIMUM DRAFT PER SIDE
(d) NO EJECTOR PIN MARKS THIS SURFACE
(e) IDENTIFICATION AND REQUIRED MARKING PERMISSIBLE THIS SURFACE
(f) HARDNESS TEST HERE
(g) FORGING PLANE
(h) PREDOMINANT GRAIN DIRECTION
(i) TEST SPECIMEN LOCATION
(j) MACHINED SURFACE PERMISSIBLE
(k) MACHINING NOT PERMITTED IN THIS AREA
(l) PERFECT FORM AT MMC NOT REQD
(m) TUNNEL OR SUB GATE ACCEPTABLE IN THIS AREA
(n) SUPPLIER IDENTIFICATION IN THIS AREA
(o) CAVITY IDENTIFICATION IN THIS AREA
(p) PART NUMBER IN THIS AREA

NONMANDATORY APPENDIX A
GLOSSARY

A.1 GENERAL

This Appendix explains the meaning of some commonly used casting/forging/molded part terms.

A.2 CASTING TERMS

blind riser: a riser which does not extend through the top of the mold.

book mold: a split mold hinged like a book.

boss: a protrusion from a surface of a part, often cylindrical and generally used for attachment or location to other parts.

casting (noun): see definition in para. 3.1.1.

casting (verb): a process by which material is introduced into a mold while liquid, is allowed to solidify inside the mold, and is subsequently removed, resulting in a part.

centrifugal casting: a casting made by pouring metal into a mold that is rotating or revolved.

cheek: the intermediate section of a flask that is used between the cope and drag when molding a shape requiring more than one parting plane.

chill: a metal insert imbedded in the surface of a mold to increase the cooling rate at that point.

cold chamber machine: a die casting machine where the metal chamber and plunger are not immersed in molten metal.

cold shut: an imperfect junction between two flows of metal in a mold.

continuous casting: a casting technique in which an ingot, tube, or other shape is continuously solidified while it is being poured, so that its length is not determined by mold dimensions.

cope: the upper or topmost section of a flask, mold, or pattern.

core: the male half of the mold or die typically forming the inner side of the part; also, a formed insert used to shape the interior or other feature of a casting which cannot be formed by the mold or the die.

corner radius (edge radius): see definition in para. 3.1.2.

die: see definition in para. 3.1.3.

die casting: a casting process where molten metal is forced under pressure into the cavity of a metal mold.

die closure: see definition in para. 3.1.4.

draft: see definition in para. 3.1.5.

drag: the bottom section of a flask, mold, or pattern.

dressout: a localized depression on the surface of a forging that results when abrasive tools are used to remove surface discontinuities.

ejector: a device which is mounted in such a way that it assists in removing a cast part from a die.

ejector pin: device used to apply force to remove a cast or molded part from the die or mold after separation.

fillet radius: see definition in para. 3.1.7.

flash: see definition in para. 3.1.8.

flash extension: see definition in para. 3.1.9.

flask: a metal or wooden frame used for making and holding a sand mold.

gate: see definition in para. 3.1.14.

hot chamber machine: a die casting machine where the metal chamber and plunger are immersed in molten metal.

hot isostatic pressing: a method by which a workpiece is processed under simultaneous application of high gas pressure and high temperature to reduce nonsurface-connected internal casting voids (also used for the densification of powder metal parts).

investment (lost wax) casting: a casting produced by pouring metal into a refractory material mold. Refractory material molds are produced using a heat disposable pattern (usually wax).

match draft: see definition in para. 3.1.17.

match plate: a metal or wooden plate on which pattern for castings are mounted to facilitate the molding operation.

mismatch: see definition in para. 3.1.18.

mold: see definition in para. 3.1.19.

mold line: see definition in para. 3.1.20.

mold line center point: See definition in para. 3.1.21

mold line center line: See definition in para. 3.1.22

parting line: see definition in para. 3.1.23.

parting plane: see definition in para. 3.1.24.

parting surface: see definition in para. 3.1.25

pattern: see definition in para. 3.1.26.

permanent mold: a metal mold that is used repeatedly for the production of castings.

plaster molding: a molding system using a mold made of gypsum-bonded aggregate in the form of a water slurry poured over a pattern, hardened, and dried.

pressure casting: making castings with pressure on the molten metal.

riser: see definition in para. 3.27.

riser stub: see definition in para. 3.1.28.

runner: a passage through which the molten material flows between the sprue and the gate.

sand casting: a casting produced by pouring metal into a sand mold.

sink: see definition in para. 3.1.31.

straightening: a mechanical process to restore castings to drawing requirements.

sprue: an opening through which molten material is transferred into a mold or die; also, the name given to the waste material that remains in the opening.

trimming: the process of removing flash from a casting.

vent marks: see definition in para. 3.1.32.

wall: see definition in para. 3.1.33.

wall thickness: see definition in para. 3.1.34.

weld correction: adding material by welding to restore castings that have surface discontinuities.

A.3 FORGING TERMS

blocker die: die impression which imparts on the forging an intermediate shape, preparatory to forging of the final shape.

boss: a protrusion from a surface of a part, often cylindrical and generally used for attachment or location of other parts..

buster die: die impression used for preliminary forging operations to position material for next operation.

coining: a process of applying pressure to a portion or all of a forging surface to obtain closer tolerances or smoother surfaces.

conventional forging: a forging characterized by design complexity and tolerances which falls within the broad range of general practice.

corner radius (edge radius): see definition in para. 3.1.2.

die: see definition in para. 3.1.3.

die closure: see definition in para. 3.1.4.

draft: see definition in para. 3.1.5.

dressout: a localized depression on the surface of a forging that results when abrasive tools are used to remove surface discontinuities.

fillet radius: see definition in para. 3.1.7.

finisher die: the final forging impression (conventional or precision) which imparts final shape to the forgings.

flash: see definition in para. 3.1.8.

flash extension: see definition in para. 3.1.9.

forging (noun): see definition in para. 3.1.10.

forging (verb): the process of creating a part by plastically deforming metal (normally preheated) with impact or pressure into a specific shape.

forging plane: see definition in para. 3.1.11.

grain direction: see definition in para. 3.1.15.

grain flow (flow lines): see definition in para. 3.1.16.

impression die forging: a forging that is formed to the required size and shape in machined three dimensional impression dies.

knock-out pins: a power operated plunger installed in a die to aid in the removal of the forging.

lap: a surface defect appearing as a seam, caused by the folding over of hot metal and the consequential forging of these into the surface.

match draft: see definition in para. 3.1.17.

mismatch: see definition in para. 3.1.18.

mold line: see definition in para. 3.1.20.

mold line center point: see definition in para. 3.1.21.

mold line center line: see definition in para. 3.1.22.

near net forging: a forging with small draft angles and requiring limited secondary operations such as machining.

open die forging: material that is worked between flat or simple contour dies.

parting line: see definition in para. 3.1.23.

parting plane: see definition in para. 3.1.24.

precision forging: a forging with complexity and tolerances similar to a machined part.

rib: a thin wall or bracing structure on a forged part connecting other structural features and projecting generally in the direction perpendicular to the forging plane.

scale: see definition in para. 3.1.30.

trimming: the process of removing flash from a forging.

upset forging (hot): process for enlarging or reshaping some of the cross-sectional area of a bar, or other product form of uniform section.

vent marks: see definition in para. 3.1.32.

wall: see definition in para. 3.1.33.

wall thickness: see definition I para. 3.1.34.

web: a thin panel or bracing structure on a forged part connecting bosses, ribs, and other structural features. It is generally orientated parallel to the forging plane.

A.4 MOLDED PART TERMS

boss: a protrusion from a surface of a part, often cylindrical and generally used for attachment or location to other parts.

cavity: the female half of the mold, typically forming the outer side of the molded part.

core: the male half of the mold, typically forming the inner side of the molded part.

corner radius (edge radius): see definition in para. 3.1.2.

die: see definition in para. 3.1.3.

die closure: see definition in para. 3.1.4.

die draw: the term used for the orientation of the part within the mold, allowing the part to be removed from the mold without locking.

die lock: the term used to describe a condition of a molded part, which would cause the part to lock onto one of the halves of the mold.

draft: see definition in para. 3.1.5.

ejector pin: mold or die component used to apply force to remove a part.

fillet radius: see definition in para. 3.1.7.

flash: see definition in para. 3.1.8.

flash extension: see definition in para. 3.1.9.

gate: see definition in para. 3.1.14.

gloss: the term used to describe the desired level of reflected light (shininess) of the surfaces of a molded part.

grain: term used to describe the desired surface texture of the part.

knit line: a line formed on the molded part where the meeting of two flow fronts occurs (sometimes called weld line).

lifter: a mechanism attached to, and activated with, the ejector system used to create features in a direction other than the direction of die draw.

match draft: see definition in para. 3.1.17.

mismatch: see definition in para. 3.1.18.

mold: see definition in para. 3.1.19.

mold line: see definition in para. 3.1.20.

mold line center point: see definition in para. 3.1.21.

mold line center line: see definition in para. 3.1.22.

mold/melt flow: the path the molten material takes to fill the mold.

mold/melt flow analysis: a computer-generated analysis utilized to predict the melt flow to identify knit lines, potential warp problems, and high stress areas to optimize filling and temperature control of the mold.

molded part: a part typically made by injecting heated polymer material into a mold.

parting line: see definition in para. 3.1.23.

parting plane: see definition in para. 3.1.24.

runner: a channel through which the molten material flows between the sprue and the gate.

short shot: a condition where material does not fill the mold completely which causes an incomplete molded part.

shrink: the difference between the size of mold and the size of the part as produced. The shrink rate is based on material properties, cooling, gating, environmental conditions, etc.

sink: see definition in para. 3.1.31.

slide/side core: a mechanism in the mold which is mechanically or hydraulically timed and activated relative to mold opening which moves in a direction different from the die draw direction. It is used to create complex features such as a hole through the part 90 degrees to die draw.

sprue: the channel that connects the pouring basin or mold-filling orifice with the runners. Sprue is also the name given to the waste piece of plastic that forms within the channel.

trimming: the process of removing flash from a molded part.

vent marks: see definition in para. 3.1.32.

wall: see definition in para. 3.1.33.

wall thickness: see definition in para. 3.1.34.

weld line: see “knit line”.

NONMANDATORY APPENDIX B
SAMPLE DRAWINGS

Figures B-1 and B-2 in this Appendix are intended only as illustrations of the principles of dimensioning casting/forging/molded part drawings.
The absence of a figure illustrating the desired application is neither reason to assume inapplicability nor basis for drawing rejection. In some instances, the figure shows added detail for emphasis; in other instances, the figure is incomplete by intent.

In figure B-1, the isometric views are included to aid with visualization of the part.

Figure B-1 Sample Molded Part Drawing

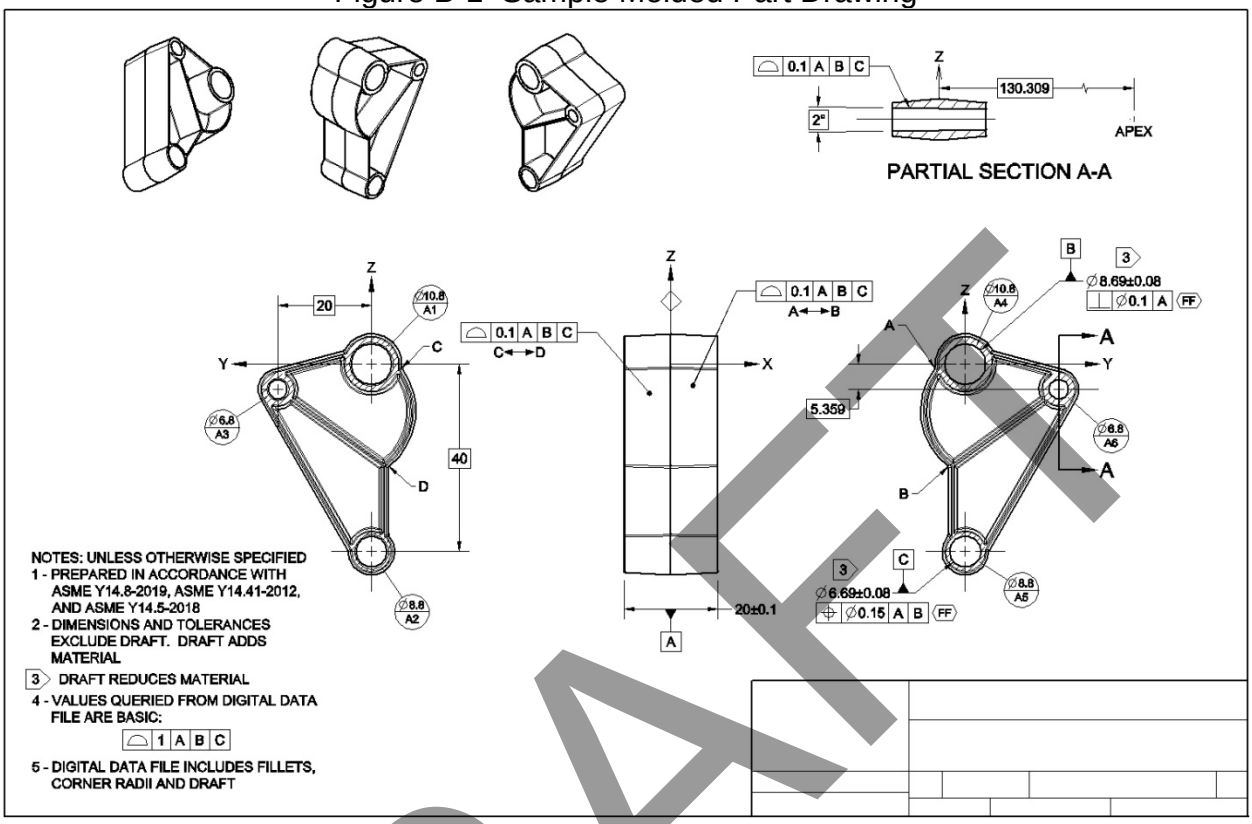
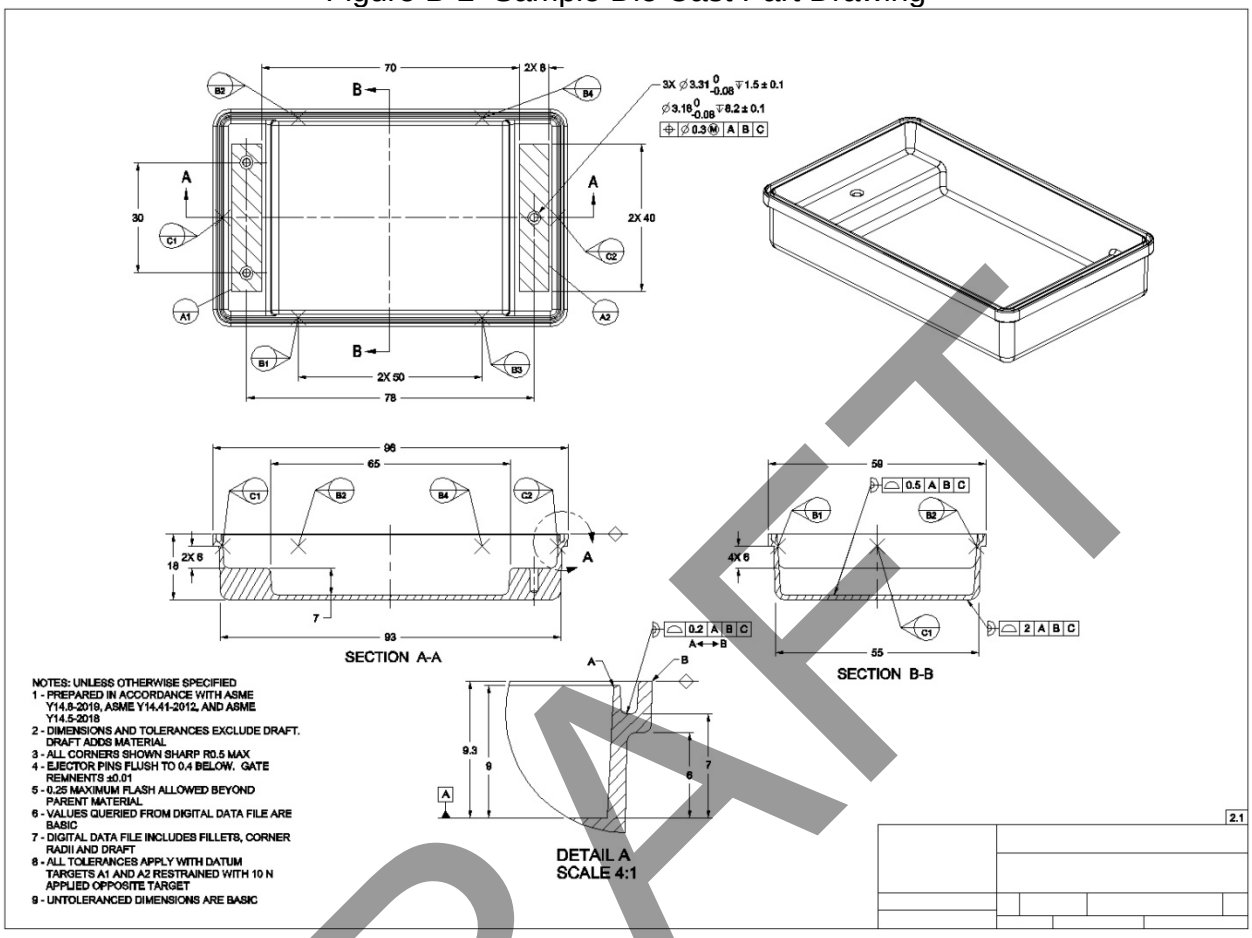


Figure B-2 Sample Die Cast Part Drawing



NONMANDATORY APPENDIX C
FORM AND PROPORTION OF SYMBOLS

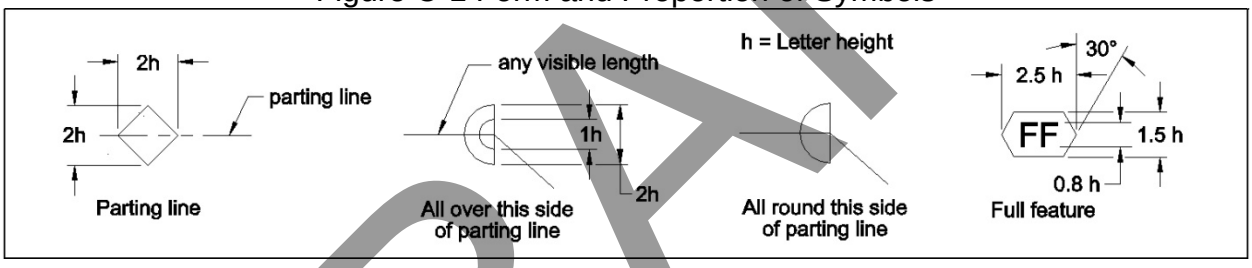
C.I GENERAL

The purpose of this Appendix is to present the recommended form and proportion for symbols used on drawing of castings/forgings/molded parts.

C.2 FORM AND PROPORTION

Figure C-1 illustrates the preferred form and proportion of symbols established by this Standard for use on engineering drawings. In the figure, symbol proportions are given as a factor of h, where h is the letter height selected for use within the enclosing symbols. See ASME Y14.2 for line weights, letter heights, and arrowhead proportions.

Figure C-1 Form and Proportion of Symbols



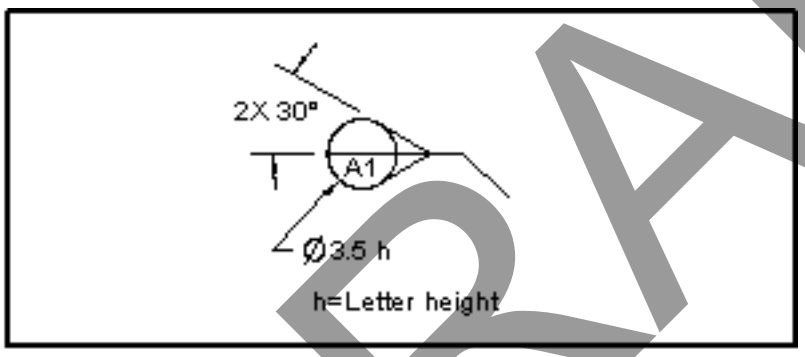
NONMANDATORY APPENDIX D
FORMER PRACTICES

D.l GENERAL

The purpose of this Appendix is to identify and illustrate symbols, terms, and methods of dimensioning that were featured in ASME Y14.8-2009. For information on changes and improvements, see the Forward. The information in this Appendix is provided to assist in the interpretation of existing drawings on which former practices may appear.

D.2 MOVEABLE TARGET SYMBOL DEFINITION REMOVED

Definition of the moveable target symbol was adopted into ASME Y14.5-2009.



D.3 END ITEM DRAWING METHOD REMOVED

An end item drawing defines either an individual part or assembly in its final or completed state. Surfaces may be defined as cast/forged/molded or machined to meet drawing requirements. Notes relative to machining shall be listed separately. See Figure D.3.

NOTE: The end item drawing method may result in unexpected/uncontrolled mechanical properties such as residual stress, tensile strength.

Figure D.3 End Item Method (Not recommended practice.)