



MECHANICAL DRAFTING 15.1300.40

TECHNICAL STANDARDS

An Industry Technical Standards Validation Committee developed and validated these standards on November 5 and 17, 2020. The Arizona Career and Technical Education Quality Commission, the validating authority for the Arizona Skills Standards Assessment System, endorsed these standards on January 27, 2021.

Note: Arizona's Professional Skills are taught as an integral part of the Mechanical Drafting program.

The Technical Skills Assessment for Mechanical Drafting is available SY2022-2023

Note: In this document i.e. explains or clarifies the content and e.g. provides examples of the content that must be taught.

STANDARD 1.0 APPLY MEASUREMENT AND SCALE CONCEPTS IN DESIGN DRAFTING

- 1.1 Identify types of unit systems used in design drafting (i.e., SI units, Imperial, ANSI, IEC standards, etc.)
- 1.2 Demonstrate the use of different measurement systems (i.e., SI units, Imperial, etc.)
- 1.3 Explain the use of measurement tools (i.e., ruler, protractor, measuring tape, calipers, etc.)
- 1.4 Use types of geometric measurements (i.e., linear, angular, etc.)
- 1.5 Determine and apply appropriate scale

STANDARD 2.0 INTERPRET MECHANICAL DESIGN DOCUMENTS

- 2.1 Differentiate among mechanical, civil, and architectural drawings
- 2.2 Interpret dimensions, symbols, legends, and scales (i.e., diameter, depth, tolerance, parallelism, angularity, etc.)
- 2.3 Describe mechanical features in technical drawings (i.e., hole diameter, dimension, location, etc.)
- 2.4 Analyze technical drawings for clarity, completeness, and accuracy (i.e., ASME GD&T Standard, etc.)

STANDARD 3.0 APPLY BEST PRACTICES TO CREATE TECHNICAL DRAWINGS

- 3.1 Use basic drafting techniques for drawings (i.e., isometric, oblique, projection drawing views, etc.)
- 3.2 Develop manual sketches that accurately reflect real objects
- 3.3 Communicate concepts with manual sketches
- 3.4 Create computer draft of sketches
- 3.5 Classify line type and line weight
- 3.6 Create and identify elements of title blocks and borders
- 3.7 Apply notes and dimensions
- 3.8 Determine correct drawing scale and layout based on output requirements (e.g., hard copy and electronic delivery)
- 3.9 Organize and maintain drawings and supporting documents
- 3.10 Prepare detail and assembly drawings

STANDARD 4.0 UTILIZE HARDWARE AND SOFTWARE TOOLS

- 4.1 Describe the role of new technologies in the use of drafting drawings (i.e., simulations, AI, robotics, etc.)
- 4.2 Use computer hardware and input/output devices for design drafting problems (i.e., 3D printers, CNC Machines, etc.)
- 4.3 Apply file and disk management techniques (i.e., network, revision control, document management, nomenclature for file naming, etc.)
- 4.4 Import and export data files using different formats (i.e., DWG, DXF, PDF, STEP, etc.)

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STANDARD 5.o APPLY CADD SYSTEM AND PROCEDURES

- 5.1 Explore and determine applicability of CADD
- 5.2 Use CADD software to set up drawing (e.g., scale, format, and dimensioning)
- 5.3 Determine and apply CADD commands and techniques (e.g., layers, colors, line types, editing commands, and properties)
- 5.4 Employ available libraries and templates
- 5.5 Draw geometric constructions using snap functions (i.e., parallel lines, polygons, tangents, perpendicular, landscape, etc.)
- 5.6 Determine views for projection (e.g., plan, top, and front)
- 5.7 Identify, create, and place views for orthographic features
- 5.8 Identify, create, and place auxiliary views to determine true size, shape, and location of non-orthogonal features
- 5.9 Identify, create, and place appropriate section views
- 5.10 Construct full, half, offset, aligned, revolved, and removed section views
- 5.11 Utilize various material hatch patterns in section views
- 5.12 Draft assemblies, intersections, developments, and patterns (i.e., including radial and parallel line patterns)

STANDARD 6.o COMPARE BASIC MANUFACTURING PROCESSES

- 6.1 Identify types of parts to be detailed (i.e., cast, machined, forged, sheet metal, welded, etc.)
- 6.2 Incorporate manufacturing process symbols in mechanical drawings (e.g., welding, machining, casting, and sheet metal)
- 6.3 Identify fasteners used in manufacturing processes (i.e., screw heads, rivets, studs, etc.)
- 6.4 Read a material specification sheet (i.e., mechanical material, yield strength, etc.)
- 6.5 Generate a bill of materials
- 6.6 Identify differences in material types and conditions (i.e., stainless steels, carbon steels, aluminum, plastics, etc.)
- 6.7 Explain dimensional tolerances of various manufacturing materials and processes (i.e., sheet metal, fabrication welding, etc.)
- 6.8 Identify part finishes (i.e., painted, powder coated, galvanized, anodized, etc.)
- 6.9 Analyze dimensional tolerance stack-up in assemblies per material/design feature
- 6.10 Determine the tolerance usage per material/design feature

STANDARD 7.o APPLY DIMENSIONING BEST PRACTICES

- 7.1 Use dimensioning rules in compliance with ASME Y14 standards
- 7.2 Draw/select appropriate dimensioning practices (i.e., conventional, tabular, datum, ordinate, aligned, coordinate systems, fit, unilateral/bilateral tolerance, etc.)
- 7.3 Identify potential machining datums (i.e., holes, planes, circular, etc.)
- 7.4 Check drawings for accuracy, completeness, and clarity

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