Level 2 Certificate in Performing Engineering Operations

Producing CAD drawings using manual techniques

Producing CAD Drawings Using Manual Techniques

In the Level 2 Certificate in Performing Engineering Operations, one of the key skills that you will learn is producing CAD drawings using manual techniques. This involves creating detailed technical drawings of engineering components and systems using Computer-Aided Design (CAD) software, but without the use of automated features that are common in modern CAD programs.

Key Terms and Vocabulary:

1. Engineering Drawing: A type of technical drawing used to fully and clearly define requirements for engineered items. It communicates all needed information for manufacturing, inspection, and assembly.

2. Computer-Aided Design (CAD): The use of computer software to create 2D or 3D models of physical objects. CAD drawings can be used for architecture, engineering, and manufacturing.

3. Manual Drafting: The process of creating technical drawings by hand using drafting tools such as T-squares, triangles, compasses, and templates.

4. Orthographic Projection: A method of representing a three-dimensional object in two dimensions. It uses multiple views (front, top, side) to show the object from different perspectives.

5. Isometric Projection: A method of drawing a three-dimensional object on a two-dimensional surface. It shows all three dimensions of an object in a single view.

6. Scale: The ratio between the size of an object on a drawing and its actual size in real life. Common scales include 1:1, 1:2, 1:5, etc.

7. Dimensioning: The process of adding measurements and annotations to a technical drawing to define the size and location of features.

8. Sectional Views: A view that shows an object as if it has been sliced in half. It reveals internal features that are not visible in the standard views.

9. Detail Drawing: A drawing that provides detailed information about a specific part of an assembly. It includes dimensions, materials, finishes, and other specifications.

10. Bill of Materials (BOM): A list of all the materials and parts needed to manufacture a product. It includes item numbers, descriptions, quantities, and sometimes costs.

11. Tolerance: The acceptable variation in dimensions for a part. It ensures that parts will fit together properly during assembly.

12. GD&T (Geometric Dimensioning and Tolerancing): A system for defining and communicating engineering tolerances. It uses symbols to specify the allowable variations in form, size, and orientation of features.

13. Revision Control: The process of managing changes to a drawing or document. It ensures that everyone is working with the latest version and that changes are documented.

14. Assembly Drawing: A drawing that shows how different parts fit together to create a complete product. It includes exploded views, part numbers, and assembly instructions.

15. Drawing Standards: Guidelines and conventions for creating technical drawings. Standards ensure consistency and clarity in communication between designers, engineers, and manufacturers.

Practical Applications:

Producing CAD drawings using manual techniques is a crucial skill for engineers, designers, and drafters in various industries, including mechanical, electrical, civil, and aerospace engineering. Here are some practical applications of manual CAD drawing techniques:

1. Designing Machine Components: Engineers use CAD drawings to design and detail individual parts of machines, such as gears, shafts, and housings. Manual techniques help in creating precise and accurate drawings that meet industry standards.

2. Architectural Drawings: Architects use CAD software to create detailed floor plans, elevations, and sections of buildings. Manual drafting techniques are essential for adding fine details and annotations to these drawings.

3. Electrical Schematics: Electrical engineers use CAD drawings to create circuit diagrams and wiring schematics. Manual techniques are used to ensure that all connections are clearly labeled and easy to read.

4. Civil Engineering Drawings: Civil engineers use CAD software to design roads, bridges, and other infrastructure projects. Manual drafting techniques help in creating detailed cross-sections and profiles of the terrain.

5. Prototype Development: When developing a new product or component, engineers often create prototypes based on CAD drawings. Manual techniques are used to refine the design and make adjustments before manufacturing.

Challenges:

While producing CAD drawings using manual techniques can be rewarding, it also comes with its

challenges. Here are some common challenges faced by individuals learning manual CAD drawing techniques:

1. Precision and Accuracy: Manual drafting requires a high level of precision and accuracy to ensure that dimensions and annotations are correct. Small errors can lead to costly mistakes during manufacturing.

2. Time-Consuming: Creating detailed CAD drawings by hand can be time-consuming, especially for complex components or assemblies. It requires patience and attention to detail to produce high-quality drawings.

3. Skill Development: Mastering manual drafting techniques takes time and practice. It requires learning how to use drafting tools effectively and understanding technical drawing conventions.

4. Adaptability: Manual techniques may not always be suitable for every project, especially when working on large-scale or complex designs. It is essential to be adaptable and willing to learn new CAD software and techniques.

5. Communication: Technical drawings are a form of communication between designers, engineers, and manufacturers. It is crucial to ensure that drawings are clear, concise, and easy to interpret by all parties involved.

By mastering the art of producing CAD drawings using manual techniques, you will gain valuable skills that are essential for a successful career in engineering and design. Practice regularly, seek feedback from experienced professionals, and stay updated on industry standards and best practices.