

1.1.1 Objective of the training: 1. Understanding sewage systems became second nature, including the intricacies of the waste stack, soil stack, and ventilation chimney functions. The training period lasted for approximately 9 weeks, and the participants had the opportunity to engage with different departments and learn about their respective responsibilities, as detailed in Appendix A.

1.1.5 Division of ministry of works: The ministry has multiple departments and headquarters in various locations throughout the kingdom with the following division:

- Transportation Infrastructure Division:
  - o Roads and Bridges Department
  - o Traffic Engineering Department
  - o Transportation Planning Department
- Buildings and Housing Division:
  - o Public Buildings Department
  - o Housing Development Department
  - o Architectural Design Department
- Maintenance and Operations Division:
  - o Infrastructure Maintenance Department
  - o Facilities Management Department
  - o Asset Monitoring and Optimization Department
- Project Planning and Design Division:
  - o Project Planning Department
  - o Design and Engineering Department
  - o Feasibility Studies Department

Chapter 2

1.2 supervision at CPD department:

1.2.1 Action steps for the supervisor: After a contractor wins a tender for a project, an initial meeting is held with the interested parties. Different types of HVAC units are commonly employed in buildings to address these varying needs

a) Split System: A split system HVAC unit comprises an outdoor component housing the condenser and compressor, and an indoor component housing the evaporator coil and air handler. In summary, a building's air conditioning and ventilation system comprises various components like an HVAC unit, ductwork, thermostat, air filters, ventilation system, cooling towers, humidifiers, and dehumidifiers. Sustainability and environmental conservation are strongly emphasized by the Ministry of Works, which encourages the use of eco-friendly materials, energy-efficient designs, and the inclusion of green spaces in urban developments. The key tasks of mechanical supervisors are: Reviewing design documentation Monitoring installation progress Performing quality assurance and control Resolving technical issues The main responsibility is to monitor the quality of various systems, test them in reality, and solve any problems encountered. In essence, the system includes a water source, storage tanks, pumps, pipes, valves, meters, backflow preventers, and fire hydrants, all working together to provide a dependable water supply for firefighting, hygiene, and daily needs within the building. Our journey encompassed a broad spectrum of topics, from plumbing systems to the intricate world of air conditioning units, spanning installations in various structures like buildings, hospitals, and residences.

Professional Exposure: The training will immerse participants in the real-world work environment of the Construction Project Directorate (CPD) department, allowing them to observe and actively participate in construction projects while engaging with industry experts. Problem solving and decision-making Abilities: The training will strengthen participants' critical thinking capabilities by engaging them in exercises and case studies that revolve around resolving issues encountered in construction projects.

1.1.4 Duties and activities at training: The training program organized by the CPD (Construction Project Directorate) focused on providing participants with knowledge about various aspects of infrastructure, such as the firefighting system, Gray water management, elevators, and other related topics. These key components include fire detection devices like smoke and heat sensors, automatic sprinkler systems, fire hydrants, hose reels, portable fire extinguishers, and fire-resistant construction materials. One key responsibility involves designing HVAC systems by calculating heating

and cooling needs and developing solutions to enhance productivity and well-being while reducing energy consumption. The Ministry oversees various sectors, including transportation, housing, public buildings, roads, bridges, sewerage systems, and drainage systems. To achieve this, the Ministry conducts feasibility studies, designs road networks, and implements solutions to tackle traffic congestion and enhance road safety. This involves monitoring water quality, detecting leaks, sustaining water pressure, and validating the efficiency of valves, pumps, and backflow prevention tools.

**HVAC Unit:** The HVAC system, an abbreviation for Heating, Ventilation, and Air Conditioning, depends on a unit with essential components like an air handler, compressor, condenser, and evaporator. They are frequently used in buildings to provide both heating and cooling functions, efficiently utilizing rooftop space and preserving interior areas.

**Responsibility:** The program will emphasize the importance of embracing ethical practices, upholding responsibility, adhering to standards, and promoting sustainability principles. It focuses on building and maintaining government facilities, educational institutions, healthcare centers, and affordable housing units to meet the needs of the growing population. Its extensive planning, designing, and construction efforts aim to establish a durable built environment that fosters the country's economic progress and improves the quality of life for its residents. Over the years, the Ministry has prioritized developing transportation networks, constructing buildings, and embracing sustainable practices. The Ministry has continuously adapted to meet the country's evolving needs by incorporating new approaches and collaborating with stakeholders to enhance project implementation.

In summary, a building's firefighting system is composed of various interconnected elements working together to effectively detect, manage, and extinguish fires. When selecting an HVAC unit for a building, factors like building size, climate conditions, energy efficiency criteria, and specific heating or cooling requirements are taken into consideration. This cycle persists until the desired room temperature is attained, making these air conditioners a convenient cooling option for spaces like apartments or small homes without central air conditioning.

**Firefighting design** is another crucial aspect, involving the development of fire suppression and detection systems and evacuation plans to prioritize occupant safety during emergencies. Designing at the CPD Department demands attention to detail and adherence to engineering principles and standards to establish a safe, efficient, and environmentally friendly building environment for occupants. Hands-on experiences included witnessing the installation of advanced elevators tailored for the elderly, streamlining their mobility. Its main objective is to ensure that infrastructure projects are executed successfully while upholding established standards and following best practices.

When smoke or excessive heat is detected, the system triggers audible and visual alarms to notify the building occupants and management of the potential fire hazard. These extinguishers contain specialized extinguishing agents designed to combat different types of fires, such as water, foam, carbon dioxide, or dry chemical agents. This specialized room is equipped with monitoring panels, alarms, and communication systems that allow for the continuous monitoring of the fire detection devices.

**d) Packaged Unit:** A packaged unit integrates all HVAC system components into a single unit, encompassing the compressor, condenser, evaporator, and air handler. Typically employed in smaller spaces or buildings with restricted space, packaged units eliminate the need for separate indoor and outdoor units.

**Air Filters:** Air filters play a crucial role in enhancing indoor air quality by eliminating dust,

pollen, allergens, and other harmful particles. Tasks such as cleaning filters, inspecting ductwork for leaks, and servicing the HVAC unit are essential for peak performance.

**Distribution System:** The distribution system conveys the treated water to designated areas within the building for non-potable purposes like landscaping irrigation, toilet flushing, and other authorized uses. Collaboration with stakeholders ensures seamless integration of designs with electrical and structural components for overall system harmony. Exploring air conditioning setups, and fire safety protocols, and an insightful visit to the sewage department in Tubli broadened our horizons.

**Technical Knowledge Enhancement:** The program will deepen the participants' understanding of the principles, practices, and regulations governing construction project management.

**Collaboration and Communication Skills:** The program will cultivate teamwork abilities and refine participants' communication and negotiation skills within a professional setting.

The Ministry plays a crucial role in the advancement of transportation infrastructure, such as roads, highways, and bridges. Since then, the Ministry has played a crucial role in planning, designing, constructing, and maintaining infrastructure projects across Bahrain.

**1.2.2 firefighting system:** A building's firefighting system is a interconnected network of components and devices designed to effectively detect, manage, and extinguish fires. Regularly inspecting, maintaining, and testing the firefighting system is crucial to ensure it functions correctly and is ready to respond in the event of a fire. This includes checking that fire alarms are working properly, testing the sprinkler systems, inspecting fire hydrants, and making sure fire extinguishers are charged and easily accessible throughout the building. The overall purpose of this integrated firefighting system is to detect fires at an early stage, contain the spread of the flames, and provide the necessary tools and resources for firefighting efforts.

**1.2.4 Airconditioning and Ventilation system:** The HVAC system in a building is vital for providing a healthy indoor environment by managing temperature, humidity, and air quality. When coupled with an internal fan that circulates air, this process enables effective air conditioning, making window air conditioners a practical choice for efficiently cooling small spaces. Each indoor unit can be controlled separately, allowing for customized temperature regulation and zoning capabilities. This setup aids in air circulation, reducing Odors, removing pollutants, and promoting a healthy indoor atmosphere. They work by transferring the heat produced by the condenser to the surrounding environment, assisting in cooling the refrigerant before it is cycled back into the system. These elements collaborate to regulate temperature, manage humidity, enhance air quality, and foster a healthy indoor environment for occupants. These systems include sensors, flow meters, and control panels, which are crucial for collecting data on water usage, treatment efficiency, and system functionality. Regular inspections, monitoring, and upkeep of the system are essential to maintain water quality, prevent malfunctions, and maximize the benefits of water conservation. The Design Department focuses on creating efficient and effective mechanical components to ensure optimal building functionality. The collaborative spirit thrived as we engaged in enlightening sessions with the Project Management, Architecture, and Electricity Departments, enriching our knowledge base.

**1.1.2 Background of Ministry of Works:** The Ministry of Works is the governing body responsible for overseeing the planning, design, construction, and maintenance of infrastructure projects in Bahrain. In addition to transportation infrastructure, the Ministry is also involved in constructing buildings and housing projects.

**1.1.3 Historical information:** The roots of

the Ministry of Works can be traced back to 1924, when the Public Works Department (PWD) was established during the colonial period. The PWD was responsible for overseeing the construction and maintenance of infrastructure, such as roads, bridges, and government buildings. Today, the Ministry of Works remains a central establishment in Bahrain, contributing to the country's development and progress through various infrastructure initiatives. The main contractor provides the organizational structure and CVs of the engineers working on the project, and then the work procedures are executed. It is composed of various parts and devices, each playing a crucial role in safeguarding the safety of building occupants and minimizing damage to property. Smoke detectors utilize optical or ionization sensors to detect the presence of smoke particles in the air. Firefighters can access the water from these hydrants to supply their firefighting equipment, such as hoses, in order to extinguish fires on the premises. The purpose of these fire-resistant components is to provide time for building evacuation and allow firefighters to effectively combat the flames.

1.2.3 Water supply system: The water distribution system within a building is essential for supplying water effectively for various purposes like firefighting, hygiene, and daily use. Water Storage Tanks: Buildings often incorporate water storage tanks or reservoirs that hold water to address demand during peak periods or in the event of a water supply interruption. Their primary role involves extracting water from either the water source or storage tanks and circulating it throughout the piping network. They are instrumental in determining water charges and monitoring water usage, while also identifying potential leaks or inefficiencies. Ongoing maintenance, assessments, and tests are essential to ensure the functionality and safety compliance of a building's water supply system. It Treats wastewater, from sources, than toilets allowing for its reuse.

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