

1.25 AUTOMOBILE

To transport raw materials to the factory and finished products from the factory, we need sufficient facilities by providing long services.

For the convenience of workers and other staff, for their transport, we need some buses and cars, in case of a big industry.

Lorries and buses are driven by diesel engines while cars are driven by either petrol engines or diesel engines. Diesel cars are costlier than petrol cars. Types of internal combustion engines like 2 stroke and 4 stroke and details of their working including fuel systems, cooling system, lubrication system, etc. are given in another chapter 2 stroke petrol engines are used in all motor cycles.

In the USA, every house has more than one car. In 1956, I have driven in the 8 lane highway in Chicago and all the lanes were full. In spite of very heavy traffic, road accidents are very few, as the roads are good and all of them follow the traffic rules.

But, in India, road accidents and deaths are very heavy due to the following reasons:

1. Most of the roads are not good. So, the government should look into the matter and rectify the defects.
2. Drivers do not follow the traffic rules. They drive the vehicles, after consuming alcohol such people must be heavily punished. Scooter driver do not wear helmet, in most of the states. Only in Delhi, almost 100% of the drivers including the person in the rear seat wear helmet. They must be congratulated.

In Chapter 11, the topic “Internal Combustion Engine (IC Engine)” is presented. The chapter deals with the different types of engines, important parts, their working, cooling arrangements, lubrication and fuel systems.

1.26 ENERGY ENGINEERING

From the consumption pattern of various fossil fuel like natural gas, fuel oil, coal, etc., it has been estimated that petroleum products and coal are not going to last beyond 50–100 years, respectively. As a result, every country needs to develop technologies which make use of non-conventional sources of energy such as solar, wind, tidal, geothermal, ocean, thermal energy, etc. In India, we produce maximum electricity by wind mills.

In Chapter 8, the topic “Power Plant” is presented. The chapter deals with the different types of alternate sources of energy.

1.27 INTERDISCIPLINARY CONCEPTS IN CIVIL AND MECHANICAL ENGINEERING

One of the main functions of civil engineering is the construction of buildings. Mechanical engineering is mainly involved in production work in industries, for which they need large number of buildings which can be constructed by civil engineers.

For construction work, we need large amount of cement. Though civil engineers may buy from the market, it is manufactured by mechanical engineers in cement factory.

Now-a-days, multistoried buildings are very common in all countries. In 1956, at New York, USA, I was thrilled to see very large number of multistoried buildings, including the Empire States building, the tallest in the world. For lifting building materials for the construction of such tall buildings, mechanical engineering comes to help.

One of the main functions of civil engineering is the construction of buildings. Mechanical engineering is mainly involved in production work in industries, for which they need large number of building, which can be constructed by civil engineers. For the construction of various types of industrial structures in pharmaceutical industry, food industry, paper industry, automobile industry, etc. civil engineers and different disciplines engineers like bio-medical engineers, chemical engineers, automobile engineers, biotech engineers, etc. work together.

Few examples are listed as follows:

1. Ventilation facilities especially in multi-storied building, fire safety in buildings and industries where civil, mechanical and fire safety engineers have to work together.
2. In health sector, doctors, health care officers, educationalists, municipal officers, taluk and district administrators have to interact with civil and mechanical Engineers for the construction of specialized hospitals and Educational Institutions. Construction of dust and microorganism free operation theatres, tissue banks, wards for patients of cancer and burns in hospitals demand great coordination.
3. Clean room constructions for the pharmaceutical industry, RandD centres, demand great coordination of civil and Bio-medical Engineers .
4. Few of the tough and large scale activities are construction of steel industry, paper industry, dams, bridges, tunnels, metal ores like iron, gold, etc. In which civil, mechanical and chemical engineers are required to coordinate.
5. In the transport sector, civil and mechanical engineers work together in executing facilities like roadways and railways.
6. For the construction of automobile industries, civil engineers require the coordination with mechanical and automobile engineers.
7. Marine engineers have to coordinate with civil and mechanical engineers for establishment of harbors, huge container handling cranes and naval structures.
8. Aeronautical and aerospace engineers have to interact with civil and mechanical engineers for the development of airports, aircraft manufacturing and rocket launching pads.
9. In food production, they work together in industries like fertilizers, production of pesticides, sugar industry, confectionary industries, to produce and preserve milk products like milk, cheese, butter, ghee, butter milk, milk powder, yogurt etc. Significant contributions are made in construction of the walk-in type of cold storages to preserve food materials where cooperation between civil and biotech engineers is needed.

10. Architects' and town planners' interaction with civil engineers is also essential for the infrastructure development, construction of energy conserving and environment friendly buildings. Recently, Government of India has planned many smart cities. Smart city concepts have great future to create safe living or work places. In this aspect, the cooperation of architects and civil engineers is needed.
11. The two engineering fields contribute tremendously, either to reduce the losses or for a quick recovery, at the time of natural or manmade calamities. Few of the techniques are listed as follows:
 - To reduce the chances of land slides in the hills, especially near the dams, concept of fixing cement concrete pivots on the sloping surfaces of a hill is used.
 - To reduce the possibilities of land erosion along the river beds articulated concrete blocks are used and in the coastal regions tetrahedral concrete structures are used.
 - Forest fires are brought under control with the help of equipment designed by civil and mechanical engineers.
 - Earthquake resisting foundations and buildings are available with the help of civil and mechanical engineering.
 - Building designs to resist or minimise the losses while encountering tsunami waves.
12. Infrastructure development includes suitable electric supply, Internet, telephones, good healthcare and therefore, civil engineers have to interact with electrical, communication and bio-medical engineering professionals.
13. Civil engineers and mechanical engineers coordinate with electrical engineers for the design, constructions and maintenance of the power plants like thermal power plant, hydro power plant, nuclear power plant and non-conventional power plants.
14. Constructions and maintenance of seawater desalination systems like Multi-Stage Flashing (MSF), Multi-Effect Desalination, Reverse Osmosis, or any other desalination plant where civil and mechanical engineers collaboration is required.
15. Software application is becoming more important and efficient in the project planning, estimation, analysis, design and stability of civil engineering structures and hence the role of software engineers in the civil engineering sectors becomes inevitable.

Thus, Civil Engineers should understand the importance of interdisciplinary approach in their planning, construction and erection activities to avoid criticism from any corner of the society. Though Civil and Mechanical Engineering professionals have their own systems in place in their fields, if other engineers play an interdisciplinary role, it will enhance values to their systems.