

12. Regulations and legislation relevant to this unit standard include the following:
- Labour Act, No. 11, 2007.
 - Occupational Health and Safety Regulations No. 18, 1997 and all subsequent amendments
 - SABS 0111-1: 1993, Code of practice for engineering drawing, part 1. - General principles.
 - ISO-origin standards

Quality Assurance Requirements

This unit standard and others within this subfield may be awarded by institutions which meet the accreditation requirements set by the Namibia Qualifications Authority and the Namibia Training Authority and which comply with the national assessment and moderation requirements. Details of specific accreditation requirements and the national assessment arrangements are available from the Namibia Qualifications Authority and the Namibia Training Authority on www.nta.com.na.

Elements and Performance Criteria

Element 1: Demonstrate knowledge of engineering drawing fundamentals.

Range

The terms used in engineering drawing may include but not are limited to drawing, centre, centre-line, cylinder and cylindrical, degree (of angle), internal diameter, outside diameter, pitch circle diameter, material, square, hexagon, millimetre, metre, radius, diameter, maximum, minimum and circumference.

Drawing instruments and equipment may include but are not limited to A2 and A3 drawing paper, A2 -drawing board and/or table, t-square, protractor 180⁰, clutch pencils 0,3mm, 0,5mm and/or 0,7mm with H and 2H leads, eraser, set squares (30⁰, 60⁰ and 45⁰), masking tape and/or drawing clamps or clips, spring-bow pencil compass and divider, French curve and/or flexi curve.

Performance Criteria

- 1.1 The purpose and function of engineering drawing as a subject is described.
- 1.2 Drawing documents that have been established to lay down standards for various lines, symbols and conventions are interpreted.
- 1.3 Artistic drawings and technical drawings are differentiated and described.
- 1.4 The abbreviation for the terms used in engineering drawings are identified and correctly applied.
- 1.5 Drawing instruments and equipment are identified and their uses, care and maintenance are stated.
- 1.6 Drawing sheets and materials are described as contained in the code of practice for engineering drawing in terms of size designation, layout of information, drawing number and choice of drawing materials.

1.7 The purpose and use of each type of drawing sheet is identified and stated.

Element 2: Apply basic drawing techniques.

Range

Types of lines: A, B, C, D, E, F, G, H, J, K and L.

Line specification may include but are not limited to requirements of quality, applications, construction, line thickness and precedence of lines.

Tolerances to dimensions may include but are not limited to those applicable to single limits of size, radii, square symbol, cones, chamfers, curved surfaces, countersinks, counter, bores and spot faces, diameters, holes, slope symbol, screw threads keyways and indication of location of special treatment.

Performance Criteria

- 2.1 The purpose of different types of scales used in industry is stated.
- 2.2 Appropriate scales for the different categories as contained in the code of practice for engineering drawing are applied.
- 2.3 Line specifications are described, correctly used and converted as contained in the code of practice.
- 2.4 Letters, figures and symbols are printed according to universal and ISO-origin standards and requirements in terms of standard height, forms of letters and figures, line thickness of characters and designation for dimensions and spacing.
- 2.5 The layout of drawings is explained as contained in the code of practice with reference to information on the drawing, spacing, notes, underlining and emphasizing.
- 2.6 Terminology and applications associated with dimensions and tolerances are explained. This includes functional and non-functional dimensions, auxiliary, redundant and equal dimensions, dimensions not to scale, projection and dimension lines, size, style of arrowheads and spacing.
- 2.7 The recommended units and format of dimensions with reference to unit of measurement and decimal dimensions and arrangement are applied.

Element 3: Construct basic free-hand drawings.

Range

Drawings by hand may include but are not limited to circles and arcs, selected hand tools, wire and cable terminations and electrical polyvinyl chloride (PVC) conduit fittings and fasteners.

Performance Criteria

- 3.1 The difference between a freehand sketch and a free-hand drawing is explained.
- 3.2 Instruments used in freehand drawing are identified and applied correctly.
- 3.3 Correct methods and techniques are applied when using a pencil and drawing lines.
- 3.4 Important aspects and techniques used to improve the standard and/or quality of free-hand drawings are explained and correctly applied.
- 3.5 Various shapes are hand-drawn to required standards.

Element 4: Construct geometrical drawings.

Range

Geometric constructions may include but are not limited to performing functions to bisect a straight line segment, bisect an angle, draw a perpendicular line from a given point on a line, draw a perpendicular line from a given point outside a given line, draw a perpendicular line at the end of a given line segment, draw a line parallel to another line at a given distance, draw a circle through three given points, draw parallel lines using set squares, draw an arc to lines that form a right angle, obtuse angle and an acute angle, draw an arc joining a straight line to an arc or curve, draw an arc joining two other arcs or circular curves, draw an ellipse by means of the four centre method, transfer a given angle, divide a given line segment into an amount of equal segments, and draw a hexagon, an octagon, an equilateral triangle and/or a square.

Performance Criteria

- 4.1 Terminologies used in geometrical constructions are defined and interpreted.
- 4.2 Instruments, methods and techniques used in geometrical constructions are identified and correctly applied.
- 4.3 Different geometrical drawings are constructed with the aid of drawing instruments following correct steps.

Element 5: Construct reproduction drawings.

Range

Geometrical plane figures may include but are not limited to triangles, quadrilaterals (squares, rectangles, rhombus, parallelograms and trapeziums), regular hexagons and regular octagons.

Performance Criteria

- 5.1 Terminologies and concepts used in reproduction drawing are defined and interpreted.
- 5.2 Instruments, methods and techniques used in reproduction drawing are identified and correctly applied.
- 5.3 Different types of scales (full size, reduction and enlarging) are differentiated.
- 5.4 The purpose of a scale ruler is explained and divisions (calibrations) are interpreted.
- 5.5 Geometrical plane figures are constructed from given information with the aid of drawing instruments.
- 5.6 A view of a single object (machine part) or casting is drawn to required scale.

Element 6: Produce basic drawings in first-angle orthographic projection.

Range

Hidden detail may be required.

Centre lines should be inserted.

Dimensions may be required.

Title, scale and the orthographic projection system symbol must be inserted.

Performance Criteria

- 6.1 Basic concepts, principles, terminologies and methods (including drawing steps) of projection in first-angle orthographic projection are explained.
- 6.2 Symbols and abbreviations are used in line with standard drawing conventions.
- 6.3 Primary views of elementary single objects are drawn from a given isometric drawing, according to scale and in first angle orthographic projection.
- 6.4 A third view of an elementary single object is drawn by means of projection with two views of the object given.

Element 7: Produce axonometric drawings.

Range

Oblique views may include but are not limited to cubes and castings, simple and complex objects containing circles and arcs.

The following must be considered for oblique views:

- The cabinet method is to be used where all oblique lines are halved to compensate for the lack of perspective.
- The object is to be given in such a manner that the view containing circles or arcs is to be in the front view.
- Students are not required to draw an oblique circle or an oblique arc.
- Interpenetrations and fillet radii are not to be included in oblique drawing.
- No dimensions are required.
- Hidden detail may be required.

Isometric drawings may include but are not limited to cube, rectangular prism, elementary castings, views with non-isometric lines and complex shapes.

The following must be considered for isometric views:

- Isometric circles and arcs are not required.
- Non-isometric lines may be drawn at any angle.
- Interpenetrations and fillet radii are not to be included in isometric drawing.
- No dimensions are required.
- Centre lines may be required.
- Hidden detail may be required.
- The isometric scale is not required.
- Complex shapes.

Performance Criteria

- 7.1 Terms of axonometric drawings, oblique drawings and isometric drawings are defined and explained.
- 7.2 An oblique drawing of a single object of which at least two views are given in first angle orthographic projection is drawn.
- 7.3 An isometric drawing of a single object of which at least two views are given in first angle orthographic projection is drawn.

Element 8: Project prisms and pyramids.

Range

Prisms and pyramids under this element may include but are not limited to regular, right prisms and pyramids with triangular, square, hexagonal, octagonal and circular bases at an inclined angle.

The following must be considered:

- Regular, right prisms and pyramids with triangular, square, hexagonal, octagonal and circular bases may be required.
- The given prism or pyramid must be placed in the first quadrant with its axes at an angle of 30 degrees, 45 degrees, 60 degrees or 90 degrees with the horizontal plane and parallel to the vertical plane.
- Where necessary an auxiliary view must be used with the front view.
- Only views of single prisms or pyramids may be asked.
- The symbol for first angle orthographic projection is required.

- Hidden detail may be required.
- No dimensioning is required.

Performance Criteria

- 8.1 Terminologies related to geometrical solids are defined.
- 8.2 Prism and pyramid are differentiated and interpreted using pictorial and orthographic illustrations.
- 8.3 From a given front view and/or an auxiliary view of a prism or a pyramid that is placed at an inclined angle, the left view and top view in first angle orthographic projection is projected.

Element 9: Produce basic sectional drawings.

Range

The following must be considered:

- Sectional views are limited to full sections, half sections and/or partial sections.
- Elementary machine parts used should not have interpenetration curves or fillet radii (only sharp corners).
- Machine parts with webs or ribs may be required.
- Outside views with or without hidden detail may be required.
- Hidden detail is not required to be drawn on the portion in section.
- Dimensioning may be required.

Performance Criteria

- 9.1 Sectioning as a drawing concept is described.
- 9.2 Terminologies related to sectional drawings are defined and the purpose of sectional drawings is stated.
- 9.3 Conventions, methods and good practice in sectioning are correctly applied.
- 9.4 The primary views of elementary, single machine parts are drawn according to scale in first angle orthographic projection.

Registration Data

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