

TITLE: 3D CAD – DESIGNER’S PARADISE***Mr. Amit Chawla* | Dr. Ishwer Singh ******Research Scholar, Himalayan University, Itanagar, Arunachal Pradesh, India.****Research Guide, Himalayan University, Itanagar, Arunachal Pradesh, India.*DOI: <http://doi.org/10.47211/idcij.2021.v08i01.014>**ABSTRACT**

Three-dimensional computer-aided design (3D CAD) has revolutionized the way engineers and designers create products, buildings, and infrastructure. This article provides an overview of 3D CAD technology, including its history, key features, and benefits. It describes the various types of 3D CAD software and their applications, as well as the advantages of using 3D CAD over traditional 2D drafting.

Key Words: *computer-aided design (3D CAD), engineers and designers, 3D CAD technology.*

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INTRODUCTION

Drafting and designing are two distinct processes that are often used in the creation of technical drawings and blueprints. Although these terms are sometimes used interchangeably, they are not the same thing. Here's a detailed explanation of the differences between drafting and designing.

PURPOSE

Drafting is the process of creating a detailed and accurate representation of a design or plan, typically in the form of drawings or blueprints. The purpose of drafting is to communicate and document technical information in a clear and concise manner so that it can be easily understood and implemented by others. Here are some specific purposes of drafting.

Communication: Drafting allows engineers, architects, and other professionals to communicate their designs and ideas to others. Through drawings and other technical documents, they can convey important details about dimensions, materials, and other technical specifications.

Visualization: Drafting allows designers to visualize their ideas in a concrete form. This makes it easier to refine and improve upon their designs before they are built.

Planning: Drafting helps in planning the construction process and identifying potential issues that may arise. It also allows for detailed cost estimates and scheduling of resources.

Documentation: Drafting is used to document the design and construction process. This includes creating as-built drawings, which show how a structure or system was actually built, and other records of the design process.

Legal compliance: Drafting is essential for legal compliance in many industries. For example, building codes often require detailed drawings and specifications for new construction.

Overall, the purpose of drafting is to create accurate and clear representations of designs or plans, which can be used for communication, visualization, planning, documentation, and legal compliance.

Designing on the other hand is a complex process that involves a range of activities, such as research, ideation, prototyping, testing, and refining. The purpose of designing can vary depending on the context and the intended outcome, but it generally involves problem-solving, innovation, user experience, and aesthetic appeal.

Problem-solving is one of the primary purposes of designing. The design process starts with identifying a problem or a need that a product or system can address. Designers conduct research to understand the problem, the user's needs, and the context in which the product or system will be used. Based on this research, designers create solutions that are functional, efficient, and effective in solving the problem. This can involve designing new products or systems, as well as improving existing ones.

Innovation is another purpose of designing. Designers strive to create new and original ideas, concepts, and products that have not existed before. This involves pushing the boundaries of what is possible and exploring new ways of doing things. By creating innovative solutions, designers can drive progress and make a positive impact on society.

User experience is also a critical purpose of designing. Designers aim to create products and systems that are user-friendly, easy to understand, and enjoyable to use. This involves considering the user's needs, preferences, and behaviours throughout the design process. Designers conduct user testing to ensure that the product or system is intuitive and easy to use, which can lead to higher adoption rates and user satisfaction.

Finally, **aesthetic appeal** is an essential purpose of designing. Designers aim to create products and systems that are visually appealing and attractive to the user. This involves considering factors such as colour, typography, and layout, as well as the overall look and feel of the product or system. By creating visually appealing designs, designers can enhance the user experience and create a strong emotional connection with the user.

In conclusion, the purpose of designing is multifaceted, and it involves solving problems, driving innovation, enhancing the user experience, and creating visually appealing solutions. By understanding these purposes, designers can create products and systems that meet the needs of users and make a positive impact on society.

TOOLS

Traditional mechanical drafting involved the use of manual tools such as pencils, straightedges, compasses, and protractors to create precise drawings by hand. These drawings were typically created on drafting paper, and required a high level of skill and attention to detail to produce accurate and detailed plans.

In contrast, modern drafting tools utilize computer software to create digital drawings and designs. Computer-aided drafting software allows draftsmen to create 2D drawings, as well as manipulate and edit them with ease. These softwares also provide features such as measurement tools, layer control, and the ability to easily create multiple views and renderings of the same drawing.

The shift from traditional mechanical drafting to modern drafting tools has significantly increased the

efficiency and accuracy of the drafting process. With modern drafting tools, engineers can create and modify drawings more quickly and easily, and can also collaborate and share their work with others in real time. Additionally, modern drafting tools can create more complex drawings, allowing designers to explore new possibilities and push the boundaries of what is possible.

However, traditional mechanical drafting still has its place in certain industries, such as architecture and engineering, where hand-drawn sketches and plans may be required for certain stages of the design process or for presentation purposes. Nonetheless, the vast majority of drafting work today is done using modern tools and software, which have become essential in many fields, including manufacturing, product design, and graphic design.

In contrast the mechanical design is a specific type of drafting that requires specialized tools. Here are some common tools used for mechanical designing:

Computer-aided design (CAD) software: As mentioned before, CAD software, such as NX, Solid Edge, Pro-E, SolidWorks, or Inventor, is commonly used for mechanical designing. These tools allow you to create precise 2D and 3D models, as well as simulate the performance of mechanical components.

Finite element analysis (FEA) software: FEA software, such as ANSYS or COMSOL Multiphysics, can be used to analyse the structural and thermal properties of mechanical components. This can help ensure that your designs are safe and efficient.

3D printing software: 3D printing software, such as Ultimaker Cura or Simplify3D, can be used to prepare your designs for 3D printing. These tools allow you to generate print-ready files and adjust settings like layer height and infill density.

CAM software: Computer-aided manufacturing (CAM) software, such as Mastercam or Fusion 360, can be used to generate toolpaths for CNC machines. This can help automate the manufacturing process and ensure that your designs are produced accurately.

Mechanical engineering textbooks and handbooks: While not strictly tools, mechanical engineering textbooks and handbooks can be invaluable resources for mechanical designers. They provide detailed information on topics like mechanics, materials science, and manufacturing processes.

As with any type of drafting, the best tools for mechanical designing will depend on your individual needs and preferences. It may be helpful to try out a few different options before settling on the one that works best for you.

SKILL

Mechanical drafting, also known as mechanical design, is the process of creating technical drawings and plans for mechanical systems and devices. Some of the skills required for mechanical drafting include:

Technical knowledge: Mechanical drafters need to have a solid understanding of mechanical systems, materials, and manufacturing processes.

Proficiency with drafting software: Mechanical drafters use computer-aided drafting software to create technical drawings in details.

Attention to detail: Mechanical drafters need to be meticulous and detail-oriented to ensure that their drawings are accurate and comply with industry standards.

Communication skills: Mechanical drafters often work as part of a team and need to be able to communicate effectively with engineers, technicians, and other professionals.

Problem-solving skills: Mechanical drafters need to be able to identify and solve design problems to ensure that mechanical systems function properly and efficiently.

Time management skills: Mechanical drafters often work on multiple projects simultaneously and need to be able to manage their time effectively to meet project deadlines.

Knowledge of industry standards: Mechanical drafters need to be familiar with industry standards and regulations to ensure that their drawings comply with relevant codes and guidelines.

Creativity: While mechanical drafters need to follow established standards and guidelines, they also need to be creative and innovative to develop new and improved designs.

Mechanical designing is the process of designing mechanical components, machines, and systems using computer-aided design (CAD) software. Some of the skills required for mechanical designing include:

Technical knowledge: Mechanical designers need to have a thorough understanding of mechanical systems, materials, and manufacturing processes.

Proficiency with CAD software: Mechanical designers use computer-aided design (CAD) software to create 2D and 3D models of mechanical systems and components.

Attention to detail: Mechanical designers need to be meticulous and detail-oriented to ensure that their designs are accurate and comply with industry standards.

Communication skills: Mechanical designers often work as part of a team and need to be able to communicate effectively with engineers, technicians, and other professionals.

Problem-solving skills: Mechanical designers need to be able to identify and solve design problems to ensure that mechanical systems function properly and efficiently.

Creativity: Mechanical designers need to be creative and innovative to develop new and improved designs that meet customer needs and requirements.

Knowledge of industry standards: Mechanical designers need to be familiar with industry standards and regulations to ensure that their designs comply with relevant codes and guidelines.

Time management skills: Mechanical designers often work on multiple projects simultaneously and need to be able to manage their time effectively to meet project deadlines.

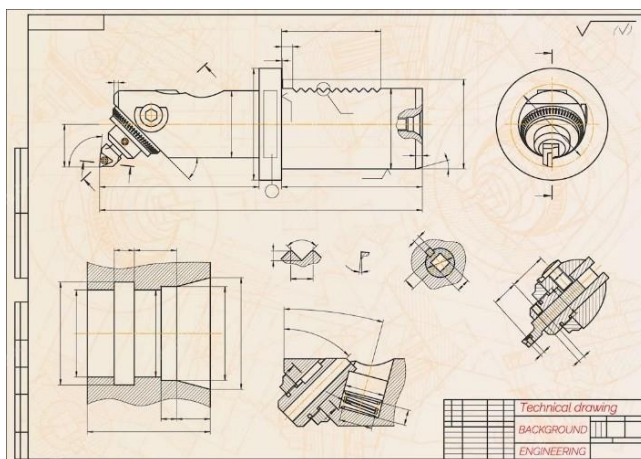
Understanding of manufacturing processes: Mechanical designers need to understand the manufacturing processes and limitations to create designs that can be manufactured efficiently and cost-effectively.

Knowledge of materials: Mechanical designers need to have knowledge of materials and their properties to select the appropriate materials for mechanical systems and components.

OUTPUT

The output of mechanical drafting typically consists of detailed technical drawings and specifications that are used to communicate design intent and manufacturing requirements. These drawings may include information on dimensions, materials, tolerances, finishes, and other key features of a mechanical component or system.

Mechanical drafting outputs can take various forms, including 2D or 3D drawings, schematics, diagrams, assembly instructions, and bills of materials. In addition to traditional hand-drawn sketches and blueprints, mechanical drafting can also be done using computer-aided drafting (CAD) software, which allows for greater precision, efficiency, and flexibility in the design process.

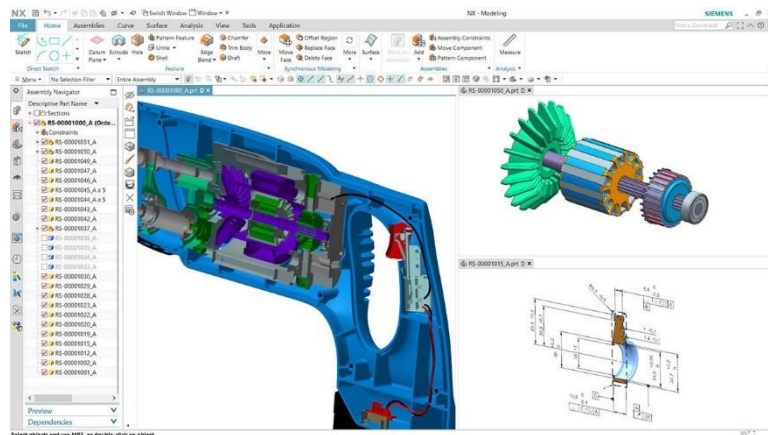


The primary purpose of mechanical drafting is to provide a clear and accurate representation of a mechanical component or system, so that it can be manufactured, assembled, and maintained correctly. This requires careful attention to detail, as well as a thorough understanding of engineering principles and industry standards.

The output of mechanical designing typically consists of digital models and technical drawings that represent the design of mechanical components or systems. These models and drawings are used to communicate design intent and specifications to various stakeholders, including manufacturers, engineers, and clients.

The digital models created in mechanical designing may include 3D models of individual parts or assemblies, which can be analysed and tested using simulation software to ensure they meet the desired performance specifications. These models can also be used to generate photorealistic renderings and animations to help visualize the final product.

Technical drawings in mechanical designing typically include detailed views of the individual parts or assemblies, along with dimensions, tolerances, materials, and otherspecifications required for manufacturing. These drawings can be produced using computer-aided drafting (CAD) software, which allows for greater precision and efficiency in the design process.



In addition to digital models and technical drawings, mechanical designing may also involve the creation of prototypes or physical models to test and refine the design. This can involve the use of various tools and techniques, such as 3D printing, CNC machining, or manual fabrication.

CONCLUSION

The primary purpose of mechanical designing is to create a detailed and accurate representation of a mechanical component or system, which can be manufactured and assembled to meet the desired performance specifications. This requires a thorough understanding of engineering principles, manufacturing processes, and industry standards, as well as strong technical and creative skills.

To conclude here, I would say that one should not interchange between design and drafting. Both are different with their importance at their places. Both fields have different purpose, require different skills, different types of output; even then both go hand in hand too in manufacturing.